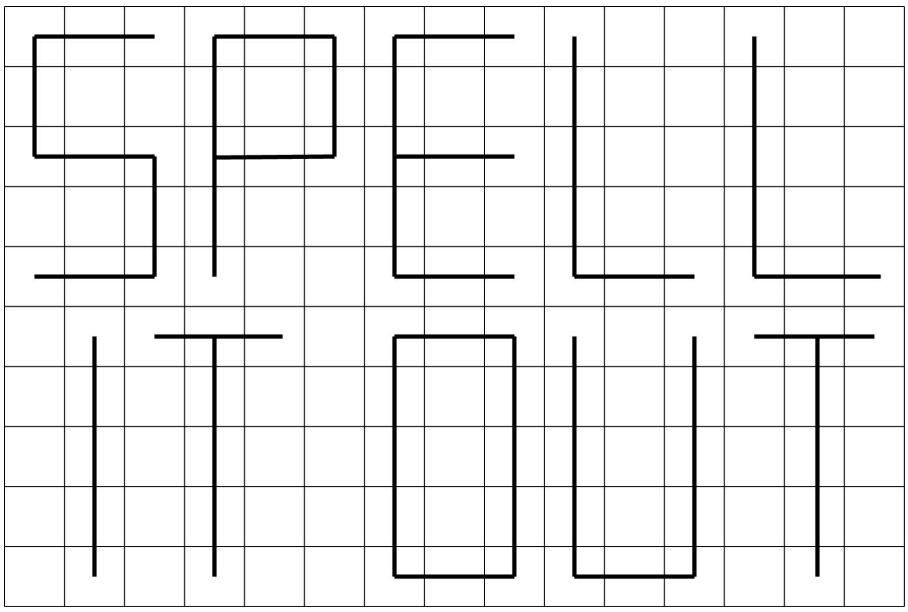
15ML62287

ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2016/2017

1 This is part of the tiled floor of the magic shop Spell It Out.



Five different types of tile make up the design. How many of the tiles have the pattern  ?

A 18

B 19

C 17

D 21

E 20

2 A factory has received an order for a product. It takes 9 operations to manufacture it. These may take place in any order and at any time in the manufacturing process but an individual worker stays with one operation from its beginning to its end. The number of hours for one worker to complete each operation is as follows:

Operation	A	B	C	D	E	F	G	H	I
Duration in hours	12	3	8	9	10	2	6	4	10

All workers are able to complete all operations, but can only do one at a time. The product has to be ready in 16 hours.

What is the minimum number of workers required to manufacture the product in the given time?

A 6

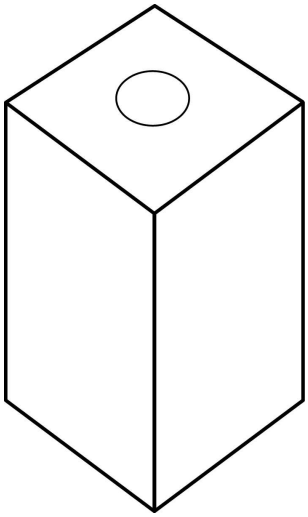
B 4

C 9

D 1

E 5

3 Below is a picture of a biscuit tin with four identical sides. A set of these tins is to be made that are all distinguishable from each other by colour alone. The manufacturer will paint each of the four sides either red or blue. The top and bottom are not painted.



What is the greatest number of different tins that can be made?

A 6

B 7

C 8

D 4

E 5

4 In a slalom skiing competition skiers tackle the course one at a time. Each skier makes two runs. The times for the two runs are added and the fastest total time determines the winner. Competitors who fail to finish their first run are not allowed to make a second run.

In the second round, skiers compete in the reverse order of their positions after the first round.

Grace took part in a slalom competition last week. She was the eighth skier to make her first run. At the end of the first round she was in sixth position, so she had to wait for 17 of her rivals to make their second runs before it was her turn again. Three skiers had failed to complete the course in the first round.

How many competitors took part in last week's slalom competition?

A 26

B 23

C 34

D 31

E 28

5 In 1688 the Irish philosopher William Molyneux asked whether a blind person who regained their vision could recognise by sight an object they had previously only known by touch. Richard Held and Pawan Sinha of the Massachusetts Institute of Technology attempted to answer this question in an experiment with five children in India who had just had successful surgery which gave them their sight for the first time. Within 48 hours of the operation the children were asked to feel a toy block without looking at it. They were then shown two blocks, one of which they had touched. They identified the orginal block just over half of the time and this is only a little better than guesswork. Recognising touched objects by sight alone improved within days.

Which one of the following can be drawn as a conclusion of the above passage?

A Using children in experiments such as the one described above is morally wrong.

B Identifying an object by sight alone which had been touched but not seen previously is learned behaviour and not innate.

C Identifying an object by sight alone which had been touched but not seen previously is innate behaviour and not learned.

D Identifying an object by sight alone which had been touched but not seen previously is something which adults do better than children.

E Identifying an object by sight alone which had been touched but not seen previously is something which children do better than adults.

6 A delivery company opens its depot at 7:30 am. It uses large and small vans to make deliveries. The smaller vans take 10 minutes to load and then 1 hour to make the deliveries and return. The larger ones have a loading time of 30 minutes and return from deliveries after 2 hours. The driver of a large van starts loading at 8:00 am.

If the driver of a small van is to make the maximum number of deliveries he can, how much later than the driver of the large van can he start loading if they are both to arrive back at the depot for lunch at 1:00 pm?

A 0 minutes

B 20 minutes

C 15 minutes

D 5 minutes

E 10 minutes

7 A bakery shop makes its own bread in batches to sell on site. Bakers always describe the quantities of other ingredients as a percentage of the weight of flour used. They will then use the percentages in the table below to calculate how much water, salt and fat are required. Today, the baker is planning to use 250 kg of flour to make White Bread.

The Baker's Percentage			
Bread Type	*Water (%)*	*Salt (%)*	*Fat (%)*
Neapolitan Pizza	59	1.5	None
Baguette	60	2	None
French Bread	66	2	None
Ciabatta	80	2	2.5
Focaccia	80	3	3
White Bread	54	2	17
Brioche	22	2	133

What is the total weight of the mixture to be made?

A 323 kg

B 432.5 kg

C 250 kg

D 182.5 kg

E 420 kg

8 My choice of sandwich will depend on its nutritional content as shown in the following table:

type	*price (£)*	*energy (kJ)*	*protein (g)*	*fat (g)*	*salt equiv (g)*
beef	2.00	1220	22	3.4	1.3
chicken	2.10	1327	26	4.1	1.4
ham	1.90	1164	18	3.8	1.7
turkey	2.20	1163	20	2.5	1.5
salad	1.50	931	8	3.3	1.7
tuna	2.00	1579	19	14.3	1.7

I want to have at least 20 g of protein in my sandwich and no more than 4 g of fat.

Which is the smallest amount that I will pay for my sandwich?

A £2.20

B £2.00

C £1.50

D £2.10

E £1.90

9 Few linguists would argue against the view that our first language is acquired and not learned. Pre-school children do not study their native tongue nor do they learn grammar rules but, by the time they start school at the age of five or six, the vast majority are competent users of their language. Therefore, when learning a second or additional language, studying grammar is a waste of time and all that is required is exposure to the target language in order to acquire competency in its use.

Which one of the following identifies the underlying assumption of the above argument?

A Only people who know how to read can learn a second or additional language.

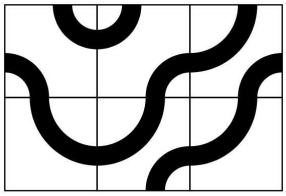
B Languages are fundamentally different from one another.

C Children are better at acquiring languages than adults.

D Learners of second or additional languages should read the target language.

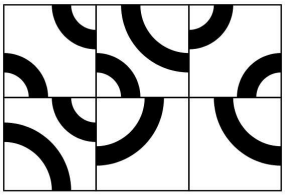
E Acquiring a second or additional language is the same process as acquiring a first language.

10 The following pattern is made from six square tiles:

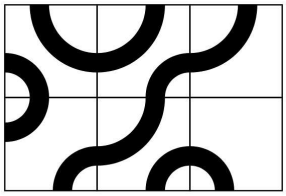


Which one of the following patterns can also be made from the same six tiles?

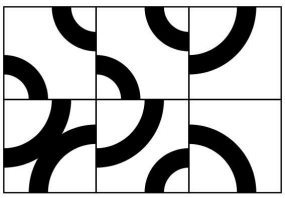
A



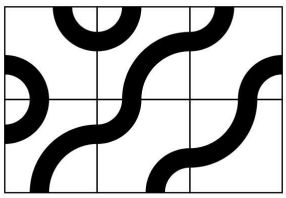
B



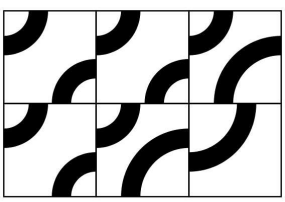
C



D



E



11 Children need to play in order to develop their thinking skills. When children play, they are merely going through scenarios, working out the consequences and implications of actions, puzzling out what might happen – the very same processes that adults have learned to do in their heads, the process more commonly known as 'thinking'! It follows that thinking and playing are really one and the same thing.

Which one of the following best expresses the main conclusion of the above argument?

A Children need to be taught how to think about the future.

B Children who do not play will not be good thinkers.

C Playing and thinking are essentially two forms of the same activity.

D Children need to be allowed to play in order to develop their thinking skills.

E Playing is just an early version of abstract thinking and reasoning.

12 What is a clone but a twin? What is genetic engineering or selective breeding but assisted evolution? How often do we hear these trite excuses for man's arrogant interference with natural processes? Too often. It is time to call a halt and consider just what limits need to be placed on the break-neck progress of bio-technology, if 'progress' is even the right word for it. The big question for science should not be 'What's in it for us?' but 'Could this have happened naturally?' And if the answer is 'No' then we should not bring it about just because we have found that we can. If we do we may live a bit longer or grow more food per acre, but we don't know where our meddling will end.

Which one of the following is a principle which underlies the above argument?

A Nature will have its own way in the long run.

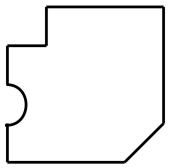
B Meddling with nature could only ever end in disaster.

C Science should not progress beyond what is natural.

D It is time to call a halt on bio-technological advances.

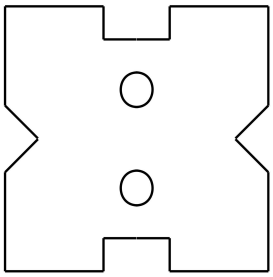
E Cloning, genetic engineering and selective breeding are not 'progress'.

13 I have folded a square piece of paper in half, then in half again, then cut three pieces from the resulting smaller square, as indicated below:

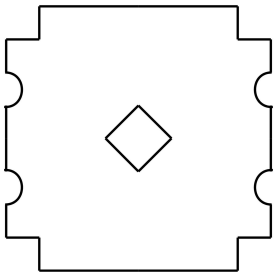


Which one of the following CANNOT possibly be the appearance of the paper after I unfold it?

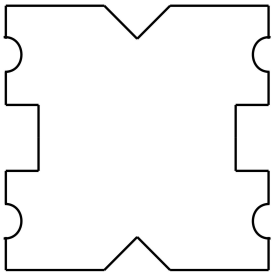
A



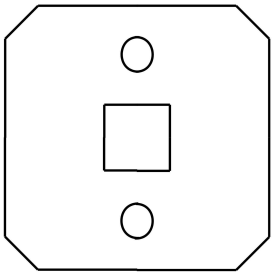
B



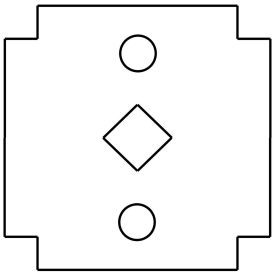
C



D



E



14 Children born in Japan today can expect to live five years longer than their American counterparts. Life expectancy has been rising in all countries, but the slowest rate of increase has been in the USA. What could account for this, given that the percentage of people who smoke is roughly the same in all rich countries? Of course, the USA is the birthplace of fast food restaurants that sell unhealthy food. Moreover, a recent survey of American lifestyles has found that overeating and failure to exercise are widespread amongst the population. So we must assume that obesity and lack of exercise have caused the USA to lag behind in the increase in life expectancy.

Which one of the following, if true, most weakens the above argument?

A Most rich countries have the same standard of medical expertise.

B The USA spends more money on fast food than any other nation.

C Japanese children had a healthier diet in the 1960s than they do today.

D In the 1960s and 1970s the USA had the highest percentage of smokers.

E American fast food restaurants are now found in most rich countries.

15 While some animal rights activists have long accepted that there is a link between bovine tuberculosis (TB in cattle) and badgers, others have argued that it was not proven. They felt that the culling of badgers to stop the spread of TB in cattle was not justified if a link was unproven. But direct evidence of the transmission of TB between badgers and cattle has now been found. DNA sequencing of the TB bacteria in cattle and in badgers has shown that the disease crosses species barriers. This latest discovery completely undermines the case of those who have opposed badger culling. To protect farmers from severe loss of their cattle and hence their livelihoods – and to protect one of our primary sources of meat and milk – the badger population should be culled.

Which one of the following, if true, would most weaken the argument in the passage above?

A Animal rights activists are interested in the protection of badgers per se, whatever risk they pose.

B There may be factors other than badgers, such as the movement of cattle, which contribute to the spread of TB in cattle.

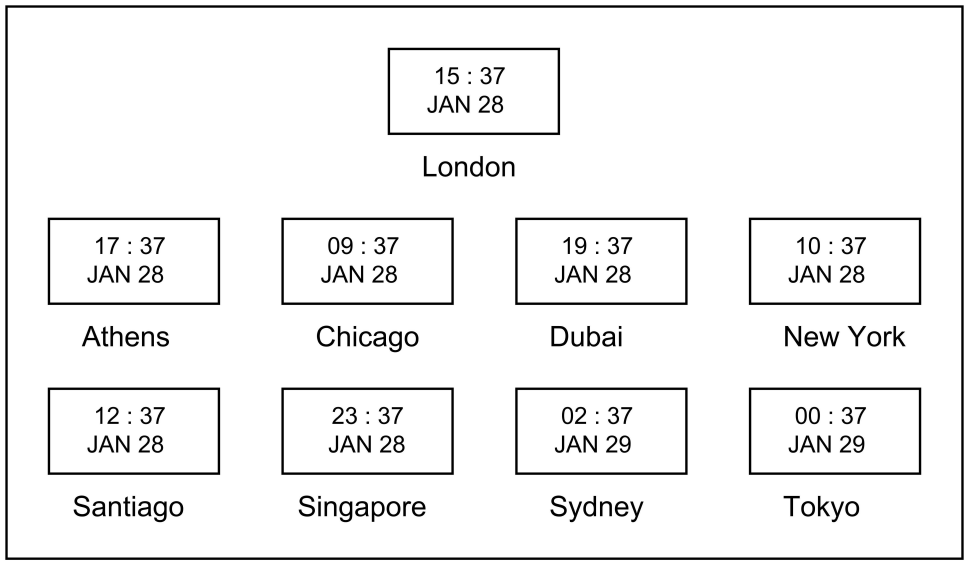
C It is too expensive and logistically difficult to vaccinate all cattle against TB.

D Badger culling would be unpopular with a substantial number of people.

E Not all farmers are convinced that the culling of badgers would stop the spread of TB.

16 In the foyer of a company in London there are nine clocks showing the local time at each of the company's nine branches.

This is how they appear at present:



The person in charge of re-setting these clocks in March and October has to remember:

1 In Dubai, Singapore and Tokyo clocks remain unchanged all year round.

2 In London, Athens, Chicago and New York clocks are put one hour forward in March and one hour back in October.

3 In Santiago and Sydney clocks are put one hour forward in October and one hour back in March.

When these clocks are next reset, which two will show the same time?

A Chicago and New York

B Athens and London

C New York and Santiago

D Singapore and Tokyo

E Sydney and Tokyo

17 Childhood obesity is still a problem. This is often blamed on the fact that children have easy access to a range of unhealthy foods and increasingly have more money available to them to spend on fattening and sugar-filled foods. A solution seems obvious – raise the prices of all these foods so that parents will have more control over what their children eat and will find it more economical to buy healthy foods. Unfortunately, this is unlikely to work as the problem is also caused by the fact that unhealthy foods tend to be more convenient and that is what many parents consider when deciding what foods to provide. A wider range of 'ready to eat' healthy food options would be a good start to solving the problem of child obesity.

Which one of the following best expresses the main conclusion of the above argument?

A Parents should have more control over the food that their children eat.

B The price of unhealthy foods should be raised.

C There should be more 'ready to eat' healthy meals available.

D Children have too much access to fattening and sugar-filled foods.

E Child obesity is still a problem.

18 The government is considering changing the law to assume consent for the donation of organs after death. People opposed to the idea would have to deliberately 'opt out' of the scheme, although relatives would still be consulted. The supply of healthy organs available for transplant would be vastly increased under this scheme. If the government really wants to improve the lives of people with long-term health problems, this is a measure it must take.

Which one of the following, if true, would most strengthen the argument in the passage above?

A Bereaved relatives find donation decisions very distressing.

B The number of voluntary organ donors is small and not increasing.

C Not all of the organs donated are suitable for transplant.

D There would be opposition by civil liberties groups to this measure.

E It is not known how many people would 'opt out' of the compulsory scheme.

19 In recent years there has been increased concern that fashion models reflect an unrealistic and unattainable image of femininity and that this has a negative effect on the self-esteem of many young women. Many major designers continue to design for an exceptionally tall and flat-chested female frame. It should be no surprise therefore that there have been several cases recently when designers have favoured male models on their catwalks to model their womenswear. Rather than being a cause of surprise or concern, this should be welcomed as a recognition of the fact that these designs are unsuitable for most women and it draws attention to the major differences between catwalk fashion and clothing for the real world.

Which one of the following statements, if true, would most strengthen the argument above?

A Some designers have favoured male models simply to generate more media attention for their collections.

B Some female models struggle to maintain the necessary physique for catwalk modelling.

C Some designers are recognising that the physique of many catwalk models represents an unhealthy ideal for most women.

D Very few observers noticed initially that the male models were not in fact women.

E Surveys of young women have suggested that the use of male models makes the typical model physique less desirable to attain.

20 High profile members of society can raise awareness of worthy causes better than members of the public, because they have their opinions listened to and respected more readily by a larger number of people. Celebrities should not be shy about drawing attention to charities and foundations to which they donate their time and money, because it may encourage other people to do the same.

Which one of the following best illustrates the principle underlying the argument above?

A People should value their superiors' opinions on all matters because they have been successful in one or more fields.

B If your boss does not commit any virtuous acts then neither should you.

C If you can help someone else by donating your disposable time and money, it will help improve society.

D Directors of companies should encourage their employees to recycle more by visibly doing so themselves.

E Companies with the most employees should be put under pressure to commit to the most social change.

21 Which of the following countries is NOT a founding member of NATO?

A Canada

B Belgium

C Germany

D France

E Italy

22 Which of the following is NOT one of the Seven Wonders of the Ancient World?

A The Hanging Gardens of Babylon

B The Great Pyramid of Giza

C The Lighthouse of Alexandria

D The Parthenon of Athens

E The Colossus of Rhodes

23 Which organelle contains RNA but not DNA?

A nucleolus

B mitochondrion

C chloroplast

D smooth endoplasmic reticulum

E ribosome

24 An organism is heterozygous for two genes. These two genes make up part of the same DNA molecule.

For one gene, E represents the dominant allele, e represents the recessive allele.

For the other gene, R represents the dominant allele, r represents the recessive allele.

Assuming there is no mutation, at the end of a mitotic division producing two cells which row(s) is/are possible?

	number of DNA molecules containing these two genes in each cell	*alleles present in each cell*
row 1	one	only E or only R
row 2	one	E and r
row 3	one	E and R
row 4	two	only E on one molecule, only R on the other
row 5	two	only e on one molecule, only r on the other
row 6	two	E and R on one molecule, e and r on the other
row 7	two	E and r on one molecule, e and R on the other

A row 6 only

B rows 4 and 5 only

C row 1 only

D rows 2 and 3 only

E rows 6 and 7 only

25 Which row correctly identifies a nucleic acid NOT directly involved in transcription, and a nucleic acid which is NOT directly involved in translation?

row	*nucleic acid NOT directly involved in transcription*	*nucleic acid NOT directly involved in translation*
1	tRNA	DNA
2	mRNA	tRNA
3	DNA	mRNA
4	tRNA	mRNA
5	DNA	DNA

A row 3

B row 5

C row 1

D row 4

E row 2

26 Which row of the table correctly indicates features that are found in **both** pure extracts of DNA and tRNA molecules?

✓ = present and X = absent

	pentose sugar	*adenine*	*hydrogen bond*	*phosphodiester bond*	*uracil*
row 1	✓	✓	X	X	X
row 2	X	✓	✓	✓	✓
row 3	✓	X	X	✓	✓
row 4	✓	✓	✓	✓	X
row 5	X	✓	X	X	✓

A row 4

B row 1

C row 5

D row 3

E row 2

27 Which of the following can be random processes?

1 genetic drift

2 mutations

3 artificial selection

A 2 and 3 only

B 1, 2 and 3

C 1 and 2 only

D none of them

E 1 and 3 only

28 Below are some steps involved in the production of transgenic plants.

Step V: Mixing of the required gene and the plasmid with ligases

Step W: Isolation of the required gene using restriction enzymes

Step X: Identification of the recombinant plasmid

Step Y: Injection of plasmid into host plant cell

Step Z: Use of restriction enzymes to produce sticky ends in the plasmid

Which one of the following options gives a correct order for these steps?

A W → Z → X → V → Y

B W → Z → X → Y → V

C Z → W → V → Y → X

D W → V → Z → X → Y

E Z → W → V → X → Y

29 Which sequence shows cells of increasing size (from left to right)?

A E. coli → human red blood cell → onion epidermal cell

B human red blood cell → E.coli → onion epidermal cell

C E. coli → onion epidermal cell → human red blood cell

D onion epidermal cell → human red blood cell → E. coli

E onion epidermal cell → E. coli → human red blood cell

30 Which option shows the structure in humans that produces bile and then the structure that stores bile?

A gall bladder produces and then liver stores

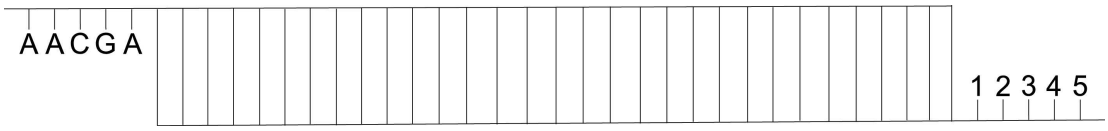
B liver produces and then liver stores

C gall bladder produces and then gall bladder stores

D liver produces and then gall bladder stores

E liver produces and then duodenum stores

31 The diagram represents a whole DNA plasmid that has been cut open using a single restriction enzyme:



What are the bases in positions 1, 2, 3, 4 and 5 respectively?

A T T G C T

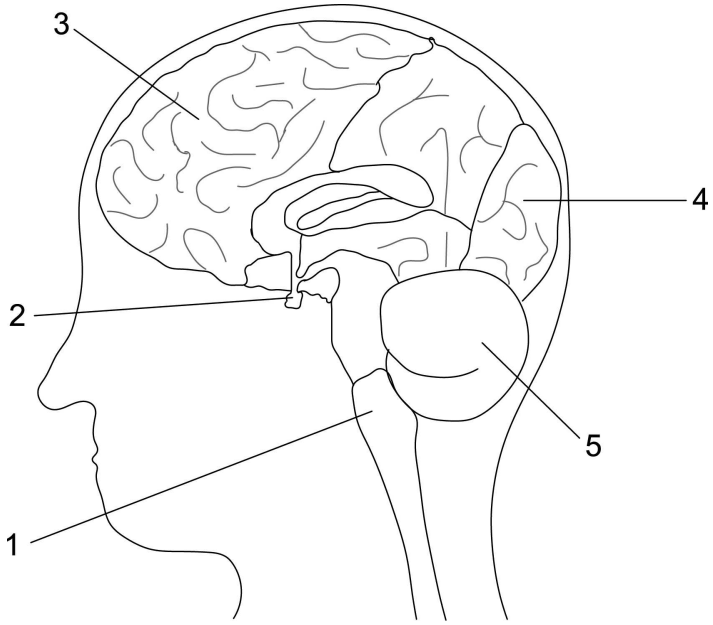
B U C G U U

C U G C U U

D U U G C T

E T C G T T

32 Which labelled structure on the diagram of the brain plays the major role in regulating the nervous control of heart rate?



A 1

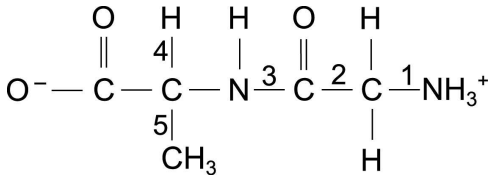
B 3

C 4

D 2

E 5

33 The dipeptide represented below is in aqueous solution.



Which numbered bond (1 to 5) needs to be broken (hydrolysed) in this dipeptide to directly form two amino acids?

A 1

B 5

C 3

D 4

E 2

34 Which of the following are respiratory enzymes?

1 acetyl coenzyme A

2 FAD

3 reduced NAD

A 1 and 2 only

B 2 and 3 only

C 1, 2 and 3

D none of them

E 1 and 3 only

35 In the testes of a healthy man there are diploid cells that undergo meiosis to produce gametes.

Which of the following statements is/are correct about meiosis for one of these diploid cells?

1 The diploid cell has doubled its DNA content before the start of meiosis I.

2 The cells at the start of meiosis II are diploid.

3 The total number of chromosomes produced by the end of meiosis II is double that of the original diploid cell.

A 3 only

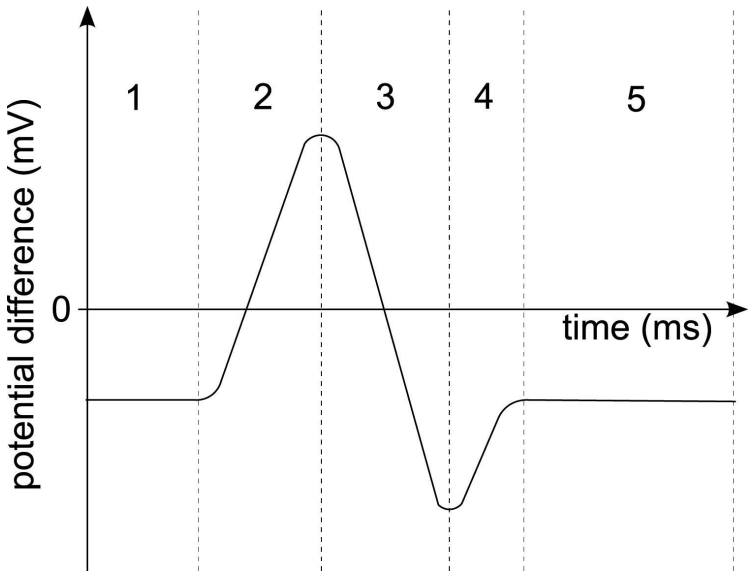
B 2 and 3 only

C 1, 2 and 3

D 1 and 3 only

E 1 only

36 The diagram shows the change in potential difference (pd) across the cell surface membrane of a sensory neurone. During which one of the phases (1–5) are the Na^+ gates of the neurone open?



A 1

B 3

C 4

D 2

E 5

37 An experiment is set up to study two genes. The two genes assort independently and for each gene the expression of alleles involves complete dominance. In the genetic cross RrTt x RrTt, a number of different phenotypes are seen. What is the difference between this number of phenotypes and the number of phenotypes seen when the cross RrTt x rrtt is carried out?

A 4

B 8

C 2

D 1

E 0

38 Which option correctly identifies the site of the light-dependent reactions in photosynthesis (S), the hydrogen carrier (H) used and its end state (N)?

A S: stroma; H: NAD; N: reduced

B S: granum; H: NAD; N: reduced

C S: granum; H: NADP; N: reduced

D S: stroma; H: NADP; N: oxidised

E S: stroma; H: FAD; N: oxidised

39 The following shows the phases in mitosis.

Prophase → Phase two → Anaphase → Phase four

Which row in the table below shows the correct processes occurring in Phase two and Phase four of mitosis?

	Phase two	*Phase four*
row 1	chromosomes line up	nuclear envelope reforms
row 2	spindle fibres contract	chromosomes reach opposite poles
row 3	DNA duplicates to form sister chromatids	chromosomes are not visible
row 4	DNA starts to condense	chromatids separate and move to opposite poles
row 5	homologous chromosomes line up	cytoplasm of parent cell is divided into two daughter cells

A row 1 and row 5 only

B row 1 only

C row 2 and row 3 only

D row 5 only

E row 4 only

40 In which of the following organelles do carbohydrates play a relevant role?

1 mitochondria

2 Golgi apparatus

3 chloroplasts

A 1 and 3 only

B 2 only

C 1 and 2 only

D 2 and 3 only

E 1, 2 and 3

41 Which of the following substances will form an alkaline solution when dissolved in water?

1 Na_2CO_3

2 NaCl

3 $NaHSO_4$

A 1, 2 and 3

B 1 only

C 1 and 2 only

D 2 and 3 only

E 1 and 3 only

42 Lead(II) nitrate solution and potassium iodide solution react to form potassium nitrate in solution and a bright yellow precipitate of lead(II) iodide.

Which one of the following correctly represents the ionic equation for this chemical reaction?

A $Pb^{2+}(aq) + I^{-}(aq) \rightarrow PbI(s)$

B $Pb^{2+}(aq) + I^{2-}(aq) \rightarrow PbI(s)$

C $Pb^{+}(aq) + 2I^{-}(aq) \rightarrow PbI_2(s)$

D $Pb^{2+}(aq) + 2I^{-}(aq) \rightarrow PbI_2(s)$

E $Pb^{+}(aq) + I^{-}(aq) \rightarrow PbI(s)$

43 The formula of a molecule is $CH_2CHCH_2CH_2COCH_2CHO$.

Which functional groups given below are present in the molecule?

1 alkene

2 alcohol

3 aldehyde

4 ketone

A 1, 3 and 4 only

B 2, 3 and 4 only

C 1 and 4 only

D 1, 2 and 3 only

E 3 and 4 only

44 Which of these particles have the same electronic structure?

1 $_{12}Mg^{2+}$

2 $_{10}Ne$

3 $_{16}S^{2-}$

4 $_{9}F^{-}$

5 $_{3}Li^{+}$

A 1, 2 and 5 only

B 2, 4 and 5 only

C 1, 2 and 3 only

D 3, 4 and 5 only

E 1, 2 and 4 only

45 A mixture of methanol and ethanoic acid is left until equilibrium is reached. The equation for this reaction is given below.

$$CH_3OH(l) + CH_3COOH(l) \rightleftharpoons CH_3COOCH_3(l) + H_2O(l) \qquad \Delta H = -8.5 \text{ kJmol}^{-1}$$

The amount of CH_3OH in this mixture at equilibrium can be increased by:

1 adding more water to the mixture

2 raising the temperature of the mixture

3 adding sodium hydroxide to the mixture

4 adding a catalyst to the mixture

A 2 and 4 only

B 1 and 2 only

C 1 and 3 only

D 1, 2 and 3 only

E 4 only

46 The compounds carbon dioxide (CO_2), propane (C_3H_8) and ethanal (CH_3CHO) all have $M_r = 44$.

Which of the following lists correctly shows these compounds in the order that they become gases as their temperature rises from –100°C at the same pressure?

A CO_2, C_3H_8, CH_3CHO

B CH_3CHO, C_3H_8, CO_2

C CO_2, CH_3CHO, C_3H_8

D C_3H_8, CO_2, CH_3CHO

E C_3H_8, CH_3CHO, CO_2

47 A sample of lithium was completely reacted with water. The equation for this reaction is:

$2Li(s) + 2H_2O(l) \rightarrow 2LiOH(aq) + H_2(g)$

The aqueous lithium hydroxide solution formed has a concentration of 0.10 mol/L.

What is its concentration in g/L?

(A_r: Li = 7.0; O = 16.0; H = 1.0)

A 240

B 480

C 4.8

D 3.1

E 2.4

48 An aqueous solution of NaOH has a concentration of 0.01 mol/L.

Given the ionic product of water is $K_w = [H^+]\,[OH^-] = 10^{-14}\ mol^2/L^2$ (at 25°C) and that the equation for pH is $pH = -\log_{10}[H^+]$, calculate the pH of the NaOH solution at 25°C.

A 13

B 11

C 7

D 14

E 12

49 How many unbranched straight chain molecules are there with the molecular formula $C_4H_8F_2$, but with different structural formulas?

A 8

B 4

C 9

D 12

E 6

50 Identify the number of protons (p), neutrons (n) and electrons (e) present in the ion:

$$^{52}_{24}Cr^{3+}$$

A p = 27 n = 25 e = 21

B p = 24 n = 28 e = 24

C p = 27 n = 25 e = 24

D p = 24 n = 28 e = 21

E p = 24 n = 24 e = 21

51 Which of the following molecules contain bond angles of 180° in their gaseous states?

(Atomic numbers: H = 1; Be = 4; C = 6; Cl = 17)

1 $BeCl_2$

2 C_2H_2

3 CCl_4

A 1 and 3 only

B 1 and 2 only

C 1 only

D 2 and 3 only

E 2 only

52 Five of the ions of vanadium are listed below:

1 VO_3^-

2 V^{3+}

3 V^{2+}

4 VO^{2+}

5 VO_2^+

Which two ions have vanadium in the same oxidation state?

A 2 and 5

B 1 and 5

C 3 and 4

D 4 and 5

E 1 and 3

53 A right-angled triangle has an area of 18 cm². One of the two shorter sides is twice the length of the other one.

What is the length of the hypotenuse of the triangle?

A $9\sqrt{2}$ cm

B $6\sqrt{5}$ cm

C $3\sqrt{10}$ cm

D $3\sqrt{5}$ cm

E $3\sqrt{6}$ cm

54 Which physical quantity can be measured in joules per metre?

A kinetic energy

B momentum

C power

D work

E force

55 Which one of the following is a simplification of

$$\frac{2}{x^2-1}-\frac{1}{x-1}$$

[where $x \neq \pm 1$]

A $-\frac{1}{x+1}$

B $\frac{2}{x-1}$

C $\frac{3-x}{(x-1)^2}$

D $\frac{1}{x^2-1}$

E $\frac{3-x}{(x-1)(x+1)}$

56 The straight-line graph given by the equation

$$\frac{x}{4}+\frac{y}{6}=1$$

intersects the x-axis at A (a,0) and the y-axis at B (0,b).

A circle passes through A and B and has a diameter AB.

What are the coordinates of the centre of the circle?

A (2, 3)

B (3, 2)

C (6, 4)

D (4, 6)

E (0, 0)

57 A student has three 6.0 Ω resistors that can be connected together in any configuration. What are the maximum and minimum resistances that can be obtained by using one or more of these three resistors?

[Assume the connections between the resistors have negligible resistance, the temperature of the resistors is constant, the resistors are used in a d.c. circuit and none of the resistors is short-circuited.]

A maximum resistance: 6.0 Ω; minimum resistance: 2.0 Ω

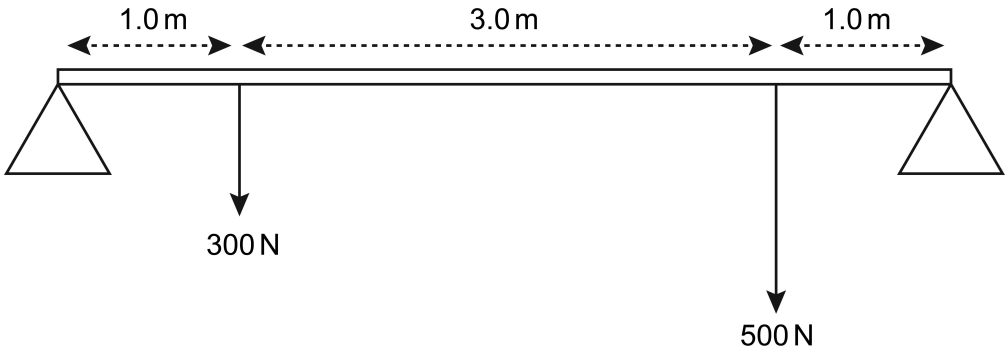
B maximum resistance: 12 Ω; minimum resistance: 0.50 Ω

C maximum resistance: 6.0 Ω; minimum resistance: 0.50 Ω

D maximum resistance: 18 Ω; minimum resistance: 6.0 Ω

E maximum resistance: 18.0 Ω; minimum resistance: 2.0 Ω

58 The diagram shows a uniform horizontal beam of negligible mass, 5.0 m long, placed on two supports, one at each end. It has a 300 N weight placed 1.0 m from one end and a 500 N weight placed 1.0 m from the other end. Both weights act vertically on the beam as shown in the diagram.



What are the upward forces from the two supports acting on the beam?

A 340 N and 460 N

B 300 N and 500 N

C 240 N and 560 N

D 400 N and 400 N

E 360 N and 540 N

59 A ball is projected vertically upwards and then falls back to its original position.

Once projected, the ball experiences only a single force, downwards, due to a constant gravitational field strength of 10 N/kg.

Here are three statements about the ball:

1 When the ball is moving upwards it loses kinetic energy and gains potential energy.

2 The magnitude of the ball's acceleration increases as it falls.

3 No vertical forces act on the ball when it is at its maximum height.

Which of the statement(s) is/are correct?

A 2 and 3 only

B none of them

C 1 and 2 only

D 3 only

E 1 only

60 $x = 3 \times 10^{m}$ and $y = 5 \times 10^{n}$ where m and n are integers.

Which of the following is an expression, in scientific notation, for xy?

A $8 \times 10^{m+n}$

B 1.5×10^{mn}

C $15 \times 10^{m+n-1}$

D $1.5 \times 10^{mn+1}$

E $1.5 \times 10^{m+n+1}$

IMAT 2016

Answer Key

Question	Answer
1	C
2	E
3	A
4	A
5	B
6	B
7	B
8	B
9	E
10	A
11	D
12	C
13	E
14	D
15	B
16	C
17	C
18	B
19	E
20	D
21	C
22	D
23	E
24	E
25	C
26	A
27	C
28	E
29	A
30	D

Question	Answer
31	A
32	A
33	C
34	D
35	D
36	D
37	E
38	C
39	B
40	E
41	B
42	D
43	A
44	E
45	D
46	A
47	E
48	E
49	E
50	D
51	B
52	B
53	C
54	E
55	A
56	A
57	E
58	A
59	E
60	E

ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2015/2016

1 Although the Earth supports life, it has a mysterious carbon deficit. Compared with other bodies in the solar system the Earth has far less carbon than would be expected for a planet that supports life. Originally it was thought that in the inner region of the dust disc where the Earth formed, temperatures soared high enough for the carbon to boil away. However, observations of developing solar systems have now suggested that the temperature would not have been high enough. It is more likely that fire is to blame. Hot oxygen atoms would have readily combined with carbon, burning to produce carbon dioxide. There would have been fewer of these oxygen atoms further away from the Sun.

Which one of the following, if true, would most strengthen the above argument?

A The carbon that is present on the Earth could have arrived at a later date from an asteroid.

B The abundance of carbon in the asteroid belt surrounding the inner planets increases the further away you get from the Sun.

C There is no theoretical reason why life has to be carbon-based.

D There are other solar systems with Earth-like planets that have an abundance of carbon on them.

E At temperatures that are high enough for carbon to boil away, oxygen would also have boiled away.

2 Tom is having a celebration and needs to send out 50 invitation cards. The cards must be at least 6 cm wide and at least 8 cm high and Tom wants to put a photo on the card. Each type of card has a standard version and a deluxe version. The prices (per card) that have been quoted to Tom are shown in the table below:

Width (cm)	*Height (cm)*	*Photo?*	*Personalised greeting?*	*Price (standard)*	*Price (deluxe)*
6	6	Y	N	€0.90	€1.65
6	10	N	Y	€1.00	€1.60
6	10	Y	Y	€1.75	€2.15
7	7	Y	N	€1.40	€1.90
7	10	Y	N	€1.50	€1.95
7	10	Y	Y	€1.60	€2.15
10	10	Y	N	€2.25	€2.95

Tom wants to buy the cheapest type of card possible but is willing to pay for the deluxe version instead of the standard.

What is the total extra that Tom would have to pay to buy the deluxe cards?

A €30.00

B €20.00

C €25.00

D €22.50

E €27.50

3 Now, it might be thought an amazing coincidence if Earth were the only planet in the galaxy on which intelligent life evolved. If it happened here, the one planet we have studied closely, surely one would expect it to have happened on a lot of other planets in the galaxy – planets we have not yet had the chance to examine. This objection, however, rests on a fallacy: it overlooks what is known as an 'observation selection effect', so it wouldn't be such a coincidence. Whether intelligent life is common or rare, every observer is guaranteed to originate from a place where intelligent life did, in fact, arise. Since only the successes give rise to observers who can wonder about their existence, it would be a mistake to regard our planet as a randomly selected sample from all planets.

Which one of the following best expresses the main conclusion of the above argument?

A Our planet is not a randomly selected sample from all planets.

B However common intelligent life is, every observer will certainly originate from a place where intelligent life did, in fact, arise.

C If life had evolved here on Earth, it would probably have happened on a lot of other planets in the galaxy.

D There would be no amazing coincidence if we discovered that Earth were the only planet in the galaxy on which intelligent life evolved.

E It would be an amazing coincidence if Earth were the only planet in the galaxy on which intelligent life evolved.

4 Alberto has decided to paint his dining room. Paint comes in 1 litre cans. The paint in one can will cover an area of approximately 24 square metres. The dining room is 4 m x 6 m x 3.5 m high. There is just one window which is in one of the long walls and is 1.5 m x 2 m.

All of the walls, door and ceiling are to be painted with the same type of paint.

Approximately 20% of the wall area to be painted is wood which will need a second coat of paint.

What is the minimum number of cans of paint that Alberto should buy to have sufficient to complete the room?

A 4 cans

B 6 cans

C 5 cans

D 2 cans

E 3 cans

5 Children are being encouraged to take up gardening through special events at shows and activities in schools. It is hoped that an interest in gardening, and particularly growing one's own food, will make children more interested in learning about their food and they will therefore be deterred from eating junk food. The initiative should be supported and spread to more schools as quickly as possible.

Which one of the following, if true, would most weaken the above argument?

A The practical experience of gardening is not a traditional academic subject.

B The events to encourage children to garden also included stands where junk food was for sale.

C Some schools do not have a garden.

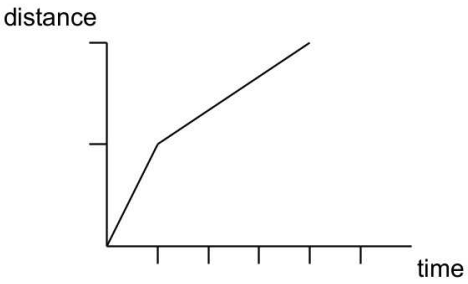
D It tends to be older people who are interested in gardening and growing their own food.

E Most children have enjoyed the events provided, but have not gained an interest in gardening itself.

6 Leroy cycles to work each morning. The first half of his journey is uphill and he can manage only a steady 5 kilometres per hour. The second half, however, is downhill and he covers this at 15 kilometres per hour.

Which one of these graphs could show Leroy's journey?

A



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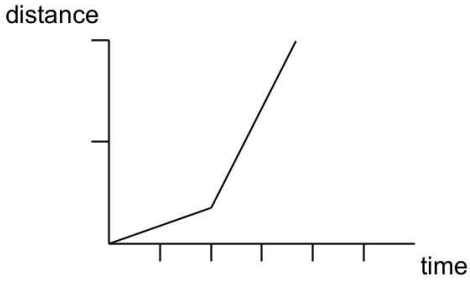

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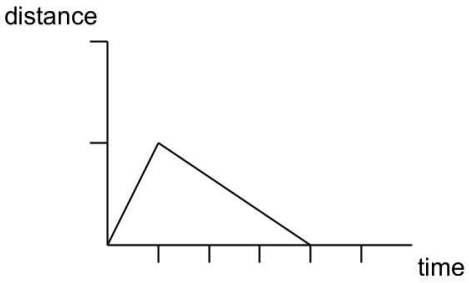

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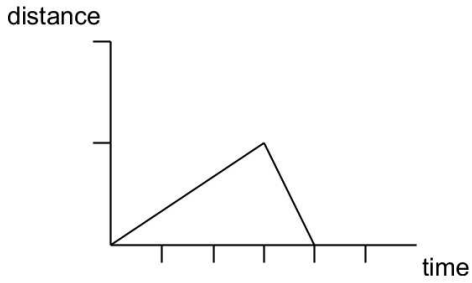
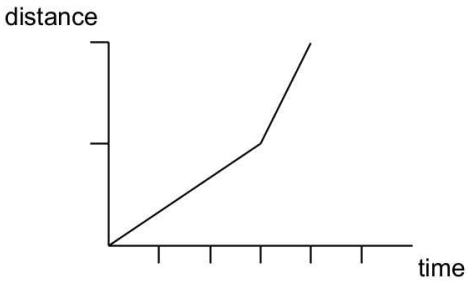


E



7 Studies are taking place to assess the benefits to dental health of adding fluoride to drinking water, a process known as mass medication. The Health Minister has urged consideration of fluoridation, particularly in deprived areas where dental care is poor. Fluoride can occur naturally in the water because of fluoride containing minerals. Fluoride, if in the water, improves dental health by up to 50 percent. Even so, fluoridation should not take place. A campaign leader opposed to fluoridation has spoken of her experiences of living in a fluoridated area of the USA. She experienced feelings of apathy and depression; her 2 year old son showed autistic tendencies and had white flecks on his teeth. These symptoms disappeared when they returned home from the USA.

Which one of the following is an underlying assumption of the argument above?

A Mass medication is always wrong.

B Fluoridation of water is a person's only source of fluoride.

C The reported health symptoms were caused by fluoride in the water.

D Fluoridation is cheaper than improving dental facilities.

E Fluoridation is only necessary in deprived areas.

8 Concern about the effects of chemicals upon the environment has led to calls for more research. But we should not wait for further research before we ban some of the chemicals used by industry. If anyone has a good reason to think something is harmful, it should not be used until, or unless, the risk is found to be zero. We know enough about past mistakes to be forewarned. Much of the harm to wildlife and humans is long-term, and the disturbing results we see today reflect the chemical environment 40 years ago. Thousands more chemicals have been released into the environment since then.

Which one of the following most closely matches the reasoning above?

A People should not be able to adopt children until proper checks have been carried out. Serious consequences may follow if adoptive parents are unsuitable.

B A suspected terrorist should be arrested at once. Waiting for conclusive evidence in the past has resulted in atrocities that could have been avoided by acting on suspicion, and the threat of terrorism has grown.

C Some homes for the elderly have been found to give dangerously substandard care. Therefore they should be closed down and the residents found acceptable alternatives.

D Cyclists should not place too much confidence in the benefits of helmets, because there is no conclusive evidence as yet that helmets prevent serious injuries.

E Some cars that have passed the annual roadworthiness test would not pass 6 months later. Cars should be tested more than once a year once they pass a certain age.

9 When I made a hotel reservation online yesterday I was given an 8-digit booking reference which contained no zeros. It did, however, consist of three 2-digit odd numbers followed by the sum of these three numbers, and all eight digits were different.

The first digit of the booking reference was 4. What was the last digit?

A 3

B 5

C 9

D 7

E 1

10 Climate scientists in Greenland studying patterns of plant growth have suggested that the early arrival of spring in the Arctic threatens to drive down populations of migrating animals such as caribou. However, comparable studies elsewhere show that their fears are unfounded. A recent study of great tits in Oxfordshire showed the birds are capable of adapting to climate change better than many scientists expected. Over the past half century, the birds have brought forward the date they lay their eggs by two weeks, so that young are born when plant-eating grubs are most plentiful.

Which one of the following is an underlying assumption of the above argument?

A Migrating animals in the Arctic can adapt to climate change as successfully as great tits in Oxfordshire.

B Birds are more adaptable than large mammals such as caribou.

C Unless animals like the caribou produce their young earlier in the year, their population will fall.

D The scientists working in Oxfordshire have greater expertise than those working in Greenland.

E Climate change in Greenland and climate change in Oxfordshire are of the same scale.

11 The table below shows the average mass of the cerebellum, which is a part of the brain, and total body mass, for a number of animal species. The cerebellum of a cat has an average mass of 5.3 g, while a cat's average body mass is 3.5 kg.

Species	Cerebellum mass (g)	Body mass (g)
Mouse	0.09	58
Pigeon	0.4	500
Squirrel	1.5	350
Rabbit	1.9	1800
Dog	6.0	3500

For which of the species shown is the ratio of cerebellum to total body mass closest to that of the cat?

A Pigeon

B Squirrel

C Dog

D Rabbit

E Mouse

12 Sports are played either as a means of getting exercise or as a competition with an opponent. Some sports, such as football, involve a large amount of running and some people are more motivated to run when it is part of a game. Other sports, such as pool, do not involve much physical activity and so it is unlikely that they would be played for the exercise.

Which one of the following conclusions is best supported by the passage above?

A Football is a better sporting activity than pool.

B There is no point in running as a hobby, since football is more fun.

C It is easier to exercise when it is as part of another activity, such as playing sport.

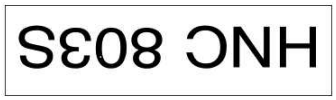
D People who play pool are more likely to be interested in the competition than those who play football.

E Since the main reason for playing sports is to get exercise, pool should not be classified as a sport.

13 Looking in his rear-view mirror, Graham sensed that there was something wrong with the number plate of the car behind him. When the car overtook him and he saw its rear plate he realised that the front plate had been upside down.

What had Graham seen in his rear-view mirror?

A



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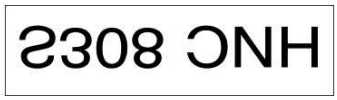


C

D

E

14 Although it is sometimes suggested that the congestion caused by the bunching of cars on motorways could be eased by increasing the speed limit to 150 km/hr, such an increase would not be a good thing. An estimated 35 per cent of drivers exceed the speed limit by 20 km/hr and would continue to do so if the limit were raised. Since bunching is caused by speeding drivers trying to pass those who observe the speed limit, raising the limit to 150 km/hr would result in the same amount of congestion, but at an increased speed. Moreover, a higher speed limit would encourage all drivers to drive faster, and thus would increase the existing danger from those who drive too close to the car in front.

Which one of the following best expresses the main conclusion of the above argument?

A Congestion on motorways is caused by speeding drivers trying to pass those who observe the speed limit.

B A higher speed limit on motorways would encourage all drivers to drive faster.

C An increase in the speed limit would increase the existing danger from those drivers who drive too close.

D Raising the speed limit to 150 km/hr would not reduce congestion on motorways.

E It would not be a good thing to increase the speed limit to 150 km/hr.

15 Food producers are resisting pressure to reduce still further the levels of salt in food. Although it is proven that salt intake must be reduced by those with hypertension, there is no evidence that reducing salt intake prevents hypertension. So why should we all be deprived of the pleasures of salt in food? We certainly need to identify those with hypertension and give them advice on their salt intake, but why should everyone else be deprived of salt? Food producers are right to resist the pressure.

Which one of the following best illustrates the principle underlying the argument above?

A Adding fluoride to drinking water has reduced tooth decay, but fluoride is unwelcome to some people. Instead, dentists should advise patients with tooth problems on better tooth care.

B The requirement to wear seatbelts has reduced deaths in car accidents but was unpopular when first introduced. People eventually accepted such changes even if it has not benefited them personally.

C Advice to wear sun block to protect the skin from harmful rays is ignored by some people. Those people should be charged for medical treatment for skin cancer.

D Passive smoking is still a problem for people who share a home with a smoker. The law should be extended to make smoking illegal even in the home.

E Retailers cannot sell alcohol to people under 18 years, but providing more general advice on alcohol in schools would be better, as it would encourage young people to be self limiting in their consumption of alcohol.

16 There are two services between Sandpoint and Genville: a fast hovercraft service which takes 50 minutes and a slow ferry which takes 1 hour 40 minutes. They both stop in port for 20 minutes at each end before starting the return journey. They start out from Sandpoint together at the same time each morning.

For how long has the slow ferry been sailing before it meets the hovercraft coming back? (Answer to the nearest minute if necessary.)

A 1 hour and 20 minutes

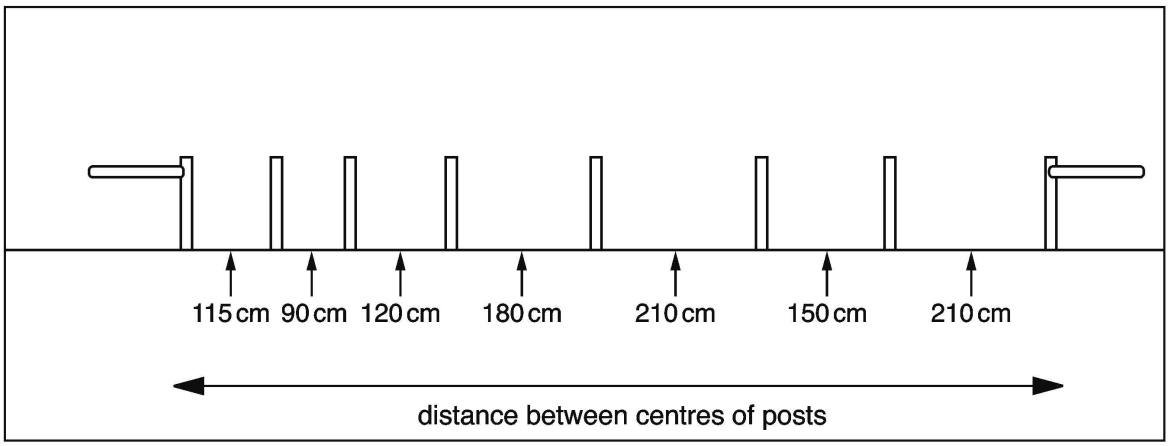
B 1 hour and 7 minutes

C 1 hour and 30 minutes

D 1 hour and 25 minutes

E 1 hour and 10 minutes

17 A farmer wishes to fix fencing rails to posts which are already in place. The posts are shown in the diagram. The farmer has a supply of rails, each one 2.4 m long. One rail or part of a rail is to be fixed between each pair of posts. (He can cut the rails into smaller lengths.)



What is the smallest number of rails that he could use?

A 5

B 3

C 4

D 6

E 7

18 Undercover police investigators sometimes commit 'crimes' in order to convince the 'real criminals' that they are on the same side as them. Some of these activities have victims, although in the main these are other criminals – rival gang members for example. In committing what are technically offences the officers are preventing many more serious crimes by helping to convict and imprison dangerous criminals who might otherwise remain at liberty. But that is not really the point. A breach of the law is a breach of the law, whoever commits it and for whatever reason. Preventing a crime does not make it right to commit another crime.

Which one of the following is the general principle underlying the above argument?

A An act is criminal only if it is committed for criminal reasons.

B Serious crime must be prevented by any reasonable means.

C The police have a duty to protect law-abiding citizens from violence.

D There is no such thing as a victimless crime.

E The end does not justify the means.

19 Deanna keeps a record of the petrol she puts into her car and the current distance it has covered so she can estimate her fuel consumption. When she puts petrol in, sometimes the tank is filled completely and she marks 'FULL' beside the entry if this is so, otherwise the tank is only partly filled.

Her data for the last month is as follows:

Date	Total km	Fuel added	FULL?
2 June	23,508	5 litres	
6 June	23,805	37 litres	FULL
12 June	24,350	25 litres	
17 June	24,743	21 litres	
23 June	24,989	34 litres	FULL
27 June	25,454	18 litres	

Which one of the following is the best estimate of her fuel consumption?

A 9.9 litres / 100 km

B 7.7 litres / 100 km

C 1.7 litres / 100 km

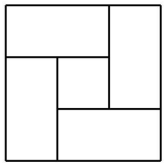
D 6.8 litres / 100 km

E 8.0 litres / 100 km

20 A local museum wishes to exhibit a collection of butterflies which is mounted in nine narrow (only 0.2 m wide) display cases, each 1.5 m long. The museum wants to arrange four tables, each 2 m long and 1 m wide, in such a way that all the display cases can be placed around the edges. The room for the exhibition is 6 m by 6 m and there must be at least 1 m of clear floor space around the outside of the tables.

Which one of the five arrangements shown would be satisfactory?

A



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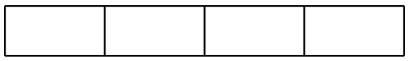
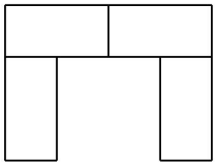


C



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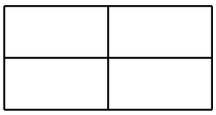
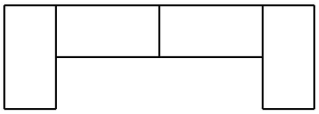


E



21 Which one of the following pairs of scholar/field of study is NOT correct?

A Amartya Sen - Economics

B Konrad Lorenz - Ethology

C Doris Lessing - Literature

D Max Weber - Pedagogy

E Ludwig Wittgenstein - Philosophy

22 Which one of the following public figures was NOT awarded the Nobel Peace Prize?

A Aung San Suu Kyi

B Nelson Mandela

C Willy Brandt

D Mahatma Gandhi

E Martin Luther King

23 The changes in concentration of hormones in a healthy woman's blood were monitored during several menstrual cycles.

During which stage of the menstrual cycle was the concentration of oestrogen falling, the concentration of luteinising hormone (LH) and follicle-stimulating hormone (FSH) maximal and the progesterone concentration rising?

A at the start of menstruation

B at the end of menstruation

C four days before ovulation and the time of ovulation

D after ovulation but before the start of menstruation

E between the end of menstruation and four days before ovulation

24 The following events occur during a reflex response to a person placing a hand on a hot object.

1. Myosin binding sites on actin filaments uncovered.
2. ADP and phosphate ion released from myosin head.
3. Sodium voltage-gated channels open.
4. Myosin head detaches from binding site on actin.
5. Calcium ions released by sarcoplasmic reticulum.

Which of the following options places four of these events in the correct order (from left to right)?

A 3, 5, 4, 2

B 5, 2, 1, 4

C 1, 2, 4, 3

D 5, 1, 2, 4

E 3, 1, 4, 2

25 The genotype QqRr produces a certain phenotype. If two individuals with a genotype of QqRr reproduce, how many **different** possible phenotypes could be created, assuming all allele combinations are equally viable and the phenotypes are the result of complete dominance?

A 16

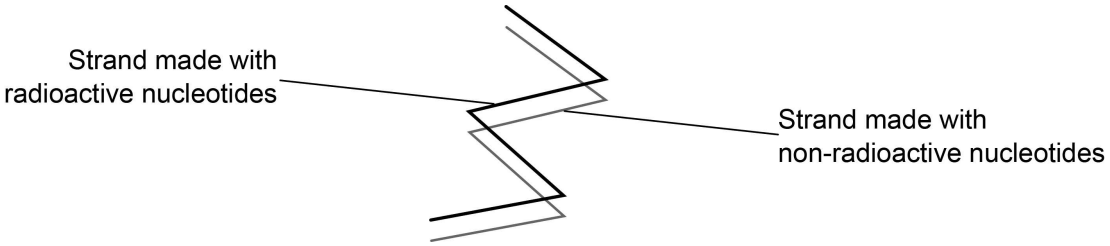
B 4

C 5

D 8

E 9

26 A double stranded DNA molecule is shown below:



This DNA molecule is allowed to replicate three times in a medium containing non-radioactive nucleotides .

Which answer shows the correct percentages of original DNA and completely non-radioactive DNA?

row	*Percentage original DNA*	*Percentage completely non-radioactive DNA*
1	12.5	87.5
2	25	75
3	50	50
4	87.5	12.5
5	75	25

[Assume all radioactive nucleotides remain radioactive throughout, and all non-radioactive nucleotides remain non-radioactive throughout].

A row 4

B row 1

C row 5

D row 3

E row 2

27 Which of the following are directly produced during photolysis of water?

1. oxygen
2. carbon dioxide
3. protons

A 1 only

B 2 and 3 only

C 1 and 3 only

D 1 and 2 only

E 2 only

28 In the nerve cells of a person, one gene has two alleles, 'A' and 'a', present. For this person, which row correctly shows the alleles present in all three different situations given in the table?

row	*Situation*		
	Stem cell starting to specialise into a liver cell	Cell at the start of mitosis	Cell at the start of meiosis I
1	Aa	AAaa	AAaa
2	AAaa	Aa	AAaa
3	AAaa	AAaa	Aa
4	Aa	Aa	A or a
5	A or a	A or a	Aa

A row 1

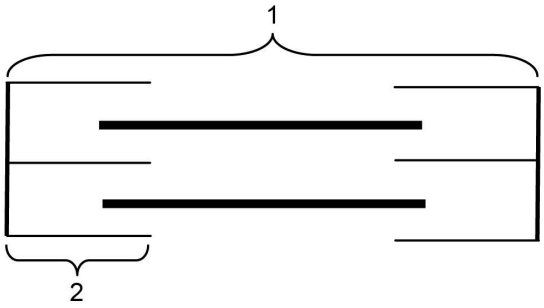
B row 2

C row 5

D row 4

E row 3

29 The diagram shows a single sarcomere in a relaxed state.



Which answer describes the changes when the sarcomere contracts?

A 1 gets smaller and 2 gets smaller.

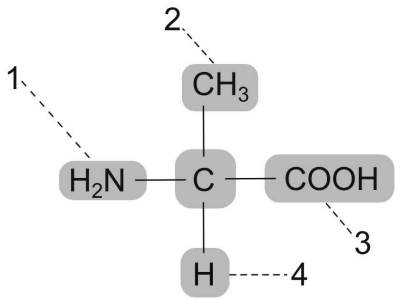
B 1 gets smaller and 2 does not change.

C 1 gets longer and 2 gets smaller.

D 1 does not change and 2 gets wider.

E 1 gets longer and 2 gets wider.

30 The diagram below shows an amino acid.



Which option correctly identifies both the variable group (R group) and the acidic group?

A variable group = 4; acidic group = 3

B variable group = 3; acidic group = 1

C variable group = 2; acidic group = 3

D variable group = 1; acidic group = 2

E variable group = 2; acidic group = 4

31 Where in a shoulder joint are osteocytes found?

A muscle tissue

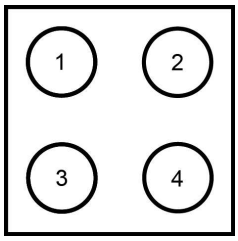
B ligament

C cartilage

D bone tissue

E skin

32 The picture below shows a DNA microarray. Each spot (labelled 1–4) contains a different DNA probe. A sample of fluorescently-labelled human DNA, with the sequence TGGTCAAGATTAT, is washed over the array.



spot	DNA probe
1	GATTAT
2	CTAATA
3	ACCAGT
4	TGGTCA

Which of the spots would show a positive signal because it fluoresces?

A 1, 2, 3 and 4

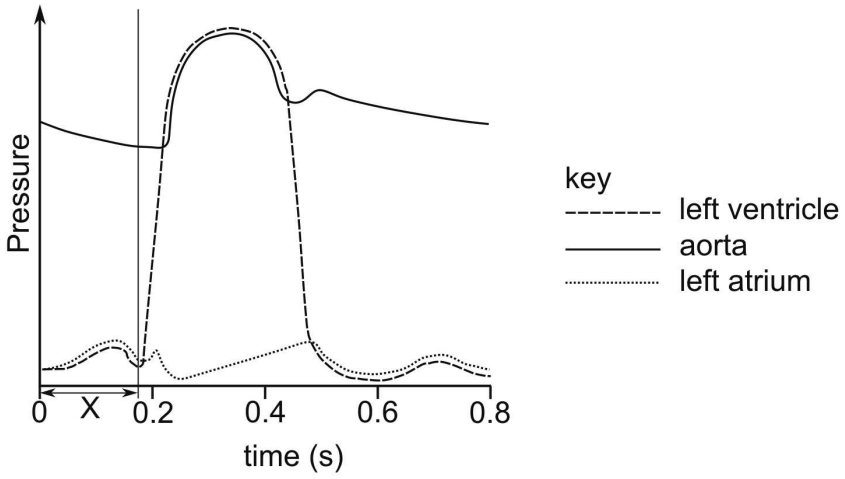
B 2 and 3 only

C 1 and 3 only

D 1 and 4 only

E 2 and 4 only

33 The diagram shows how the pressure changes in the left atrium, left ventricle and the aorta during one heartbeat in a healthy human.



Which row shows the correct events during time period X?

row	*volume of blood in left atrium*	*semi-lunar valve in aorta*	*muscles of left ventricle wall*
1	decreases	closed	relax
2	decreases	open	relax
3	increases	closed	contract
4	decreases	open	contract
5	increases	closed	relax

A row 2

B row 3

C row 5

D row 4

E row 1

34 The table shows some events of the normal eukaryotic cell cycle.

row 1	nuclear envelope disappears	DNA starts to condense	chromosomes line up at the equator	cytoplasm divides
row 2	chromosomes line up at the equator	spindle fibres shorten	DNA starts to condense	nuclear envelope reappears
row 3	chromosomes line up at the equator	spindle fibres shorten	nuclear envelope reappears	cytoplasm divides
row 4	DNA starts to condense	nuclear envelope disappears	spindle fibres shorten	chromosomes line up at the equator
row 5	nuclear envelope disappears	spindle fibres shorten	chromosomes line up at the equator	nuclear envelope reappears

Which row shows the correct sequence of events (left to right) as they occur during part of this cell cycle?

A row 5

B row 2

C row 1

D row 4

E row 3

35 Which one of the following is NOT a carbohydrate?

A glucagon

B amylose

C ribose

D amylopectin

E maltose

36 Some local anaesthetics affect nervous impulse transmission by making it more difficult for voltage-gated sodium channels to open. In a human patient treated with these anaesthetics which of the following statements would be true?

A The threshold potential required to generate an action potential would be lowered.

B The axon membrane would become more difficult to repolarise.

C It would become harder to depolarise the neuron.

D The membrane potential of the neuron at rest would decrease below –90 mV.

E The sodium/potassium pump may need to work faster to maintain the resting potential.

37 Place the following structures in a human sperm cell in descending order of size (left to right):

1. mitochondria
2. nucleus
3. ribosome

A 1, 2, 3

B 1, 3, 2

C 3, 1, 2

D 2, 3, 1

E 2, 1, 3

38 In a prokaryote, transcription can occur in which of the following?

1. cytoplasm
2. mitochondria
3. ribosomes

A 3 only

B 1 and 3 only

C 1 only

D 1 and 2 only

E 2 only

39 A normal sequence of triplets in a section of DNA is given by: ATCGAACGG

The same section of DNA has been changed by mutation, and is given by: ATCTTGCGG

Some of the triplets below represent the tRNA triplets which code for amino acids.

Key:

triplet	amino acid	triplet	amino acid	triplet	amino acid
AUC	□	ATC	■	UAG	⊡
CAA	⊙	UUG	○	GAA	●
CGG	◇	GCC	◈	TTG	◆
AAC	▲	CUU	▽	ACC	△

Using the tRNA triplets, which amino acid sequence given below could be formed from the **mutated** DNA sequence?

A ■–●–◇

B □–●–◇

C □–○–◇

D ⊡–▲–◈

E ■–◆–◇

40 Which of the following could be the outcome of evolution?

1. speciation
2. a change in allele frequency
3. increased biodiversity

A 2 and 3 only

B 1 only

C 1 and 3 only

D 1, 2 and 3

E 1 and 2 only

41 0.75 g of a hydrocarbon compound contains 0.60 g of carbon.

(A_r : C = 12.0; H = 1.0)

Which one of the following could be the molecular formula of the hydrocarbon compound?

A C_3H_8

B C_2H_4

C C_2H_6

D CH_4

E C_2H_3

42 In the reaction

$$C_3H_7Br + KOH \rightarrow C_3H_7OH + KBr$$

24.6 g of 1-bromopropane reacts with excess potassium hydroxide to produce 8.00 g of propan-1-ol.

M_r : C_3H_7Br = 123

A_r : H = 1.0; C = 12.0; O = 16.0

What is the percentage yield of this reaction?

A 57.1%

B 93.0%

C 32.5%

D 33.3%

E 66.7%

43 Pure water self-ionises. This endothermic reaction is represented by the equation:

$$H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$$

Which of the following statements is true for pure water between the temperatures of 0 °C and 100 °C?

1. The concentrations of H^+(aq) and OH^-(aq) are equal between 0 °C and 100 °C.
2. An increase in temperature causes the pH to fall.
3. An increase in temperature causes the electrical conductivity to decrease.

A 1 and 3 only

B 3 only

C 1 only

D 1 and 2 only

E 2 only

44 The atomic number of aluminium is 13.

Which electron configuration given below corresponds to the Al^{2+} ion in its ground state?

A $1s^2 2s^2 2p^6 3s^2 3p^1$

B $1s^2 2s^2 2p^6 3s^2 3p^3$

C $1s^2 2s^2 2p^6$

D $1s^2 2s^2 2p^6 3s^1$

E $1s^2 2s^2 2p^5 3s^2$

45 Atoms X and Y form an **ionic** compound with formula XY_2.

Which option below could give the correct atomic numbers for X and Y?

A X = 11; Y = 16

B X = 3; Y = 17

C X = 12; Y = 9

D X = 6; Y = 16

E X = 14; Y = 8

46 2,2 – dimethylpropane, $C(CH_3)_4$, is an isomer of pentane, $CH_3(CH_2)_3CH_3$.

Pentane has a boiling point of 36 °C whilst the boiling point of 2,2 – dimethylpropane is 10 °C.

Which statement below explains the difference in the boiling points for these two substances?

A 2,2 – dimethylpropane has stronger intermolecular forces.

B The molecules have different relative molecular masses.

C Isomers have different chemical properties.

D Pentane has permanent dipoles.

E Longer chain, less branched molecules have stronger spontaneous/induced dipoles.

47 Assume that the oxidation numbers are as shown below:

N = –3 H = +1 Cr = +6 O = –2

Which compound formula given below is correct?

A $[\,(NH_4)_2CrO_4\,]^+$

B $NH_4Cr_2O_7$

C $(NH_4)_2CrO_4$

D $[\,(NH_4)_3CrO_4\,]^-$

E $(NH_4)_3CrO_4$

48 What is the correct formula of propanal?

A $CH_3CH_2CH_2OH$

B $CH_3CH_2OCH_3$

C CH_3COCH_3

D $CH_3CH_2CO_2H$

E CH_3CH_2CHO

49 When propan-1-ol is burnt in excess oxygen the only products formed are carbon dioxide and water.

In the balanced equation for this reaction what is the ratio of CO_2 : H_2O molecules formed?

A 4 : 7

B 3 : 8

C 2 : 7

D 3 : 4

E 5 : 12

50 Potassium nitrate was found to have a solubility of 120 g in 100 g of water at 80 °C and 50 g in 100 g of water at 25 °C.

50 g of water was heated to 80 °C and solid potassium nitrate added until the solution was just saturated.

The solution was then cooled to 25 °C when solid potassium nitrate separated out to leave a saturated solution.

Using the information provided in this question, what is the minimum mass of water that must now be added to the mixture of the solution and the solid in order to make this solid potassium nitrate redissolve at 25 °C?

A 20 g

B 140 g

C 120 g

D 70 g

E 190 g

51 Which two of the following oxides would NOT give acidic solutions in water?

CO, CO_2, SO_2, NO

A NO and SO_2

B NO and CO_2

C CO and SO_2

D CO and CO_2

E CO and NO

52 Which one of the following 0.01 M aqueous solutions has a pH > 7.0?

A $AlBr_3$

B NaI

C NH_4Cl

D Na_2CO_3

E CH_3CO_2H

53 Given that $2 \log_{10} (x) - 3 = \log_{10} (y)$

Express y in terms of x.

A $y = \frac{x^2}{1000}$

B $y = \frac{2x}{1000}$

C $y = \frac{x^2}{3}$

D $y = x^2 - 3$

E $y = \frac{2x}{3}$

54 Which one of the following equations is dimensionally consistent (has consistent units)?

[All the symbols have their usual meanings:

v = velocity; F = force; m = mass; t = time; V = voltage; Q = charge; R_1, R_2, R_3, R_4 = resistance]

A energy = $(\frac{1}{2}mv^2) + Fv$

B resistance = $R_1 + R_2 + (1/R_3) + (1/R_4)$

C temperature change = energy × m × specific heat capacity

D acceleration = $(\frac{1}{2}vt^2) + (F/m)$

E electrical current = $(V/R_1) + (Q/t)$

55 The variables x and y satisfy the following two equations:

$x + 3y = 13$

$2x - y = 5$

What is the value of $x + y$?

A 7

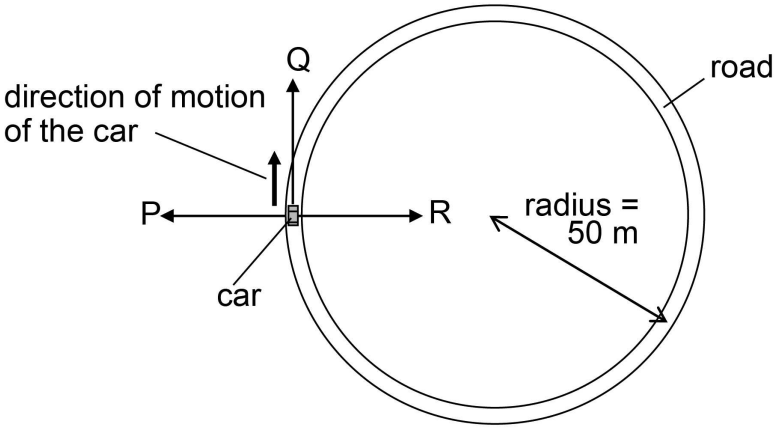
B 8

C 6

D 9

E 10

56 The diagram shows a car of mass 1000 kg travelling at a constant speed of 30 m/s in the direction shown along a flat, level road which forms a circle of radius 50 m.



Which row in the table gives both the magnitude of the resultant force on the car and the direction of the acceleration of the car at the instant shown?

row	*magnitude of resultant force (kN)*	*direction of acceleration*
1	0	R
2	18	Q
3	18	R
4	30	Q
5	30	P

A row 1

B row 2

C row 5

D row 3

E row 4

57 The arithmetic mean of the three numbers a, b, c is 8.

Find the arithmetic mean of the four numbers: $a + 1$, $b + 2$, $c + 6$, 3.

A 7

B 11

C 5

D 9

E 27

58 Evaluate:

$(27^2 – 23^2) + (14^2 – 6^2)$

A 1680

B 360

C 80

D 840

E 40

59 An aluminium block of mass 2.5 kg is supplied with 9000 J of thermal energy. This causes its temperature to rise by 4 K. Which expression gives the specific heat capacity of this aluminium, from this data?

[Assume that the block remains solid throughout, and that no additional energy is exchanged between the block and the surroundings.]

A $9000 \times 2.5 \times 4 \text{ J kg}^{-1}\text{K}^{-1}$

B $\frac{2.5 \times 4}{9000} \text{ J kg}^{-1}\text{K}^{-1}$

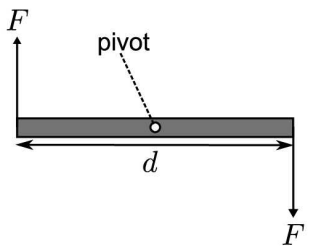
C $\frac{9000 \times 2.5}{4} \text{ J kg}^{-1}\text{K}^{-1}$

D $\frac{9000}{2.5 \times 4} \text{ J kg}^{-1}\text{K}^{-1}$

E $\frac{9000 \times 4}{2.5} \text{ J kg}^{-1}\text{K}^{-1}$

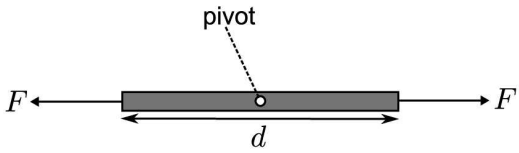
60 Two forces F of equal magnitude act on a beam. Which diagram shows a couple acting and states the magnitude of the torque (moment) of the couple about the pivot? [The pivot is at the centre of the beam]

A



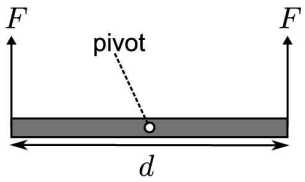
$\text{torque} = \frac{(F \times d)}{2}$

B



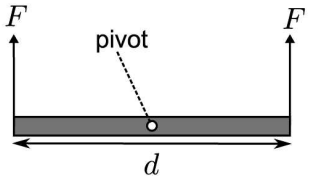
$\text{torque} = (F \times d)$

C



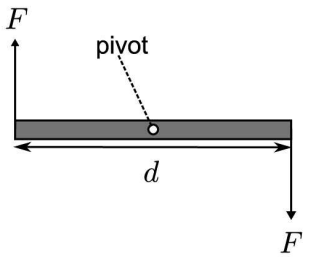
$\text{torque} = (F \times d)$

D



$\text{torque} = \frac{(F \times d)}{2}$

E



$\text{torque} = (F \times d)$

IMAT 2015

Answer Key

Question	Answer
1	B
2	D
3	D
4	C
5	E
6	E
7	C
8	B
9	D
10	A
11	E
12	D
13	D
14	E
15	A
16	A
17	A
18	E
19	D
20	C
21	D
22	D
23	C
24	D
25	B
26	B
27	C
28	A
29	B
30	C

Question	Answer
31	D
32	B
33	E
34	E
35	A
36	C
37	E
38	C
39	C
40	D
41	C
42	E
43	D
44	D
45	C
46	E
47	C
48	E
49	D
50	D
51	E
52	D
53	A
54	E
55	A
56	D
57	D
58	B
59	D
60	E

ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2014/2015

General Knowledge and Logical Reasoning

1 Over 30 years ago, the smallpox virus was eradicated (removed) from the natural environment, but examples of it are still preserved in two laboratories. It is planned, however, to destroy these remaining viruses. Given that this will be the first example of a deliberate destruction of an entire species, we should think again before destroying these viruses. Years ago we thought we had the right to kill as many creatures as we liked, but now we realise we have no such right. Furthermore, we cannot know the future; we cannot justify destroying something that could be of enormous value to us one day, valuable in ways we cannot even think of now. And anyway, what possible harm can captive viruses do to us?

Which one of the following best expresses the main conclusion of the above argument?

A We cannot justify destroying something which may one day be valuable to us.

B Captive smallpox viruses are not going to harm us.

C The deliberate destruction of an entire species should never be allowed.

D The planned destruction of the smallpox virus should be given more thought.

E We do not have the right to destroy the smallpox virus.

2 One of the foolish but persisting fantasies of the Olympic movement is that the Games are, or were, or will be, or even ought to be, completely free of politics. It is difficult to understand how this foolish belief continues, but the facts are these: the nations lining up to host the games are motivated not by unattainable ideals but by a legitimate desire to promote the excellence of their citizens; and the nations who have boycotted the games in the past have done so to make genuine political points.

Which one of the following is a conclusion which can be drawn from the above passage?

A Although everyone knows the Olympics are caught up in politics, no one is brave enough to admit it.

B National interests are ruining the Olympics.

C Just because the Olympic games have been politicised, it doesn't mean that they should be.

D If some countries use the Olympic movement to further their own ends, they are guilty only of exposing a myth.

E We should do everything possible to ensure that the Olympics do not become further politicised.

3 The purpose of an election is to decide what policies are supported by the people. However, in elections the concept of 'tactical voting' is becoming increasingly common. The argument is a simple one:

Party X will never be beaten by party Y but party Z could win with a few extra votes. Therefore, you should transfer your vote from party Y to party Z to make sure that party X is beaten.

This reasoning is perfectly sound if your main objective is to vote a party out. Unfortunately, if you support party Y then there is no guarantee that party Z will support the same principles.

Which one of the following is the conclusion that could best be drawn from the above passage?

A Elections are often thought of in terms of voting for or against the party in office, rather than as voting for your preferred party.

B Tactical voting is an important part of the electoral process.

C Tactical voting will not achieve the purpose of an election.

D It is important that party X does not win the election.

E Party X policies are not popular.

4 When driving, if the car in front of you brakes suddenly, you need to be able to stop without crashing into it. The easiest rule-of-thumb is the two second rule. You choose a reference point that the vehicle in front of you is passing then say aloud: 'Only a fool breaks the two second rule'. If you reach the reference point before you have finished the saying you need to pull back. This works at all speeds. However, when there are adverse road conditions or the road is narrow you need to double your braking distance. These practices will enable you to avoid such crashes.

Which one of the following is an underlying assumption of the argument above?

A Adopting the 'two second rule' will avoid all accidents.

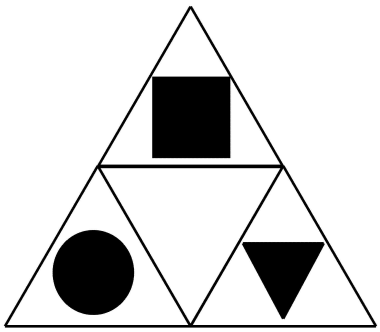
B Most crashes are caused by cars running into the car in front.

C Those who do not use the rule do not value road safety.

D Some drivers brake more suddenly than others.

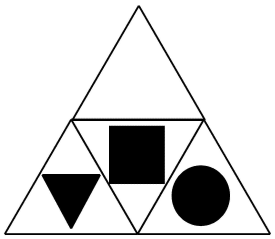
E It will not take less than two seconds to repeat the saying.

5 The net shown can be folded to make a tetrahedron with each of the shapes showing on the outside.

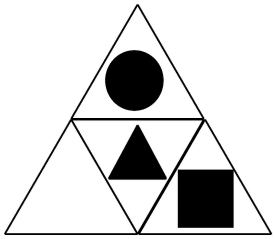


Which one of the following nets can be folded to make a tetrahedron identical to the one shown above?

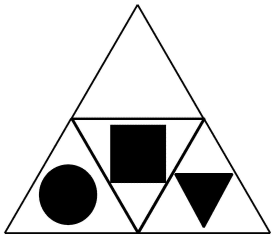
A



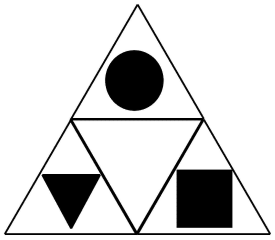
B



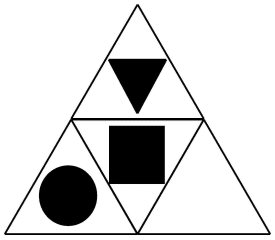
C



D



E



6 Research reveals that, in a given period of the 20th century, top footballers (defined as those who had played for their country's team) lived, on average, almost 5 years longer than middle ranking footballers. We can conclude therefore that for the top footballers, success had a beneficial effect on their lifespan.

Which one of the following is the best statement of the flaw in the argument above?

A Life expectancy increased generally in the 20th century.

B It assumes that the longer lifespan could not be explained by other factors.

C Living longer is not necessarily a good thing.

D Playing football regularly may have health benefits which contribute to longer lifespan.

E The study was limited to footballers in a given period of time.

7 15 runners took part in this year's Marathon of Marathons (eight marathon races on consecutive days). Points were awarded to the first seven to finish in each race, as follows:

Winner	11 points
Second	8 points
Third	6 points
Fourth	4 points
Fifth	3 points
Sixth	2 points
Seventh	1 point

All 15 runners finished in the first three at least once, but only Philip, who was the overall winner with a total of 61 points, finished in the first three every time.

How many of the eight races did Philip win?

A 2

B 3

C 5

D 4

E 1

8 Despite much opposition to the idea, modern musical trends such as hip-hop have a place in the world of opera. Traditional opera is a powerful musical experience. However, modern musicians should not necessarily stick with the traditional form. Modern musical forms which fuse staged drama, singing and contemporary or ethnic trends in music are also powerful musical experiences. Glydebourne's youth operas 'Misper' and 'Zoe', and its Mozart hiphopera, 'School 4 Lovers', enjoyed critical and box office success and attracted hip-hop audiences. Moving away from the snobbery of tradition gives a much wider audience access to transformative musical experience.

Which one of the following best expresses the main conclusion of the passage?

A Creating new operatic performances allows more people to access this exciting art form.

B Contemporary music forms have a place in performances of opera.

C Musicians are entitled to fuse new forms and old to create exciting musical experiences.

D Hip-hop is as powerful and dramatic as opera.

E Contemporary music has a place in the musical world in addition to traditional operatic performances.

9 Sally owns a small business which produces hand-crafted jewellery. The materials used to create a necklace cost €1.50 on average. She pays her staff €5.40 an hour. For a standard piece of jewellery she charges 70% more than it costs to produce.

To make a particular Italian-style glass necklace it takes 30 minutes. How much does she sell this single necklace for?

A €11.73

B €2.94

C €7.14

D €11.34

E €5.40

10 There is concern at the moment about the way in which football referees are treated by players during games. The Football Association and the Referees' Association feel that there is too much verbal (and physical) abuse directed at referees. Various solutions have been suggested such as only allowing the captain of each team to approach and talk to the referee. The major difficulty is how such new rules should be introduced. The preferred suggestion seems to be that the rules should be changed first in the amateur game, the aim being to improve discipline in the game from the bottom upwards, until the whole game is improved.

Which one of the following, if true, would most weaken the argument above?

A By introducing it first to amateur players, it reaches those who spend the least time playing football.

B Not many professional players start out in the amateur leagues.

C Amateur players are more likely to abuse referees than are professionals.

D Referees should use their existing powers to control abusive players.

E Referees in the amateur game are less proficient than those in the professional games.

11 Tessa makes bracelets. She works five days each week, from Monday to Friday. Her contract requires her to make a minimum of 150 bracelets every working day, for which she is paid a basic wage of $320 per week. She can also earn a bonus of $3 per bracelet for every one above 175 that she makes on any particular day.

Last week, Tessa earned $515 in total. On Friday she made 205 bracelets, the most she has ever made in one day.

What is the minimum number of bracelets that Tessa made last week?

A 940

B 805

C 890

D 865

E 815

12 A golf tournament is played over 10 rounds, on successive Saturdays. The winner of each round scores 3 points and the player finishing second scores 1 point. The tournament is won by the competitor with the most points over the 10 rounds.

Alan Vinci, Barry Durand, Carl Johansson and Daniel and Eric Lim were the participants in this year's tournament. All five won at least one round, but either Barry, Daniel or Eric finished second on each occasion. The 1-2 finishing order was different every round, and the Lim brothers didn't both score points in the same round at any time.

Who won this year's tournament?

A Eric Lim

B Daniel Lim

C Barry Durand

D Carl Johansson

E Alan Vinci

13 In many countries shocking images of the damage smoking can do to the body are displayed on cigarette packets. Images of rotting teeth, mouth tumours and cancerous lungs are among the grim pictures. A review concluded that shocking pictures of the damage smoking can do are a cost effective way to help smokers to quit and discourage others from starting. All countries should introduce these kinds of images to discourage smoking.

Which one of the following, if true, most weakens the above argument?

A Pictures that arouse emotions are especially effective.

B Smokers are likely to die younger than non-smokers.

C The USA is planning to display shocking images on cigarette packets.

D Governments receive a significant amount of revenue from taxes on tobacco products.

E In countries using the images there are high taxes on tobacco and a ban on advertising.

14 Last month Karl walked from Starton to Endham, raising money for charity. His target, successfully achieved, was to complete the walk in ten days.

He started later than intended and had only completed 12 km by the end of the first day. However, he walked 45 km on each of the second, third and fourth days, and after the fifth day he was exactly half way. Poor weather on the sixth day restricted his progress, but 41 km on both the seventh and eighth days meant that he had completed exactly three-quarters of the walk with two days left. On the ninth day he covered three-fifths of the remaining distance, completing the last 36 km on the tenth day.

How far did Karl walk from Starton to Endham?

A 360 km

B 240 km

C 328 km

D 384 km

E 294 km

15 The owner of a hotel needs to decorate 20 rooms. He has found prices for four different types of interior wood paint and calculated the volume of paint he needs for each room. He will use the same type of paint for all the rooms.

Type of paint	*375 ml*	*750 ml*	*1.25 l*	*2.5 l*	*Volume needed per room*
Non Drip Gloss	€4.50	€8.00	€10.00	€16.00	1.4 litres
Satinwood	€5.00	€8.00	€11.00	€20.00	1.1 litres
Quick Dry Gloss	N/A	€10.00	N/A	€20.00	1.0 litres
Once Gloss	€4.50	€8.00	€12.00	€18.00	0.8 litres

What is the least amount he needs to spend on paint?

A €116

B €120

C €126

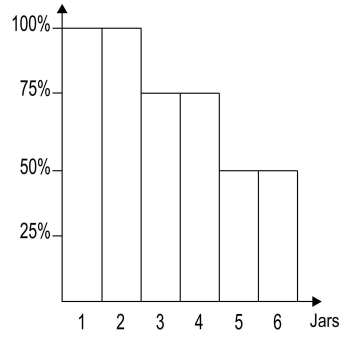
D €112

E €108

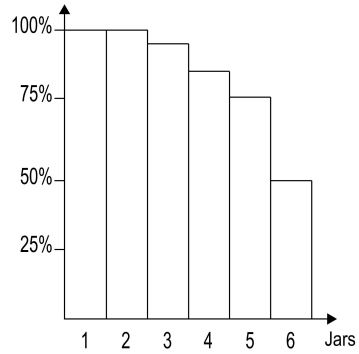
16 There is a special offer on jars of coffee this week. Customers who buy two jars at the normal price have the option to buy up to four more jars at one quarter of the normal price.

For customers buying coffee this week, which of these bar graphs shows how the average cost per jar (as a percentage of the normal cost) varies with the number of jars bought?

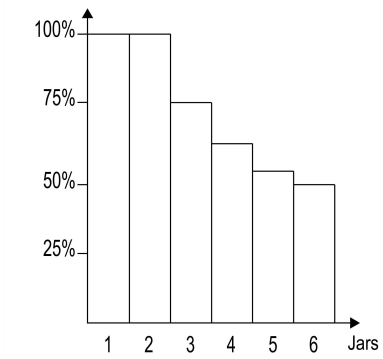
A



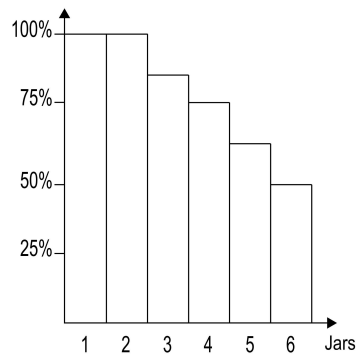
B



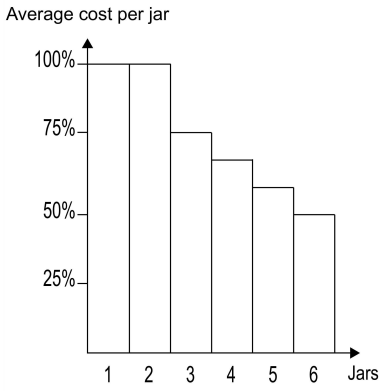
C



D



E



17 The diagram below shows the layout of a game playing board with the square board numbered as indicated. The numbers on the board start with 1 on the bottom left and finish with 25 at the top right.

21	**22**	**23**	**24**	**25**
20	**19**	**18**	**17**	**16**
11	**12**	**13**	**14**	**15**
10	**9**	**8**	**7**	**6**
1	**2**	**3**	**4**	**5**

A larger, square playing board is numbered in a similar way and divided into pieces which fit together to make the whole board. One piece of this larger board is shown below:

27	**26**	
16	**17**	**18**
	12	

How many squares are there on this larger board?

A 49

B 81

C 25

D 121

E 64

18 Smoking cigarettes causes a speeding up in the rate of blood flow, which in turn increases the risk of heart disease. It was thought that this speeding up of blood flow was caused solely by the gas carbon monoxide, which is absorbed during smoking, and not by nicotine, which is also absorbed from the smoke in the lungs. However, tests have shown that using nicotine patches (from which nicotine is absorbed through the skin) or chewing nicotine gum also causes the rate of blood flow to increase. This shows that the nicotine in cigarettes is also responsible for the increased risk of heart disease among smokers.

Which one of the following is **not** an assumption of the argument in the passage above?

A Any differences between the amount of nicotine absorbed from smoking and the amount absorbed from nicotine patches and chewing gum can be disregarded.

B Carbon monoxide is not absorbed from nicotine patches and nicotine chewing gum.

C Carbon monoxide would not produce a rise in the rate of blood flow in the absence of nicotine.

D The effect of nicotine on the body does not depend on the way in which it was absorbed.

E There is nothing else in nicotine patches and chewing gum which might cause an increase in the rate of blood flow.

19 We constantly split our attention between the people we are with and what's happening on our mobile phone screens. On-screen multi-tasking makes us less efficient as well as less emotionally engaged with others. It takes 64 seconds to recover our train of thought after interruption by a message (that's 8.5 hours a week wasted if we check our screens every five minutes) and when we've sent an email or SMS text message, the brain goes through a series of semi-conscious calculations as we wonder when and how the recipient will reply. The result is that we're not 'present' for several minutes afterwards. In order to function effectively in the workplace, we need to switch off our communication hardware.

Which one of the following is the best statement of the flaw in the above argument?

A People may be unwilling to make less use of their mobile phones.

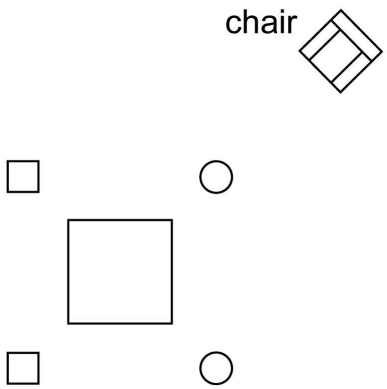
B We may need to have some 'down time' in order to recharge our mental batteries.

C In many work environments you may not be allowed to use personal mobile phones.

D Without the means to send and receive information instantly, our effectiveness may be compromised.

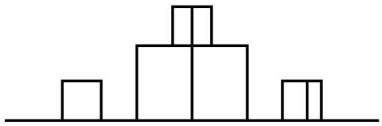
E It may only be the younger workers who use mobile phone technology to excess.

20 The diagram below is a plan of the raised flower beds and a chair in my garden.

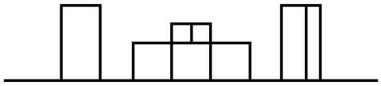


Which one of the following can **not** be a view of the raised beds from my chair?

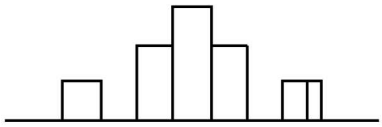
A



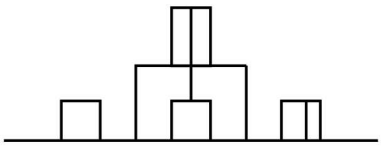
B



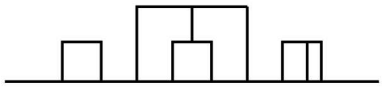
C



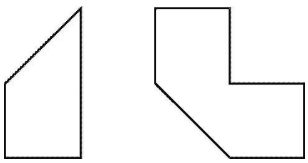
D



E



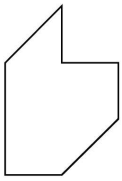
21 During a recent storm the plastic company logo fell off the outside of the office building of Fleesam Ltd. and broke cleanly into the two pieces shown below:



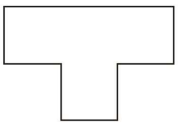
A junior clerk took the two pieces to a signmaker to show what had happened, and asked him to make a new logo. Unfortunately after the clerk had left, the signmaker realised that he didn't know how the two pieces had fitted together originally.

Which one of the following could **not** be Fleesam's logo?

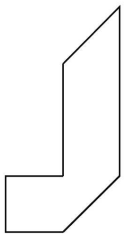
A



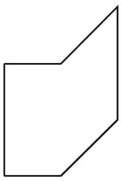
B



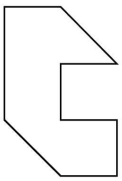
C



D



E



22 If for a number of hours each day you're having experiences on the computer where there are no consequences, that may have an implication for antisocial behaviour. In real life you can't undo something; you can't bring someone back to life once you've stabbed them. On a computer you can play the game again. It may be that for people who spend most of their time playing computer games involving killing others, real bleeding to death has no meaning. Studies of brain activity show that there is less pre-frontal cortex activity in the brains of screen-obsessed teenagers than in the brains of those who spend little time on computer games. The pre-frontal cortex area of the brain is where we process ideas of sequence, consequences and empathy.

Which one of the following can be drawn as a conclusion of the passage above?

A Brain structure is altered by environmental factors.

B People who spend a lot of time playing computer games are the main culprits in knife crime.

C There may be a link between use of computer games and violence.

D Young people cannot distinguish the difference between fantasy and reality.

E Computer games should not be available for children under 18 years of age.

23 If the media give publicity to certain types of crime, it may encourage criminals to carry out 'copy cat' offences. If, however, they were forbidden to divulge details of crimes, this would amount to censorship. The freedom of speech of the media is too important to sacrifice, so the media should be free to report crime even if this means some crimes are committed which would not otherwise be committed.

Which one of the following expresses the main conclusion of the above argument?

A Publicity about crimes can encourage others to commit similar offences.

B Censorship of the media would reduce the crime rate.

C The media should be permitted to report crimes even if other crimes sometimes result from this reporting.

D The media should not report all the details of a crime.

E Freedom of speech is a right that is too important to give up.

24 William Harvey, who wrote the book commonly referred to as 'De Motu Cordis' is famous for his description:

A of the interaction between antigens and antibodies.

B of how blood plasma carries heat and urea as well as carbon dioxide.

C of the different forms of blood cells and platelets.

D of the circulation of the blood.

E of how anaemia can be caused by a lack of iron.

25 What does the letter P stand for in the international organisation OPEC?

A Physics

B Philosophy

C Petroleum

D Piracy

E Plastics

26 The artists Claude Monet and Pierre-Auguste Renoir were associated with which art movement?

A Impressionism

B Fauvism

C Abstract expressionism

D Pointillism

E Cubism

27 Which popular website was founded in 2004 by Mark Zuckerberg?

A Twitter

B Facebook

C eBay

D YouTube

E Wikipedia

28 Which one of the following names the structure, in humans, that directly detects a change in blood glucose level and then the structure that responds to the change?

A Pituitary gland and liver

B Pancreas and pancreas

C Hypothalamus and pituitary gland

D Adrenal gland and pancreas

E Liver and adrenal gland

29 Which one of the following statements about both asexual and sexual reproduction is correct?

A Only the gametes (and not body cells) undergo meiosis in sexual reproduction compared with both cell types in sexual reproduction.

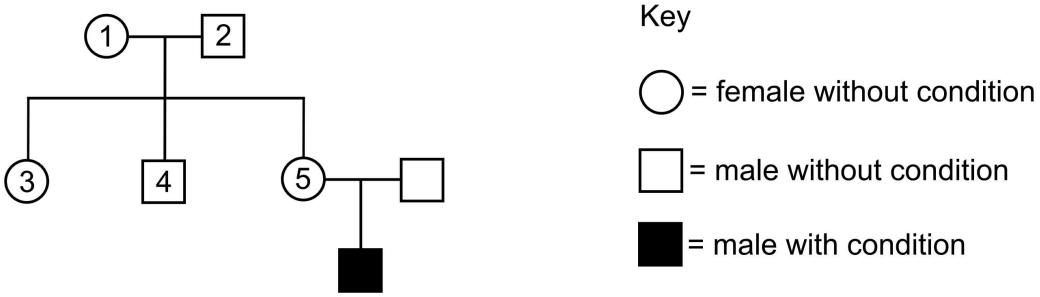
B Mitosis leads to sperm formation in asexual reproduction and sexual reproduction.

C Mutations only occur in sexual reproduction and not in asexual reproduction.

D Some organisms can carry out both asexual and sexual reproduction.

E Variation is only required for sexual reproduction and not for asexual reproduction.

30 The diagram below shows the inheritance of a non-lethal recessive sex-linked condition.



Which row in the table below does **not** correctly state the probability for each person possessing one copy of the allele for the condition?

Person	*Maximum probability (%)*
1	50
2	0
3	50
4	0
5	100

A Person 2

B Person 5

C Person 4

D Person 1

E Person 3

31 The diagram shows a sequence of bases on a DNA template:

CAC GTT CGC ATA GAC

Which one of the following shows the sequence of bases on the complementary mRNA strand with one substitution mutation?

A CUC GTT CGC UTT GUC

B GTG CAA GGG TAT CTG

C GUG CAA CCG UAU CUG

D GUG CAA GCG UAU GUC

E GTG CAA GCG TAT CTG

32 In cells of winter wheat (*Triticum aestivum*), the fluidity of the cell membrane can be varied by the plant, depending upon the environmental temperature.

As the weather becomes colder, the cell membrane changes to maintain its fluidity.

Which type of bond would be more common in cell membranes of winter wheat plant cells as their growing conditions become colder?

A C-N

B C=C

C C-H

D C-O

E C-C

33 Which of the following molecules are associated with the Human Immunodeficiency Virus (HIV)?

1. DNA
2. RNA
3. Phospholipids
4. Reverse transcriptase

A 1 and 2 only

B 2 and 3 only

C 1, 2 and 4 only

D 1, 2, 3 and 4

E 2, 3 and 4 only

34 The transmission of nerve impulses at a synapse is unidirectional.

Which of the features of the transmission of nerve impulses given below have a role in maintaining the unidirectional transmission?

1. Exocytosis of neurotransmitter at the presynaptic membrane
2. Neurotransmitter hydrolysing enzyme found on the post-synaptic membrane
3. Neurotransmitter receptors found on the post-synaptic membrane
4. Sodium gated channels on the post-synaptic membrane

A 2 and 4 only

B 1, 2 and 3 only

C 1, 3 and 4 only

D 1 and 4 only

E 1, 2 and 4 only

35 Which of the following can produce vesicles?

1. RER
2. Golgi
3. Cell surface membrane

A 1, 2 and 3

B 1 and 3 only

C 2 only

D 2 and 3 only

E 1 and 2 only

36 A circular bacterial plasmid consists of 1000 base pairs (bp). A specific restriction enzyme has three recognition sites within this plasmid. The sites are at 150 bp, 250 bp and 950 bp. After complete restriction, what size are the fragments?

A 100 bp, 200 bp and 700 bp only

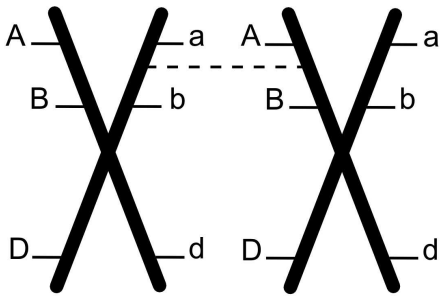
B 100 bp, 150 bp, 200 bp only

C 50 bp, 100 bp, 150 bp and 700 bp only

D 50 bp, 100 bp and 700 bp only

E 50 bp, 100 bp, 150 bp, 200 bp and 700 bp

37 The diagram below shows a pair of homologous chromosomes and the site of crossing over.



- - - - = site of crossing over

Which answer in the table is correct when meiosis is complete?

	Number of recombinant daughter chromosomes produced	*Number of daughter chromosomes that are genetically distinct from each other*
Row 1	1	2
Row 2	2	1
Row 3	4	2
Row 4	2	4
Row 5	4	4

A Row 2

B Row 3

C Row 5

D Row 1

E Row 4

38 One set of semi-lunar valves in the human heart closes when:

A the blood pressure in the aorta is greater than in the vena cava.

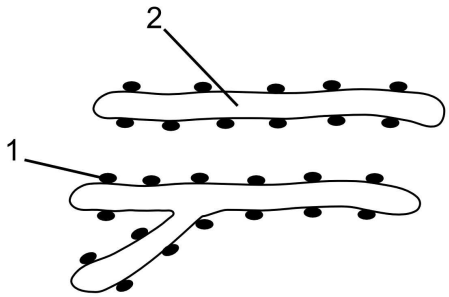
B the oxygen level in blood decreases at the respiring tissues.

C the blood pressure in the right ventricle is less than in the pulmonary artery.

D the blood pressure is greater in the left ventricle than in the aorta.

E another set of semi-lunar valves opens.

39 The diagram shows a section of rough endoplasmic reticulum (RER).



Which answer correctly identifies the substances associated with structures 1 and 2?

A 1: amino acids; 2: tRNA

B 1: tRNA; 2: polypeptide

C 1: proteins; 2: DNA

D 1: DNA; 2: carbohydrate

E 1: phospholipids; 2: mRNA

40 Two disease-free cells, P and Q, were studied. Which option correctly identifies cell P as a typical plant cell and cell Q as a typical prokaryote?

	Cell P	*Cell Q*
Row 1	Gene for RuBisCo is present	Susceptible to penicillin
Row 2	Plasmids present	Centrioles found as a pair
Row 3	Outermost layer is selectively permeable	SER present
Row 4	Glycogen can be present	Cell wall is present
Row 5	Organelle with grana present	Nucleolus may be present

A Row 1

B Row 2

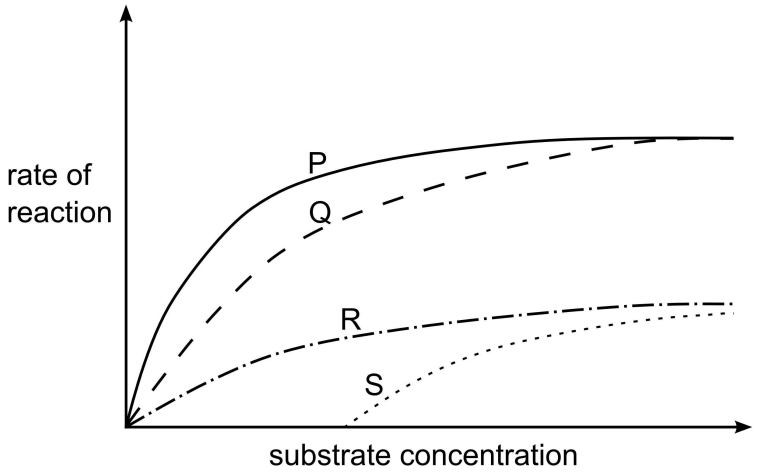
C Row 5

D Row 4

E Row 3

41 Which curves show the results of calculating the initial rate of reaction of an enzyme:

1. when the substrate concentration is varied, under optimal conditions and without an inhibitor;
2. when the substrate concentration is varied, under optimal conditions and fixed, low concentration of a competitive inhibitor?



A (1) curve P; (2) curve S

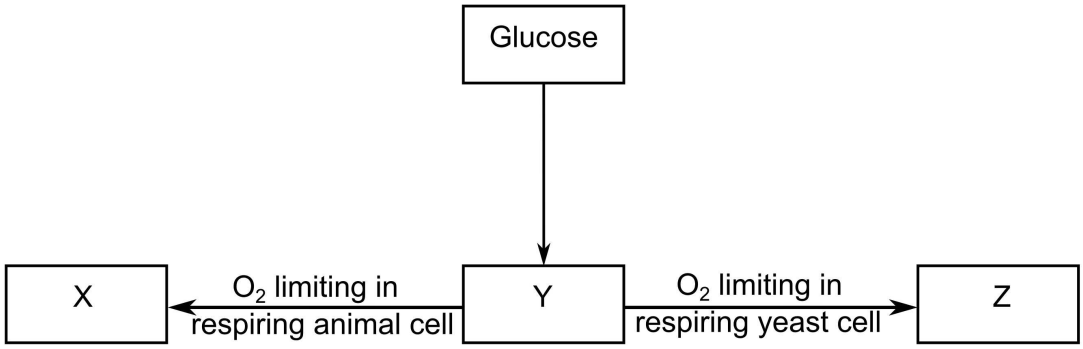
B (1) curve R; (2) curve P

C (1) curve Q; (2) curve R

D (1) curve P; (2) curve Q

E (1) curve R; (2) curve S

42 The diagram shows the respiration process in the cytoplasm of a yeast cell or an animal cell when O_2 is limiting:



Which option correctly identifies substances X, Y and Z?

A X = pyruvate; Y = ethanol; Z = lactate

B X = pyruvate; Y = lactate; Z = ethanol

C X = lactate; Y = ethanol; Z = pyruvate

D X = ethanol; Y = pyruvate; Z = lactate

E X = lactate; Y = pyruvate; Z = ethanol

43 What is the pH of 0.1 M HCl?

$pH = - \log_{10} [H^+]$

A -0.1

B -1

C 0

D 0.1

E 1

44 Excess lead (II) nitrate solution is added to 1.30 g of zinc powder and the mixture is stirred. When the reaction is finished the lead formed is filtered, dried and weighed. It has a mass of 3.31 g.

What is the percentage yield of the lead?

[A_r: Pb = 207; Zn = 65]

A 60%

B 70%

C 100%

D 90%

E 80%

45 A battery has lead plates dipped in sulfuric acid. When charged, the positive plate is covered with PbO_2. After discharge both plates are covered with $PbSO_4$.

Which option below correctly describes the overall change in the oxidation number of the lead involved in the chemical reaction during discharge?

A Positive plate: 4 → 2; Negative plate: 2 → 0

B Positive plate: 4 → 2; Negative plate: 0 → 2

C Positive plate: 4 → 0; Negative plate: 0 → 2

D Positive plate: 4 → 1; Negative plate: 0 → 1

E Positive plate: 4 → 1; Negative plate: 1 → 0

46 The following are some compounds that can be made from ethene, C_2H_4:

C_2H_6, C_2H_5Br, C_2H_5OH, CH_2BrCH_2Br, $-(CH_2CH_2)_n-$

Which one of the compounds is made by oxidising ethene?

A $-(CH_2CH_2)_n-$

B C_2H_5Br

C C_2H_5OH

D CH_2BrCH_2Br

E C_2H_6

47 A student carried out an experiment to find the rate of decomposition of hydrogen peroxide into water and oxygen gas. The student used 100 cm^3 of a 1M solution of hydrogen peroxide at 25°C and 1 atm pressure.

1 g of powdered MnO_2 as a catalyst was added and the solution was constantly stirred. The student measured the total volume of oxygen produced.

The procedure was repeated, but this time using 100 cm^3 of 2M hydrogen peroxide, under identical conditions.

Which option below shows the effect on (R) the rate of reaction, (V) the total volume of oxygen collected, by using the 2M solution compared to the 1M solution?

A R: Doubled; V: Halved

B R: No effect; V: Doubled

C R: No effect; V: No effect

D R: Doubled; V: Doubled

E R: Doubled; V: No effect

48 The atomic numbers of five atoms are given below.

Which atom would have an electronic configuration ending in a p^5?

A 7

B 9

C 5

D 8

E 6

49 The relative molecular mass of calcium carbonate is 100.

What is the minimum volume of 2.0 M hydrochloric acid that would be needed to completely react with 2.0 g of calcium carbonate?

A 40 cm^3

B 20 cm^3

C 30 cm^3

D 5 cm^3

E 10 cm^3

50 How many of the following compounds are acidic, alkaline or amphoteric (react with both acids and alkalis)?

Al_2O_3	Cl_2O_7	CO_2	HCl	H_3PO_4	K_2O	KOH
MgO	Na_2O	NO_2	P_4O_{10}	SiO_2	SO_2	

A Acidic = 10; Amphoteric = 2; Alkaline = 4

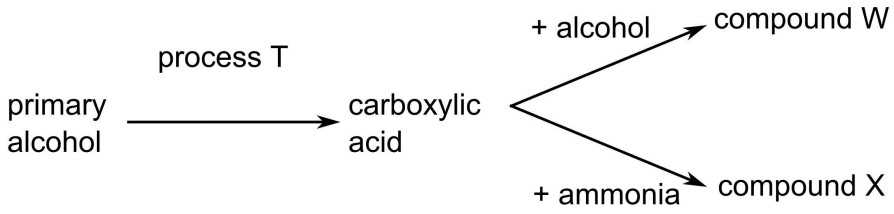
B Acidic = 7; Amphoteric = 1; Alkaline = 5

C Acidic = 9; Amphoteric = 2; Alkaline = 2

D Acidic = 6; Amphoteric = 1; Alkaline = 6

E Acidic = 8; Amphoteric = 1; Alkaline = 4

51 The reaction scheme below shows some reaction conversions of organic molecules.



Which is the correct combination of process and compounds for this scheme?

A process T: reduction; compound W: ester; compound X: amide

B process T: reduction; compound W: ketone; compound X: nitrile

C process T: oxidation; compound W: ester; compound X: amide

D process T: reduction; compound W: ketone; compound X: amide

E process T: oxidation; compound W: ester; compound X: nitrile

52 Which two of the following molecular substances in the gaseous state have the strongest permanent molecular dipole?

GeH_4 ICl SiF_4 CH_2Cl_2 CO_2

A CO_2 and SiF_4

B ICl and CH_2Cl_2

C CH_2Cl_2 and CO_2

D ICl and CO_2

E GeH_4 and SiF_4

53 A book of mass 0.40 kg rests on a horizontal surface with which it has a coefficient of dynamic friction of 0.50.

If this book is now pushed by an external horizontal force of 10 N, what will be its acceleration immediately after it has started to move?

[Assume the gravitational field strength is 10 Nkg^{-1}, that air resistance is negligible and that the orientation of the book does not change.]

A 25.0 ms^{-2}

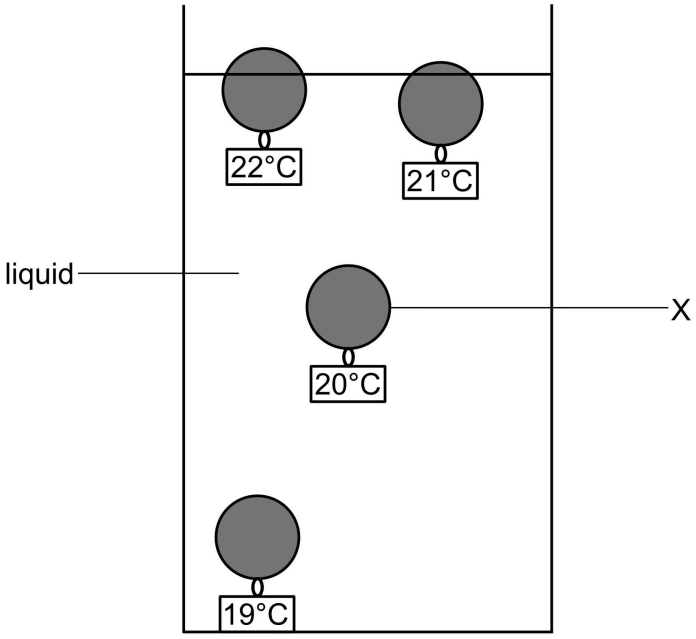
B 12.5 ms^{-2}

C 50.0 ms^{-2}

D 20.0 ms^{-2}

E 15.0 ms^{-2}

54 An ornamental thermometer, commonly known as a Galileo thermometer, contains a number of spheres of hollow coloured glass, representing different temperatures, immersed in a column of ethanol. A particular sphere (X) rises from the bottom to the top of the column of liquid when the temperature falls below the value it represents.



Which statement best explains why the sphere rises when the temperature falls?

A The mass of the sphere has decreased.

B The pressure exerted by the liquid has decreased.

C The volume of gas inside the sphere has increased.

D The density of the liquid has increased.

E The temperature of the sphere is different from that of the liquid.

55 What is the equation of the straight line which passes through (-6 , 2) and is perpendicular to $4y + 3x = 8$?

A $3y - 4x = 18$

B $4y - 3x = 26$

C $3y + 4x = -18$

D $3y - 4x = 30$

E $3y + 4x = 30$

56 Evaluate:

$\frac{8\times10^{-5}}{\sqrt{1.6\times10^{7}}} \times \left(1.2 \times 10^{3}\right)^{2}$

A 2.88×10^{-3}

B 2.88×10^{-2}

C 2.88×10^{-5}

D 2.88×10^{4}

E 2.88×10^{-1}

57 Four individual spheres have radii:

$\frac{r}{2}$, r, $2r$ and $3r$.

What is the sum of their surface areas?

A $58\ \pi r^2$

B $169\ \pi r^2$

C $57\ \pi r^2$

D $25\ \pi r^2$

E $26\ \pi r^2$

58 A computer game is on sale for €32.00.

The price ticket shows that this cost is a reduction of 20% of the original price.

What was the original price?

A €25.60

B €38.40

C €33.60

D €52.00

E €40.00

59 An earthed magnet is near a bar of material which is seen to be repelled by the magnet.

What could the bar of material be?

[The system is isolated and no currents are induced.]

A A bar of unmagnetised soft iron.

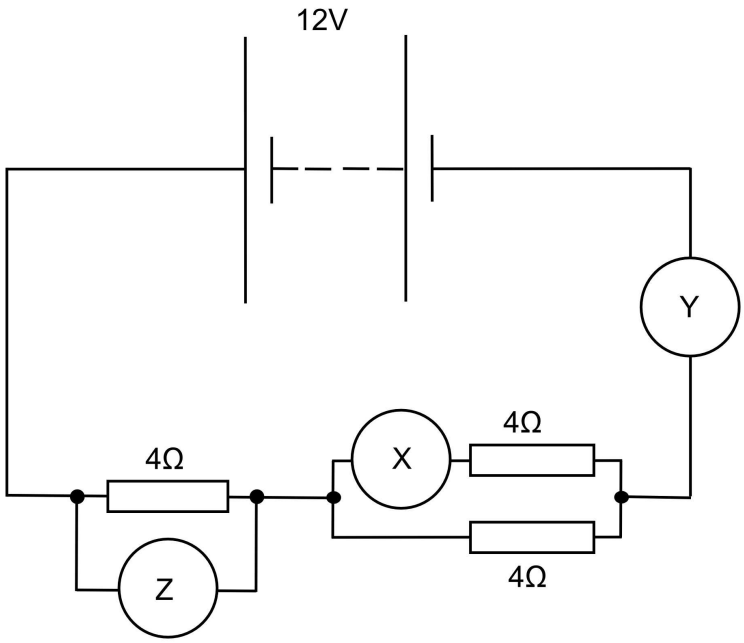
B A bar of unmagnetised cobalt.

C A bar of electrostatically charged copper.

D A bar of magnetised steel.

E A bar of electrostatically charged aluminium.

60 The circuit shown contains three identical resistors, two ammeters X and Y, and a voltmeter Z. The internal resistance of the battery is negligible.



Which option shows the readings on the three meters?

[Assume the ammeters have negligible resistance, and negligible current flows through the voltmeter.]

A X = 1.0 A; Y = 0.0 A; Z = 12 V

B X = 2.0 A; Y = 0.0 A; Z = 4.0 V

C X = 1.0 A; Y = 2.0 A; Z = 8.0 V

D X = 3.0 A; Y = 6.0 A; Z = 12 V

E X = 1.0 A; Y = 2.0 A; Z = 6.0 V

IMAT 2014

Answer Key

Question	Answer
1	D
2	D
3	C
4	E
5	A
6	B
7	E
8	B
9	C
10	B
11	C
12	C
13	E
14	A
15	B
16	C
17	A
18	C
19	D
20	A
21	D
22	C
23	C
24	D
25	C
26	A
27	B
28	B
29	D
30	D

Question	Answer
31	C
32	B
33	E
34	C
35	A
36	A
37	E
38	C
39	B
40	A
41	D
42	E
43	E
44	E
45	B
46	D
47	D
48	B
49	B
50	E
51	C
52	B
53	D
54	D
55	D
56	B
57	C
58	E
59	D
60	C

ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2013/2014

Thinking Skills - General Knowledge and Logical Reasoning

1 A significant social trend in the 20th century was for people to move away from their place of birth in order to access education and work. This gave individuals more opportunities and helped the economy by producing mobility within the workforce. The negative side of this is now being felt as more and more elderly people face the problems of old age without family members nearby to care for them. This has negative effects on the economy as well as on the individual, as more and more state funding for care is needed.

Which one of the following could be drawn as a conclusion of the above passage?

A The benefits of a mobile workforce have to be compared with the costs to elderly people and the economy.

B Elderly people are expecting the state to provide care for them rather than relying on their children.

C People should try to find education and work close to their place of birth.

D The state should provide care for elderly people to make mobility of the workforce possible.

E People should make caring for their elderly parents a priority over choice of work opportunities.

2 Any company that wishes to sell a new drug must provide the government with details of research about its safety and possible side effects. At present, this information is confidential, but there are plans to make it available to the public. While patients are surely entitled to more information about the drugs they are prescribed, this will also inevitably make public vital details about the ingredients of certain drugs and how they are manufactured. Drug companies are naturally reluctant to release this information to their competitors. Therefore, through fear of imitators, drug companies will no longer introduce new and important drugs into the country.

Which one of the following, if true, would most weaken the above argument?

A There are sufficient drugs already on the market and so there is no necessity to introduce new ones.

B The drug industry is a very competitive business and secrecy is vital if companies are to survive.

C People may be reluctant to use certain drugs when they have fuller information about them.

D People are better informed about the side effects of drugs abroad than they are in this country.

E Strong patent laws prevent companies from using the information to create rival drugs.

3 There is an increasing number of historical or significant buildings in the UK which are said to be 'At Risk'. Without a change in the law most of these buildings are doomed to crumble into the ground. This is because these buildings are no longer structurally sound. The exisiting strict renovation laws mean that they are too expensive or impractical for private individuals or developers to renovate or repair. There are certainly people out there who would be willing to maintain these buildings if they could use more modern and less expensive techniques and materials. Surely it is better to sacrifice some of the original building's character rather than lose the entire structure.

Which one of the following best expresses the main conclusion of the above argument?

A There is nothing wrong with changing the character of historic buildings.

B 'At Risk' buildings need to be renovated according to strict rules.

C A change in the law is needed if we hope to preserve more 'At Risk' buildings.

D Existing laws make 'At Risk' buildings too expensive for most developers.

E Historians can learn more from buildings which have not been modernised by modern developers.

4 Many people believe that foreign travel broadens the mind and that there is some inherent benefit in spending some time in a culture different from your own. Many students are taking 'gap' years where they spend time in another country. Whilst this may offer some benefits in terms of confidence and independence, it is wrong to assume that foreign travel alone can provide this. Global travel can have negative impacts on local cultures and the environment. Home country based 'gap' projects are often seen as unglamourous but the benefit of working with different groups and cultures within our own society can be equally rewarding.

Which one of the following is the main conclusion of the above passage?

A Foreign gap year projects must have an element of community work for them to be worthwhile.

B Foreign travel is not the only way to gain confidence and independence.

C Projects within our own society can be as rewarding as foreign travel.

D There is inherent benefit in spending some time abroad.

E It is important that gap year students consider the impact of their travel on the communities they work in.

5 After looking at interviews conducted with a number of adult learners, our research suggested that the learners who felt they were most successful were all highly motivated. We noticed that early success had heightened motivation in some cases and saw that both success and motivation may be due to a special aptitude for learning. We also noticed that many of those who felt they were most motivated were also learning in favourable conditions or for fun, which meant they may have become motivated since starting their classes. Though these conditions seemed persuasive, the results led us to the same conclusion. It's impossible to learn anything without motivation.

Which one of the following is **NOT** a flaw in the above argument?

A It assumes that those who felt they were successful actually were.

B It assumes that those who felt they were motivated actually were.

C The research does not establish that there are no successful learners who lacked motivation.

D The research is only concerned with adult learners.

E It assumes that in order to be motivated you have to have a special aptitude for learning.

6 In which modern day country was the Inca civilization centred?

A Chile

B Peru

C Brazil

D Ecuador

E Bolivia

7 A placebo is:

A a type of pain killer.

B a form of local anaesthetic.

C a form of mild stimulant.

D an inactive drug or treatment.

E a sedative.

8 A nationwide survey showed that the majority of people would not be willing to give up their car in favour of public transport. However, in a recent survey of people living in an area with heavy traffic problems, 76% stated that they would prefer to travel to work by public transport if the system was made more reliable. This shows that the previous findings were wrong. We should, therefore, restrict car use and start a programme of improving the nation's public transport network as soon as possible.

Which one of the following is the best statement of the flaw in the argument above?

A It fails to specify which types of public transport are to be improved.

B The counter arguments are not explained in detail.

C The statistic presented may not be representative of the whole population.

D It does not consider the 24% who would not prefer to use public transport.

E It fails to explain how the public transport system can be improved.

9 Which general famously crossed the Alps with his army?

A Octavius

B Hannibal

C Hamilcar

D Augustus

E Antony

10 The headquarters of the World Health Organisation (WHO) is found in which of these cities?

A Nairobi

B Washington DC

C Rome

D London

E Geneva

11 A multi-storey car park has eight levels.

On the top seven levels there are eight rows of parking. Two of these rows hold 15 cars each whilst the others hold 10 cars each.

On the road level there are two rows holding 15 cars but only four rows holding 10 cars each.

The entry control system counts cars in and out. The system stops admitting cars once 90% of the total capacity is in use.

Four spaces on the road level are reserved for staff parking and these are not available to the public.

What is the maximum number of public cars which can be admitted?

A 644

B 500

C 696

D 630

E 626

12 Coffee granules are available in two jar sizes, regular and large. The regular jar contains 250 grams and costs €4.50. The large jar is 60% bigger, containing 400 grams, but at €6.30 costs only 40% more than the regular jar.

By how much per kilogram is the large jar of coffee better value for money than the regular jar?

A €3.60

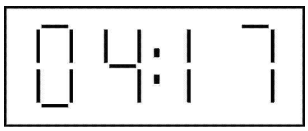
B €6.00

C €2.25

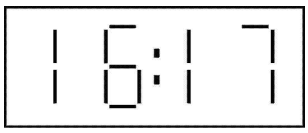
D €3.15

E €0.90

13 My watch is a twenty four hour digital watch, so that, for instance 4.17am appears as:



and 4.17pm appears as:



One morning recently I woke up, picked up my watch and saw:

I panicked, thinking that I had overslept, until I realised I had picked up the watch upside down and it was only one minute past five.

At which one of the following times would the display appear the same whichever way I picked it up?

A 5.51am

B 5.51pm

C 1.01am

D 3.21pm

E 3.51pm

14 At a society meeting, 1000 people are entitled to vote in the elections for Chairperson with a one-person-one-vote system. The election rules state if no candidate obtains more than 50% of the votes cast in the first ballot, a second ballot must be held between the top two candidates. 350 votes were cast for a particular candidate in the first ballot. Then a second ballot took place.

Under these circumstances which one of the following is possible?

A The candidate won the election, came second, or came third.

B The candidate either won the election or came second.

C The candidate came second or third, but did not win.

D The candidate came third.

E The candidate definitely won the election.

15 The table below shows the winning time for the men's 200m run in the Olympic Games since 1900, when the event was first held, until 1988.

year	seconds	year	seconds
1900	22.2	1948	21.1
1904	21.6	1952	20.81
1908	22.6	1956	20.75
1912	27.1	1960	20.62
1916	*	1964	20.36
1920	22.0	1968	19.83
1924	21.6	1972	20.00
1928	21.8	1976	20.23
1932	21.2	1980	20.19
1936	20.7	1984	19.80
1940	*	1988	19.75
1944	*	-	-

* Olympics not held in these years.

What is the longest number of years for which the Olympic record stood unbroken?

A 6

B 16

C 24

D 28

E 20

16 Ever since Uranus was discovered, astronomers have thought there might be more planets in the Solar System. Because of small deviations in the orbits of Uranus and Neptune - deviations which would occur if another planet existed - some astronomers think there must be an undiscovered planet - Planet X. But these deviations cannot tell us whether Planet X exists, because they would occur if the orbits had been wrongly predicted. Since Uranus and Neptune take many decades to circle the sun, astronomers rely on old data to calculate their orbits. As this is likely to be inaccurate, the calculated orbits are probably wrong, and so Uranus and Neptune will deviate from them even if there is no Planet X.

Which one of the following best expresses the main conclusion of the above argument?

A The use of old and inaccurate data indicates that Planet X cannot exist.

B Astronomers are right to think that there must be an undiscovered planet.

C The deviations in the orbits of Uranus and Neptune cannot tell us whether Planet X exists.

D The calculations of the orbits of Uranus and Neptune are probably wrong.

E Uranus and Neptune will deviate from the predicted orbits whether or not Planet X exists.

17 According to a recent analysis of university entrance records, you are more likely to go to university if your name is John than if it is Wayne. Therefore, if you want your child to go to university, you are better off calling him John than Wayne.

Which one of the following is the best statement of the flaw in the argument above?

A It draws a general conclusion from specific evidence.

B It confuses a necessary condition with a sufficient one.

C It jumps to a conclusion without any evidence.

D It confuses a correlation with a cause.

E It fails to consider other names than Wayne or John.

18 The low level of literacy among science undergraduates is an issue across all universities. One of the biggest problems is that pupils in school spend more time perfecting their SMS text messaging and emailing skills than they do writing grammatically correct pieces of literature. It is important to get across to undergraduates that good writing matters. Employers take on scientists believing they can communicate their findings fluently and accurately. We need to deliver science graduates with these skills.

Which one of the following best expresses the main conclusion of the above argument?

A Education is failing those who leave with poor writing skills.

B Students must be helped to recognise the importance of good literacy skills.

C Many science graduates are unable to write in a grammatically correct way.

D Employment often depends on good ability in literacy.

E Students do not concentrate properly in lessons in school.

19 My packet of washing powder claims to contain enough powder for 24 washes. This claim is based on using the plastic scoop supplied with the packet and filling it once for each wash.

Living in a soft water area I find I only need to fill the scoop three-quarters full.

How many washes can I get from this packet?

A 42

B 18

C 32

D 26

E 30

20 It has recently been suggested that some degrees can be completed in two years instead of the traditional three years. But staff teaching engineering and medicine at degree level say that the current first year mostly involves getting students up to a common level of maths and physics, which in the past was achieved by high school teaching. By the end of the second year few students have reached the level of attainment that students did 40 years ago. Two year degrees are not realistic - certainly not for engineering.

Which one of the following is an assumption of the argument in the passage above?

A Two year degree courses will have the same amount of teaching per year as three year courses.

B School examinations are easier now than they were 40 years ago.

C Maths and physics are more important elements of engineering than they were 40 years ago.

D Engineering students are less motivated than they were 40 years ago.

E Two year degree courses will be more popular with students than three year courses.

21 One in four deaths caused by road accidents involving commercial vehicles is caused by the driver falling asleep at the wheel. The problem even affects police men and women, who are now more likely to die due to driving when tired than by physical attacks. Evidence at the scene (such as tyre marks) can tell investigators how quickly the car driver braked: late breaking would indicate lack of concentration which might be caused by tiredness. The problem with this evidence is that it is not conclusive, whereas conclusive evidence can be offered for other offences such as drink driving.

Which one of the following can be drawn as a conclusion of the passage above?

A Accidents caused by drivers falling asleep at the wheel are a greater problem than drink driving.

B Commercial vehicle drivers and the police are more prone to falling asleep at the wheel because of the long hours they work.

C The number of hours per day that commercial drivers should be allowed to drive should be reduced.

D It will not be as easy to prosecute drivers for falling asleep at the wheel as it is for drink driving.

E It would be unfair to prosecute people for falling asleep at the wheel.

22 Which one of these did Galileo **NOT** do?

A Discover the movement of a pendulum produces a regular time measurement.

B Develop the telescope.

C Design an electric battery.

D Design a thermometer.

E Develop the microscope.

23 The pasta that I buy in the local supermarket usually costs €1.60 per packet. This week the packet is marked '€0.20 off normal price'.

In addition the following sign is on display '10% off all bills when you spend €10 or more'.

Assuming that I spend over €10 altogether, how much will the packet of pasta cost?

A €1.26

B €1.24

C €1.30

D €1.12

E €1.18

24 A study on identical twins concluded that genes contribute roughly half of the attributes we need to be happy. People often find such studies scary, seeing something sinister about us being mere puppets of our biology. However, put in non-scientific terms, it sounds like common sense. Parents talk about how their children had different personality traits from a very young age. Perhaps it's nicer to think this is caused by something 'fluffy' like a soul - but even if that were true, why is that more reassuring than the thought that genes are responsible? Either way, you're born as you are.

Which one of the following statements is best supported as the conclusion of the passage above?

A Roughly half of what we need to be happy is decided by our genetic make up.

B We may as well accept the idea that our potential for happiness in life is to some extent decided at birth.

C Whether or not you are happy in life is either determined by your soul or your genes.

D Whether or not you are happy in life is not something over which you yourself have any control.

E The person you are at birth is the person you will be throughout your life.

25 Two companies have just started a round-the-clock air taxi service between Rome and Milan. They use the same flight path and fly at constant speeds at different altitudes. Planes owned by the company Alpha-Air take off from Rome every 10 minutes and take 90 minutes to reach Milan. Planes owned by the company Beta-Air take off every 5 minutes and take 60 minutes to reach Milan. Captain Johnston, who flies for Beta-Air, takes off from Rome 5 minutes after the previous Alpha-Air flight has departed.

How many Alpha-Air planes (flying from Rome to Milan) will Captain Johnston have passed as he lands in Milan?

A 0

B 3

C 2

D 1

E 4

26 Stephen is currently involved in a long distance charity walk from Alphcaster to Omegham. He left Alphcaster 9 days ago and has just completed 60% of his journey.

He hopes to complete 60% of the rest of the walk during the next 4 days. This will leave him just 60 miles from Omegham, which he aims to complete in a further 2 days.

How far is it from Alphcaster to Omegham?

A 375 miles

B 250 miles

C 300 miles

D 225 miles

E 450 miles

27 A safe has external dimensions as follows:

Width 48cm
Depth 44cm
Height 52cm

The entire safe is made of steel 4cm thick except the base which is 8cm thick.

What are the internal dimensions of the base of the safe?

A 40cm x 40cm

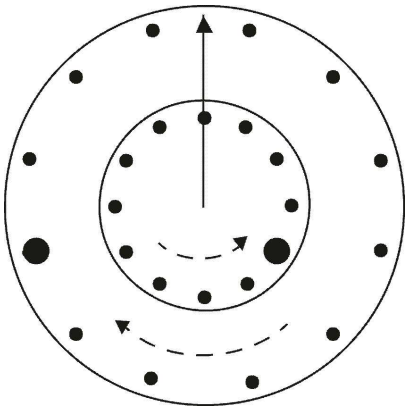
B 36cm x 36cm

C 40cm x 32cm

D 44cm x 40cm

E 40cm x 36cm

28 A novelty shop sells a rather unusual clock designed to puzzle users. There is only one hand, which points upwards. It has two faces. The larger hour face rotates clockwise and the smaller minute face rotates anticlockwise. Each face has one big dot, representing 12 o' clock or 0/60 minutes and 11 smaller marks counting one hour or five minute divisions. There are no numbers.



What time is it when the clock looks as shown in the diagram?

A 9:20

B 3:20

C 8:40

D 3:40

E 8:20

29 The table below shows the consumer price inflation and unemployment rate for 5 countries:

Consumer price inflation % rate	**March**	**February**
United States	+0.4	+0.3
Japan	+0.2	+0.5
Germany	+0.1	+0.1
France	+0.3	0.0
UK	+0.2	+0.5
Unemployed % rate	**March**	**February**
United States	5.9	6.1
Japan	3.0	3.0
Germany	9.2	9.3
France	12.6	12.6
UK	9.1	9.2

A newspaper comparing March to February reported that:

'Unemployment has fallen but there has been a rise in the inflation rate'

Which country is the statement referring to?

A Japan

B UK

C France

D United States

E Germany

30 Horrific images of the earthquake in Haiti were seen immediately all over the world, and by the next day the full extent of the damage was seen by the entire world. Clearly, the main problem was moving aid from the airport to distant areas, and with the roads largely blocked the only practical method was to use helicopters. The great nations of the world should be ashamed that food was not getting to the people who needed it, and that even a week later their relief still depended on the ability of courageous and skillful drivers to reach them in trucks.

Which one of the following is an underlying assumption of the argument above?

A The relief agencies were able to import trucks to Haiti but not helicopters.

B The great nations of the world had helicopters at their disposal which could reach Haiti within a week.

C There was enough food in Haiti to supply all the people in the weeks after the earthquake.

D The images failed to prompt the great nations of the world into relief operations after the earthquake.

E The people of Haiti were able to clear their roads within a week of the earthquake.

31 The direct product of transcription of recombinant DNA can be:

A insulin.

B monoclonal antibodies.

C mRNA.

D the primary structure of a protein.

E a replicate DNA molecule.

32 Which one of the following is found below the diaphragm in a human?

A Heart

B Pulmonary vein

C Liver

D Pulmonary artery

E Alveoli

33 Which one of the following does not contain amino acids?

A Cell membranes

B Amylose

C Viruses

D Enzymes

E Antibodies

34 Which statement about ribosomes is **NOT** correct?

A Ribosomes are involved in protein synthesis.

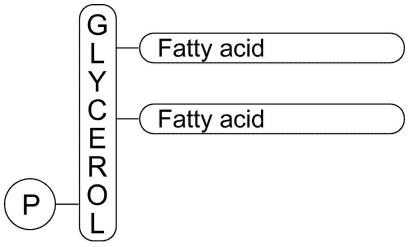
B Ribosomes can be found in the cytoplasm.

C Ribosomes can be found on rough endoplasmic reticulum (RER).

D Ribosomes can have RNA associated with them.

E Ribsosomes can carry out transcription.

35 The diagram below shows a phospholipid.



P = phosphate

When this molecule is broken into a phosphate, glycerol and two fatty acids, the number of water molecules released is:

A 2

B 3

C 0

D 1

E more than 3

36 A section of one strand of DNA has a base sequence of:

ACG-GCT-GGT-TCC

Which of the following are correct?

1. The other DNA strand would include a CGA triplet.
2. If adenine always binds with 2 H bonds to its complementary base and guanine with 3 H bonds, then each of these triplets will have a total of 8 H bonds.
3. The mRNA sequence transcribed from this DNA sequence would contain 3 uracil bases.

A 1 only

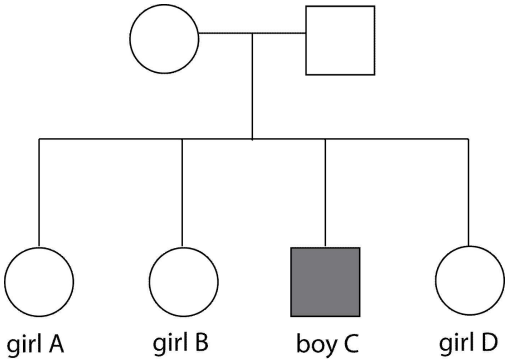
B 2 and 3 only

C 3 only

D 2 only

E 1 and 2 only

37 The family pedigree shows that boy C has a genetic condition. No other member of the family shows the same genetic condition.



Which one of the following could **NOT** explain why boy C has the condition?

A Sex-linked dominant condition

B Sex-linked recessive condition

C Both parents are carriers

D Autosomal recessive condition

E Mutation

38 Which one of the following is not involved in defending the body against infection?

A Antibodies

B T cell

C Beta cell

D B cell

E Phagocyte

39 In which of the following stages of mammalian respiration is CO_2 released?

1. Glycolysis
2. Anaerobic respiration
3. Krebs cycle

A 3 only

B 1 and 2 only

C 1 only

D 2 and 3 only

E 2 only

40 A sample of DNA contains 32 % guanine.

Which answer shows the percentage of thymine in the same sample?

A 32

B 18

C 23

D 34

E 24

41 Which of the following comes immediately after anaphase in mitosis?

A Telophase

B Interphase

C Prophase

D Metaphase

E Cytokinesis

42 The increase in the frequency of one phenotype in a wild population of fish could be due to:

1. an advantageous mutation.
2. increased reproductive success of individuals with that phenotype.
3. a change in the environment.

A 3 only

B 1 and 2 only

C 1, 2 and 3

D 2 and 3 only

E 1 only

43 Which one of the following molecules is made in both photosynthesis and respiration?

A Glucose

B Reduced NADP

C Carbon dioxide

D ATP

E Oxygen

44 A liver cell in the metaphase of mitosis can be identified as being eukaryotic because it has:

1. mitochondria
2. ribosomes
3. a nucleus

A 1 only

B 2 and 3 only

C 1 and 3 only

D 1 and 2 only

E 1, 2 and 3

45 Which name of the following phase changes is **NOT** correct?

A Solid to liquid = Melting

B Gas to solid = Freezing

C Solid to gas = Sublimation

D Liquid to gas = Evaporation

E Gas to liquid = Condensation

46 The compound $(CH_3)_2CHCH_2NH_2$ can be synthesised by the following route.

$$CH_3CH=CH_2 \xrightarrow{1} CH_3CHBrCH_3 \xrightarrow{2} (CH_3)_2CHCN \xrightarrow{3} (CH_3)_2CHCH_2NH_2$$

What types of reaction are used in stages 1, 2 and 3?

A 1=substitution; 2=addition; 3=reduction

B 1=substitution; 2=addition; 3=hydrolysis

C 1=addition; 2=substitution; 3=reduction

D 1=addition; 2=addition; 3=reduction

E 1=addition; 2=substitution; 3=hydrolysis

47 Which of the following must be correct about organic isomers?

1. They have the same molecular formulae.
2. Their physical properties are very similar.
3. They have different structural formulae.

A 1 and 2 only

B 1, 2 and 3

C 2 and 3 only

D 1 only

E 1 and 3 only

48 Which of the following are correct about carbon to carbon bonds?

1. The length of carbon to carbon bonds increases in the order C≡C, C=C, C-C.
2. The strength of the C=C bond is less than twice the strength of the C-C bond.
3. The carbon atoms are joined by six electrons in the C≡C bond.

A 2 and 3 only

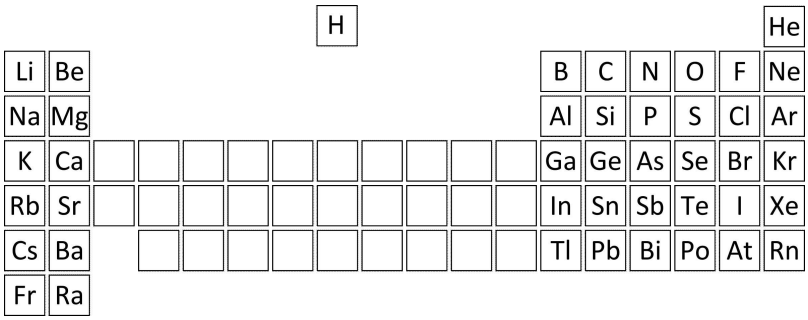
B 1 and 3 only

C 1, 2 and 3

D 1 and 2 only

E 3 only

49 The positions of the main group elements in the Periodic Table are shown below:



Which one of the following formulae is **NOT** correct?

A $GaCO_3$

B $CsNO_3$

C $BeSO_4$

D SnS_2

E $Ba(HCO_3)_2$

50 The following are some compounds of nitrogen:

NOCl, KNO_2, NO_2, NO_2Cl, $Ca(NO_3)_2$

What oxidation numbers are shown by nitrogen in these compounds?

A 3, 4, 5, 6

B 2, 3, 4, 5

C 2, 3, 4, 5, 6

D 4, 5, 6

E 3, 4, 5

51 What value does **c** need to be so that the following equation can be balanced?

$4KMnO_4 + \mathbf{a}H_2SO_4 + 5C_2H_5OH \rightarrow 4MnSO_4 + \mathbf{b}K_2SO_4 + 5CH_3CO_2H + \mathbf{c}H_2O$

A 21

B 11

C 16

D 17

E 26

52 How many atoms of hydrogen are there in 3.0kg of ethane?

[relative atomic mass: H=1, C=12; Avogadro constant = 6.0×10^{23} per mol]

A 3.6×10^{26}

B 3.9×10^{26}

C 6.0×10^{25}

D 3.6×10^{23}

E 6.0×10^{22}

53 A mass is connected to a spring and it vibrates up and down, forming a simple harmonic system.

Which of the following are correct?

1. The kinetic energy of the mass is at a maximum half way up.
2. The potential energy of the system is at a maximum at the top of the mass's motion.
3. The potential energy of the system is at a maximum at the bottom of the mass's motion.

A 1, 2 and 3

B 1 and 2 only

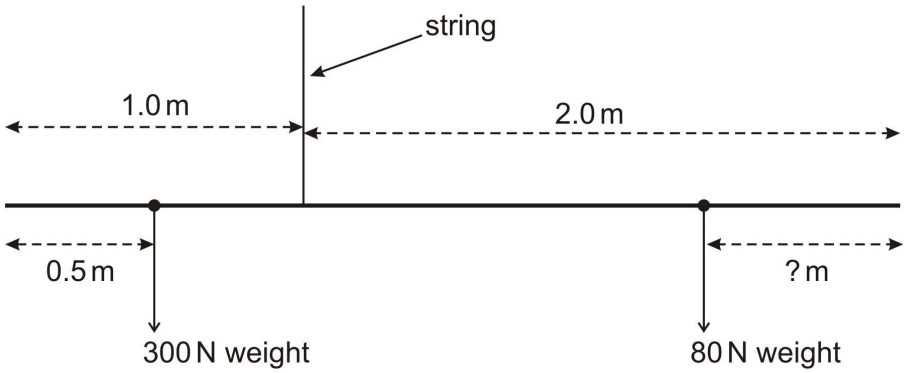
C 2 only

D 3 only

E 1 only

54 A uniform beam, 3.0m long, of weight 100N has a 300N weight placed 0.50m from one end. The beam is suspended by a string 1.0m from the same end.

A diagram of the weights placed on the beam is given below:



How far from the other end must a weight of 80N be placed for the beam to be balanced?

A 0.75m

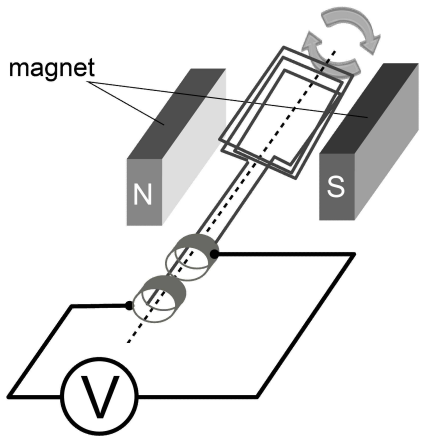
B 2.25m

C 1.25m

D 1.875m

E 0.125m

55 In an AC (alternating current) generator, a coil of wire rotates in a magnetic field.



Which of the following would change the potential difference measured by the voltmeter in the system above?

1. Use more turns of wire in the coil
2. User thicker wire
3. Change the speed of rotation

A 3 only

B 1, 2 and 3

C 1 and 2 only

D 2 only

E 1 and 3 only

56 Which of the following is the equation of the circle with centre (-1.5, 0.5) and radius 3?

A $2x^2 - 6x + 2y^2 + 2y - 13 = 0$

B $2x^2 + 6x + 2y^2 - 2y - 14 = 0$

C $2x^2 - 6x + 2y^2 - 2y - 13 = 0$

D $2x^2 + 6x + 2y^2 - 2y - 13 = 0$

E $2x^2 + 6x + 2y^2 - 2y - 23 = 0$

57 In the expressions below: g = gravitational acceleration; h = height; m = mass; R = electrical resistance; t = time; v = velocity; V = voltage.

Which of the following expressions have units of power?

1. $\frac{mv^2}{2t}$
2. $\frac{V^2}{R}$
3. $\frac{mgh}{t}$

A 1 and 2 only

B 1 only

C 2 and 3 only

D 1 and 3 only

E 1, 2 and 3

58 Simplify

$$\ln\frac{x^2}{4y} + \ln xy + \ln 8$$

A $3\ln x + 2\ln 2$

B $\ln\frac{x^2 + 4xy^2 + 32y}{4y}$

C $3\ln x + 2\ln y + \ln 32$

D $3\ln x + \ln 2$

E $4\ln x + \ln 2$

59 What is the set of values for which $12 - x^2 > 8$ and $2x + 3 \geq 5$?

A $1 \leq x$

B $1 < x \leq 2$

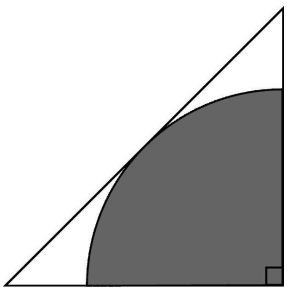
C $1 \leq x < 2$

D $2 < x$

E $-1 \leq x < 2$

60 The diagram shows a quarter of a circle surrounded by an isosceles triangle.

The radius of the circle is r.



Which one of the following expressions represents the unshaded area?

A $\left(1 - \frac{\pi}{4}\right) r^2$

B $r^2 - \frac{\pi r^2}{2}$

C $r^2 - \frac{\pi r}{2}$

D $(4 - \pi) r^2$

E $\left(2 - \frac{\pi}{4}\right) r^2$

IMAT 2013

Answer Key

Question	Answer
1	A
2	E
3	C
4	C
5	E
6	B
7	D
8	C
9	B
10	E
11	E
12	C
13	E
14	B
15	D
16	C
17	D
18	B
19	C
20	A
21	D
22	C
23	A
24	B
25	B
26	A
27	E
28	C
29	D
30	B

Question	Answer
31	C
32	C
33	B
34	E
35	C
36	E
37	A
38	C
39	A
40	B
41	A
42	C
43	D
44	A
45	B
46	C
47	E
48	C
49	A
50	E
51	B
52	A
53	A
54	A
55	E
56	D
57	E
58	D
59	C
60	A

ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2012/2013

Thinking Skills

1 Many people argue that the many government programmes intended to increase road safety have caused a steady decline in the number of accidents on our roads. However, some observers report that the real number of accidents may be much higher than is shown in the official records as many accidents are not reported by drivers. They also say that during the time when accident figures have decreased, the number of people going to hospitals because of road accidents has stayed constant.

Which one of the following can be drawn as a conclusion from the above passage?

A Road safety has improved greatly in recent years.

B Drivers should be required to report all accidents that occur on the road.

C Positive views about continually improving road safety may not be supported by what actually happens.

D Government programmes have been unsuccessful in reducing the number of accidents.

E Hospital admissions are a good way of measuring changes in the number of accidents on our roads.

2 In 2010 there were over 110,000 incidents of arson (deliberately setting fire to buildings) in the UK in which over 100 people were killed, usually in attacks on people's homes. Only a small percentage of homes have smoke alarms. If more homes had smoke alarms, the number of domestic fires would be significantly reduced. There should be a campaign to persuade people to install smoke alarms in their home as this would reduce the number of deaths.

Which one of the following identifies the flaw in the above argument?

A It assumes that having smoke alarms will prevent fires.

B It assumes that all deaths in fires are from arson attacks.

C It overlooks the fact that smoke alarms may not work.

D It assumes that people will be willing to install smoke alarms.

E It assumes that all arson attacks are on people's homes.

3 Nicotine chewing gum is already available in chemists. Nicotine is an addictive drug, but by itself it causes little, if any, harm. Unlike other addictive substances it does not reduce the brain's performance, make people lazy, anti-social, or have more accidents. But until recently nicotine has been taken only in the form of tobacco, which also contains cancer-causing chemicals and deadly gases that kill one third of the people who smoke it. The chewing gum does not contain these chemicals, and is not dangerous in any other way.

Which one of the following is a conclusion which can be drawn from the above passage?

A Nicotine chewing gum should be banned as it is addictive.

B Nicotine chewing gum is a relatively safe alternative to tobacco for those addicted to nicotine.

C Tobacco smokers can get rid of their addiction by chewing nicotine gum.

D Nicotine chewing gum will make nicotine addiction more common by removing some of its risks.

E Tobacco companies should put money into the manufacture and marketing of nicotine chewing gum.

4 Television programmes that show young people in a school environment continue to feature highly in viewing schedules. Few of the programmes, however, give any emphasis on the time spent studying and the work required for academic success. Many of the actors used are far older than the characters they portray, suggesting attitudes, behaviour and appearances that are inaccurate and sometimes inappropriate. Broadcasters and producers should try to correct this.

Which one of the following must be assumed in the above argument?

A Young people may feel that their social life is dull compared with that shown in television programmes.

B It is often impractical to use young people in television programmes given the restrictions on how many hours they can work.

C It is important to represent school life accurately.

D Television programmes about other areas such as the police are not accurate.

E School work and academic success are important to all students.

5 The volume of water expands by 9% when it freezes.

If you want a block of ice 40 cm^3, how much water would you need to put into a freezer?

A 36.7 cm^3

B 38.2 cm^3

C 38.0 cm^3

D 40.0 cm^3

E 37.0 cm^3

6 In a children's story there are three types of monster, Bongles, Crannies and Dervies. Some, but not all, Bongles are Crannies and all Crannies are Dervies.

Which one of the following is definitely **NOT** true?

A Some Dervies are both Bongles and Crannies.

B Some Dervies are neither Bongles nor Crannies.

C All Crannies are either Bongles or Dervies or both.

D No Dervies are Bongles.

E Some Bongles are Dervies.

7 Alice works until 5pm each day from Monday to Friday. On Friday she is planning to go to the cinema with friends. There is a local bus service which passes her workplace, home and cinema. Part of the bus timetable is shown in the table below. Alice plans to take the bus home, where she will get ready to go to the cinema and then she will catch the bus to get to the cinema. It will take Alice 45 minutes to get ready and she will also need 10 minutes when she reaches the cinema to buy her ticket before a film starts. Films start every 15 minutes starting from 6pm.

Work	16:39	17:04	17:39	18:04	18:39	19:04	19:39
Home	17:08	17:33	17:58	18:33	18:58	19:33	19:58
Cinema	17:33	17:58	18:33	18:58	19:33	19:58	20:33

What is the earliest time that she can watch a film?

A 18:15

B 18:30

C 18:45

D 19:00

E 19.15

8 Modern technology has given us the power to use renewable natural resources faster than they can be replaced. The decline of fish numbers provides one example of the way in which modern technology can rapidly use up a natural resource. Modern fishing ships equipped with fish detecting systems and huge nets can gather up vast quantities of fish quicker than the sea can renew them. Because high technology gives us such harmful powers, we must learn to use the renewable resources of the earth carefully, rather than waste them.

Which one of the following best expresses the main conclusion of the above passage?

A Modern technology simply takes from the environment and destroys its resources.

B Fishing is now a serious threat to the world's environment and should cease.

C Fish need to be carefully protected to prevent them from being destroyed.

D Most people are unaware of the damaging effects of modern technology.

E Humans must preserve renewable resources by learning how to use them carefully.

9 Shower gel is now used much more than soap when people take a shower. This is unfortunate. Shower gel requires much more packaging which means more rubbish. There is also a tendency for people to use more of it when washing in comparison with soap. Therefore more natural resources are consumed in the manufacturing process than would be if people used only soap. So, the trend towards shower gel is bad for the environment. This is because it creates more problems of waste disposal and uses up more resources than soap. We should make people more aware of the environmental impact of such simple decisions.

Which one of the following is an expression of the main conclusion of the above argument?

A The increased popularity of shower gel is bad for the environment.

B It is unfortunate that shower gel has become more popular than soap.

C People should be made more aware of the environmental consequences of choosing shower gel.

D The use of shower gel increases the problems of waste disposal.

E The manufacture of shower gel is more wasteful of natural resources.

10 Ten years ago in many European cities, offices typically had spaces for six bicycles, half of which were never used and spaces for 50 cars which were always full. Today, there are fewer car spaces and many more spaces for bicycles which are always full. This change to cycling may seem strange to some as cycling is more effort. Possible causes are rising fuel prices, the introduction of higher parking charges for drivers in major cities, increasing awareness of environmental issues, expensive public transport and traffic jams.

Which one of the following can be drawn as a conclusion from the above passage?

A Using a bicycle is now the most popular way of travelling to work.

B Travellers are now much more environmentally aware than they were 10 years ago.

C People will not cycle to work unless employers provide more cycle spaces on site.

D Travellers are now less happy to pay the costs of car use than they were ten years ago.

E More people cycle to work now than 10 years ago.

11 I wish to repaint the walls of my garage. It is 3 metres high, 4 metres wide and 9 metres deep. I shall not need to paint the electronic door which covers one 3 x 4 metre end, nor the window, which is 2 metres wide and 1 metre high, nor the rear door which is 1 metre wide and 2 metres high. 1 litre of paint covers 3 square metres.

How many 1 litre tins will be needed to complete the painting?

A 26

B 22

C 25

D 18

E 21

12 Approximately 1 in 14 men over the age of 50 has prostate cancer. The level of 'prostate specific antigen' (PSA) is used as a preliminary screening test for prostate cancer.

7% of men with prostate cancer do not have a high level of PSA. These results are known as 'false negatives'.

75% of those men with a high level of PSA do not have cancer. These results are known as 'false positives'.

If a man over 50 has a normal level of PSA, what are the chances that he has prostate cancer?

A 7%

B 25%

C 5%

D 0.7%

E 0.5%

13 The National Farmer's Union (NFU) approves of controlled killing of badgers to reduce their numbers, saying that it is needed to help farming. Badgers are animals believed to be responsible for the spread of *bovine tuberculosis* which results in large numbers of cows having to be destroyed every year. Animal rights supporters have criticised the proposal, but it is clear that the lives of more cattle can be saved by destroying a smaller number of badgers. This controlled killing should be allowed to go ahead.

Which one of the following is the best statement of the flaw in the above argument?

A It attacks the animal rights supporters rather than their argument.

B It assumes that the animal rights supporters believe that animals that are living freely have a greater right to life than those that are being bred on farms.

C It assumes that the animal rights supporters believe that badgers have a greater right to life than cows.

D It assumes that the arguments from the animal rights supporters are about the number of deaths.

E It assumes that animal rights supporters always disagree with the NFU.

14 Global warming is threatening the survival of California's redwoods. These trees benefit from coastal fog which is captured by the trees, causing water to drip onto the soil and therefore watering them. Since fog is now 30 percent less frequent than it was 50 years ago the trees will not have this source of water and are therefore likely to begin to die out.

Which one of the following must be assumed in the above argument?

A Global warming is to blame for the reduction in coastal fog.

B The levels of fog will continue to decline.

C Other trees will not be able to thrive in these conditions.

D Redwoods in other areas of the world are being similarly affected.

E Rainfall has also reduced over the past 50 years.

15 One of the fastest-growing beauty treatments in Britain, fish pedicures - where tiny toothless fish called *garra rufa* smooth feet by eating dead skin - has come under scrutiny from animal rights campaigners. One campaigner said, 'Fish are covered by the Animal Welfare Act. They need a stable environment and clean water, uncontaminated by perfume or lotions.' A spa in London's West End was closed recently by the local council when many of the fish in its pedicure pool died. There should be a complete ban on this type of pedicure, or else there will soon be no *garra rufa*.

Which one of the following is the best statement of the flaw in the above argument?

A Beauty spas which offer fish pedicures are not especially numerous at present.

B It would be less harmful if people washed their feet before using the spa.

C Fish in the wild are likely to die if their environment changes.

D The death of the fish in the London spa may not be a typical occurrence.

E The public does not immediately associate fish with the Animal Welfare Act.

16 The 100W light bulb (cost €0.60) is not going to be used anymore and is being replaced with the 20W (cost €3) low energy light bulb.

If electricity is charged at €0.15 per kWh, for how many hours must the low energy bulb be used in order for the lower cost of running it to exactly compensate for its higher initial cost?

A 0.25

B 250.00

C 200.00

D 160.00

E 720.00

17 Three months ago, Jane had 5 times as many DVDs as Duncan. Since then they have both bought 12 more DVDs. Jane now has twice as many as Duncan.

How many DVDs does Jane have now?

A 72

B 32

C 52

D 62

E 42

18 In preparation for my holiday in Bolandia last June, I changed €300 into Bolandian dollars every pay day from January to May (I am paid monthly).

The exchange rates were as follows:

	January	February	March	April	May
€1=	\$2.74	\$2.79	\$2.76	\$2.83	\$2.81

How many more Bolandian dollars would I have received altogether if, instead, I had changed the whole €1500 in May?

A 36

B 48

C 66

D 180

E 105

19 Rating figures for music are now much more difficult to calculate compared to a decade ago. The introduction of new formats for selling music means that figures have to be calculated based on more methods such as downloads, in addition to the sales of CDs in shops. Additionally, the availability of more formats means that there is more potential for copies of works to be shared with other fans, who do not pay for them. These fans do not show up in the ratings, so the official ratings do not reflect the relative popularity of a work.

Which one of the following, if true, would most strengthen the above argument?

A The calculation of ratings based on downloads and sales together is not difficult.

B Sharing copies of purchased works with others is against the law.

C Artists are not interested in the popularity of their work, just the sales figures.

D The sharing of works with other fans is more widespread for certain types of music.

E Official ratings have never reflected popularity very well.

20 It has been argued that since there has to be some limit on the funding of university education by governments, it would be best to target such funding, giving a lower priority to subjects which provide little benefit to society. Some subjects, such as Medicine, Engineering and Computing should be well funded, because they are clearly of great worth to the community. Subjects such as Classics, Literature and Art should be funded at a much lower level. These subjects are primarily of interest to the individual, and a wealthy society should give some subsidy to hobby subjects. However, it must be recognised that the future of society lies in the training and development of those people who will contribute the most.

Which one of the following must be assumed in the above argument?

A Subjects which are of interest to individuals can also provide benefit to society.

B The training of those people who will contribute most to society requires an increase in government funding in university education.

C Medicine, Engineering and Computing are not very interesting subjects to study.

D A wealthy society should not subsidise subjects which are of interest only to individuals.

E The study at universities of Classics, Literature and Art provides little benefit to society.

21 Roughly 60 percent of today's world population is bilingual or multilingual and it is argued that this is a new phenomenon. Today Spanish and Arabic are widely spoken whilst English is the world's most commonly spoken and written language. However, 500 years ago it was Latin which was the main language of education, religion, commerce and government in the Western World despite this not being most people's first language. In the 17th century, French and Italian gained in importance as languages of international trade.

Which one of the following can be drawn as a conclusion of the above passage?

A English will one day be replaced as the main language of communication.

B Speaking another language has always been an important practical consideration.

C The majority of bilingual or multilingual people speak English.

D The number of bilingual or multilingual people in the world will continue to grow.

E English is the most common world language today because of the spread of the internet.

22 Child actors tend to become addicted to drink and drugs in later life, usually when they become adults but are not as successful as they were previously. The actors frequently blame their parents, who often manage their children's career and so have a reason to work them hard when they are young and enjoy the wealth their children generate for them. The child actors who avoid this are often the ones who were encouraged to keep up their schooling and explore other career options.

Which one of the following can be drawn as a conclusion from the above passage?

A Child actors should have other interests that allow for other career opportunities.

B Drug abuse is common in the entertainment industry.

C Young actors who continue to work live happy, healthy lives.

D Parents should not be allowed to manage the careers of their children.

E There are fewer jobs available for adult actors.

23 According to the Food Standards Agency, film goers should be told how many calories there are in the popcorn, ice cream and fizzy drinks that they buy in cinemas and smaller portions of popcorn and drinks should also be available. As two thirds of adults and a third of children are already obese or overweight, with serious risk of heart disease, diabetes and cancer, the need for proper labelling to warn people about the calorie content of these items is urgent.

Which one of the following, if true, most strengthens the argument in the passage above?

A People who are overweight are sometimes more concerned with their looks than the long term health risks.

B A large box of salted popcorn contains as many calories as a three course meal.

C Cinemas rely on sales of food and drink to boost their profits.

D Trials show that consumers alter their eating habits when food is calorie-labelled.

E Many people think that the food and drink consumed at the cinema is as important to the visit as the film.

24 Tom shared out some money between his three children in the ratio 5:3:2. He later had an extra €6 which he gave to the child who received the least originally. This meant that the money had been shared into one large and two equal smaller shares.

How much money in total did Tom give to the three children?

A €36

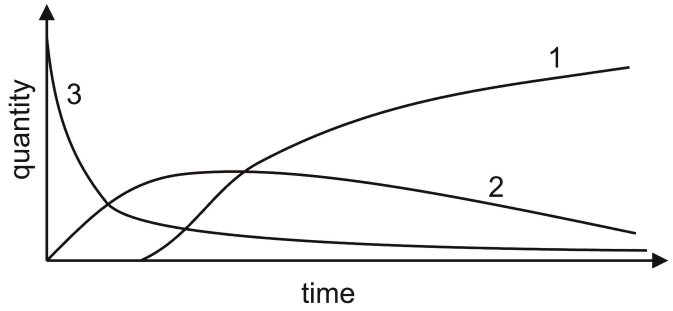
B €26

C €60

D €20

E €66

25 One radioactive substance, P, is gradually changed by radioactive decay into another, Q. Q itself decays into a third substance, R, which does not decay. The graphs below show how the quantities of P, Q and R varied with time during an experiment.



What do the graphs 1, 2 and 3 represent?

A 1:R 2:Q 3:P

B 1:Q 2:P 3:R

C 1:Q 2:R 3:P

D 1:P 2:Q 3:R

E 1:R 2:P 3:Q

26 The Chief Executive of the Royal Opera House has recently offered 100 seats on any Monday night for £10. Normally these seats can cost up to £175 therefore it represents a considerable saving. However the hopes of the Chief Executive that this will attract a broader audience are likely to be disappointed. It is not the financial costs that put people off opera - it is simply that they do not like it. Many young people spend considerable sums of money going to premier football matches or 'clubbing'. This suggests, therefore, that the problem of attracting a more diverse audience to opera is more a question of culture than economics.

Which one of the following is an expression of the main conclusion of the above argument?

A The 'cheap seats' policy is unlikely to attract a more diverse audience.

B The intention of the 'cheap seats' policy is that it will attract a broader audience.

C A considerable amount of money can be saved as a result of this offer.

D Many young people do not like the idea of going to the opera.

E Attracting a broader audience for opera is a problem of taste rather than expense.

27 The ingredients list on a tin of baked beans reads as follows (in order of descending weight):

- Navy beans (51%)
- Water
- Sugar
- Tomato puree (4.5%)
- Modified maize starch
- Salt
- Natural flavourings
- Onion powder
- Paprika

What is the maximum percentage of water the tin could contain?

A 22.2%

B 17.5%

C 49.0%

D 40.0%

E 44.5%

28 Three friends, Adam, David and Sue are sharing out a bag of marbles. To do this more quickly, they take 10 marbles each time and repeat until the bag is empty. There are not enough marbles for Sue to take 10 on the last turn. Adam and David then give her two marbles each and they all have the same.

How many marbles did Sue take on the last turn?

A 4

B 2

C 8

D 6

E 3

29 In a street, a survey showed that out of a hundred households 60 had a cat, 40 had a dog, and 20 had neither a cat nor a dog.

How many households had a cat but no dog?

A 20

B 50

C 40

D 10

E 30

30 After a long period of dry weather, the water container in my garden contained only 28% of its capacity of water. Last week's rain, however, increased the amount of water in the container by 25%, and according to the weather forecast, a similar amount of rain is expected to fall this coming week.

If, as expected, the container gets the same amount of rainwater this coming week as it did last week, what percentage of its capacity will it then contain?

A 66.25%

B 42.00%

C 78.00%

D 60.00%

E 43.75%

31 There are four rivers in Bolandia, each claiming to be the longest. Tourist board brochures in the regions containing the rivers, make the following statements:

1. The Dile is shorter than the Cubba.

2. The Bongo is shorter than the Esun.

3. The Esun is longer than the Cubba.

If all of the above are correct, which one of the following statements is definitely true?

A The Bongo is longer than the Cubba.

B The Esun is longer than the Dile.

C The Dile is longer than the Esun.

D The Cubba is longer than the Bongo.

E The Dile is shorter than the Bongo.

32 The table below shows the number of people who voted for each candidate in the recent school election:

Name	Alison	Harold	Kevin	Peter	Rachel
Votes	84	100	72	126	63

When drawing a pie chart of the results one of the numbers above was not read correctly (the other four were correct). The angles were calculated as 113.4 degrees, 90 degrees, 75.6 degrees, 56.7 degrees, and 24.3 degrees.

Whose score was copied incorrectly when the pie chart was constructed?

A Kevin

B Peter

C Rachel

D Alison

E Harold

33 A regular train service operates between Jayford and Kayton, a 16 km journey which takes 19 minutes. The trains travel at a constant speed of 60 km per hour in both directions except through a tunnel, where they are limited to 20 km per hour. Trains travelling towards Kayton enter the tunnel 4 km after setting off from Jayford.

How long is the tunnel?

A 4.5 km

B 2.5 km

C 1.5 km

D 3.5 km

E 0.5 km

34 After Northern Europe experienced the coldest weather for several years last winter, people are claiming that the theories of global warming are incorrect. This is not a conclusion that can be drawn from the information as it is only based on a single year's data. Global warming is based on long term changes in average temperature. It therefore does not mean that the temperature will increase every year. The extreme weather last winter was caused by cold air from the Arctic which is normally kept there by strong winds around the pole. Last winter those winds were not as strong.

Which one of the following, if true, would most strengthen the above argument?

A Some of the people claiming that the theories of global warming are incorrect do not come from areas that had very cold weather last winter.

B Although the weather was very cold last winter, the winter before was of average temperature.

C Other regions of the Northern Hemisphere were hotter last winter than in previous years.

D All the people claiming that theories of global warming are incorrect come from areas that had very cold weather last winter.

E The claims that theories of global warming are incorrect are supported by further evidence.

35 A student gives his friends small, short-term loans for periods of 1, 2 or 3 weeks after which time they must be repaid in full. He always lends on a Friday afternoon. He starts with €120 and loans out the following amounts each week:

Week	1	2	3	4
Amount	€45	€25	€18	€20

What is the smallest amount of money he has by the end of the 4th Friday?

A €82

B €12

C €77

D €100

E €57

36 Hundreds of miles of motorways are lit by unnecessary street lights. There is a need to save energy usage in all public services and it is time that the government considered turning off street lighting. Modern cars have powerful headlights which provide a clear view of the road ahead even without overhead lighting. There is also evidence to suggest that when drivers move from an area with lighting to an area without they are more likely to have an accident than those drivers who have driven exclusively on roads without lighting.

Which one of the following, if true, would most strengthen the above argument?

A There is evidence that there are fewer daytime accidents on those motorways without lighting.

B Driving in well-lit areas at night can lead to a lack of concentration.

C Research suggests that older drivers find driving without lighting more difficult.

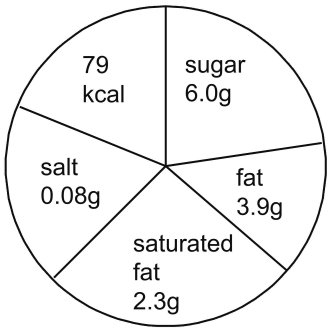
D Many drivers find driving on unlit roads difficult.

E Street lighting costs less than other types of road maintenance.

37 The following information appears on a 200g packet of biscuits:

Typical values per 100g:		
Energy	Kj	2137
	Kcal	510
Protein		5g
Carbohydrate		65.7g
of which sugars		38.5g
Fat		25.3g
of which saturates		14.6g
Fibre		1.7g
Sodium		0.21g
Equivalent as salt		0.52g

Each biscuit contains:



How many biscuits are there in a full packet?

A 22

B 11

C 6

D 13

E 7

38 A restaurant owner who has put grey squirrel on the menu has called it the 'ultimate ethical food'. The grey squirrel, a small, tree-dwelling rodent introduced to Britain over a century ago, is breeding so rapidly that the native red squirrel is disappearing. Encouraging the consumption of the grey species as food may help protect the red one, in her view. The owner added that squirrel meat was free range, low fat and low on air miles. However, we can challenge this, as it is all just a cheap publicity stunt to increase business in the restaurant. Squirrels should not be on the menu!

Which one of the following is the best statement of the flaw in the above argument?

A It attacks the owner's motive rather than her reasons.

B It assumes the disappearance of the red squirrel justifies eating the grey squirrel.

C It attacks the whole notion of an ethical food.

D It assumes that eating grey squirrels will protect the red squirrel.

E It assumes that red squirrels don't need protecting.

39 Health services should find better ways to take blood pressure readings for patients thought to be suffering from high blood pressure (hypertension). One third of patients thought to have high blood pressure may actually have 'white coat' hypertension, according to a new study. 'White coat' hypertension means that a patient's blood pressure is high at the doctor's surgery, probably due to anxiety, but normal in everyday life. In the study, patients said to have hypertension had their blood pressure measured in a normal environment; more than one third of these patients' blood pressures were in the normal range when they were at home or participating in their usual activities. It is worrying that patients are being treated with drugs with some negative side effects to reduce high blood pressure which they do not actually have.

Which one of the following best expresses the conclusion of the argument above?

A Two thirds of patients said to have hypertension are being wrongly treated.

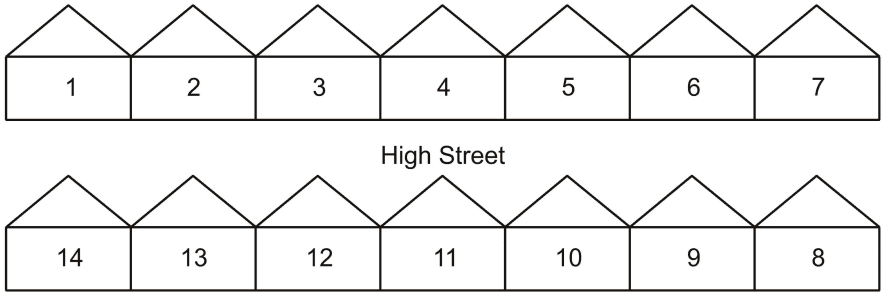
B More effective ways of measuring blood pressure are needed.

C Health services could save money currently spent on unnecessarily prescribed drugs.

D Anxiety is the most common cause of high blood pressure.

E 'White coat' hypertension has no medical significance.

40 As John walks along the High Street, the numbers to his left increase while the numbers to his right decrease, as in the diagram below.



The street where he lives is numbered in the same way. He lives at number 8 Princess Road and the house directly opposite his house is number 11.

How many houses are there on Princess Road?

A 18

B 16

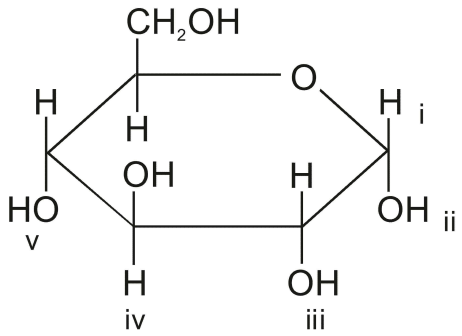
C 20

D 14

E 19

Biology

41 If a glucose molecule became incorporated as a non-terminal component of starch, which two regions, labelled **i** to **v**, would be involved in forming glycosidic bonds?



A i and iii

B iii and v

C ii and iv

D i and iv

E ii and v

42 In a reflex arc that comprises a pain receptor cell in the skin, three neurones and a muscle (effector), the number of synapses found in the central nervous system (CNS) is:

A 3

B 5

C 4

D 1

E 2

43 Which one of the following molecules will contain the greatest number of different elements?

A amino acids

B polysaccharide carbohydrates

C lipids

D monosaccharide carbohydrates

E water

44 Which of the examples of homeostasis do **NOT** require the brain to be involved in the control process?

1. temperature regulation
2. osmoregulation (regulation of the water content of blood)
3. blood glucose concentration regulation

A 2 and 3 only

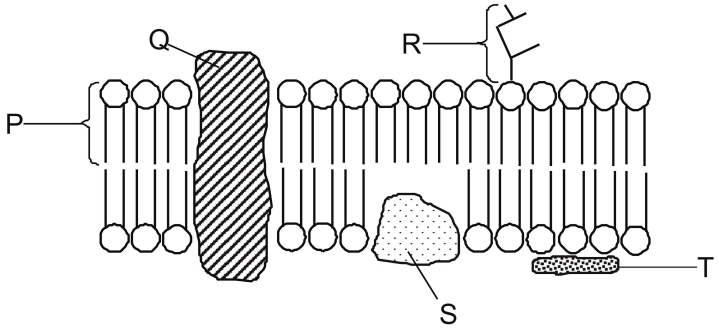
B 3 only

C 1 and 2 only

D 2 only

E 1 only

45 The diagram below represents the fluid mosaic model of the cell (surface) membrane.



Only two of the labelled molecules have both hydrophobic and hydrophilic areas. Which two molecules are they?

A P and Q

B R and S

C Q and R

D S and T

E P and T

46 Which row of the table correctly identifies a blood vessel that has a low concentration of carbon dioxide and a vessel that has a low concentration of urea?

	low carbon dioxide	**low urea**
Row 1	renal vein	pulmonary artery
Row 2	pulmonary vein	renal vein
Row 3	renal artery	pulmonary vein
Row 4	pulmonary vein	renal artery
Row 5	pulmonary artery	renal vein

A Row 5

B Row 2

C Row 4

D Row 3

E Row 1

47 Gene expression can be regulated by:

A transcription factors

B DNA replication factors

C RNA polymerase

D rough endoplasmic reticulum

E the position of the genes on the alleles

48 In a set of genetic crosses the offspring produced showed the same phenotype ratio of 9:3:3:1.

Which of the following statements could be true?

1. two genes each with two alleles were studied
2. all parents were heterozygous
3. some offspring had a phenotype different to the parents
4. some offspring had a phenotype the same as the parents

A 1, 2, 3 and 4

B 1 and 2 only

C 3 and 4 only

D 2 and 3 only

E 1 only

49 Which one of the following would be different in a pair of non-identical twins?

A alleles
B amount of nuclear DNA
C the total of adenine plus guanine
D genes
E chromosome number

50 Which one of the following is **NOT** correct about human chromosomes?

A They contain regions called genes.
B They are made of DNA and protein.
C They are sometimes not found in pairs
D They can attach to the spindle at the centriole.
E They are sometimes found in pairs.

51 Which one of the following is **NOT** true of human hormones?

A They are all released from glands and flow down ducts into the bloodstream.
B A hormone may affect one or more structures in the body.
C They travel at the speed of blood flow.
D They are all chemicals.
E Some, such as testosterone and oestrogen, can be steroids.

52 Which of the following transport mechanisms require the use of protein molecules found in membranes and ATP?

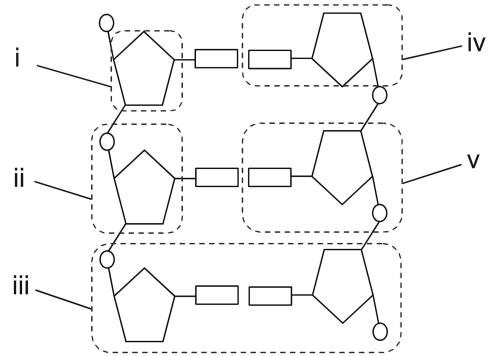
1. Active transport

2. Diffusion

3. Facilitated diffusion

A 1 and 2 only
B 2 and 3 only
C 3 only
D 1 only
E 1 and 3 only

53 Which one of the following labels, **i** to **v**, represents a nucleotide?



A i
B iv
C v
D ii
E iii

54 Which of the following crosses is most likely to produce offspring of genotype GgNn?

A ggNN x GGNn
B GGNn x GgNn
C ggNn x GGNN
D GGNN x ggnn
E GgNn x GgNn

55 Antibiotics are becoming less effective due to:

A people becoming immune to them
B people not finishing the full course
C new antibiotics being available
D people becoming resistant to them
E artificial selection

56 The following organelles are involved in processing amino acids into glycoprotein:

1. Golgi apparatus

2. Ribsomes

3. RER

Which sequence is correct for this process?

A 3 → 1 → 2

B 2 → 3 → 1

C 1 → 2 → 3

D 1 → 3 → 2

E 2 → 1 → 3

57 Which of the following are increased when the level of adrenaline rises in a human?

1. heart rate
2. breathing rate
3. impulse rate in a sensory neurone

A 1 and 3 only

B 1 only

C 2 and 3 only

D 1 and 2 only

E 1, 2 and 3

58 Which of the following is/are true about hydrogen bonds between water molecules?

1. They are weak bonds.

2. They are strong bonds.

3. They are temporary bonds.

4. They require hydrolysis to break.

A 1 only

B 2 and 4 only

C 1 and 3 only

D 2 and 3 only

E 1 and 4 only

Chemistry

59 Which one of the following could **NOT** be the formula of an aldehyde?

A $C_6H_{12}O_2$

B $C_5H_{10}O_2$

C $C_5H_{10}O$

D $C_5H_{12}O$

E $C_6H_{12}O$

60 Which of the following statements are correct about the solvent properties of water?

1. All ionic substances dissolve in water.
2. All covalent substances are insoluble in water.
3. The solubility of solids usually increases with a rise in temperature.

A 1 only

B 2 only

C 2 and 3 only

D none

E 3 only

61 In the following reactions, which substances are acting as oxidising agents?

$C(s) + O_2(g) \rightarrow CO_2(g)$

$2Fe^{3+}(aq) + 2I^-(aq) \rightarrow Fe^{2+}(aq) + I_2(aq)$

$Mg(s) + 2H^+(aq) \rightarrow Mg^{2+}(aq) + H_2(g)$

A $C(s)$, $Fe^{3+}(aq)$, $H^+(aq)$

B $C(s)$, $Fe^{3+}(aq)$, $Mg(s)$

C $O_2(g)$, $I^-(aq)$, $H^+(aq)$

D $O_2(g)$, $Fe^{3+}(aq)$, $H^+(aq)$

E $O_2(g)$, $I^-(aq)$, $Mg(s)$

62 Which one of the following is **NOT** correct about Fe, Cu and Zn, which are in the first row of the transition metals?

A They all form basic oxides.

B They all have densities greater than those of Group 1 metals.

C They are all reactive metals.

D All of them form M^{2+} ions.

E Only two of them form coloured ions.

63 The Avogadro constant is 6.0×10^{23} mol^{-1}.

How many hydrogen atoms are there in 0.420 g of cyclohexane?

[A_r: H = 1; C = 12]

A 1.8×10^{23}

B 1.8×10^{22}

C 3.0×10^{21}

D 3.0×10^{22}

E 3.6×10^{22}

64 What is the total number of electrons in the ions of sodium chloride?

A sodium ion = 11; chloride ion = 17

B sodium ion = 8; chloride ion = 8

C sodium ion = 11; chloride ion = 18

D sodium ion = 10; chloride ion = 18

E sodium ion = 10; chloride ion = 17

65 Which one of the following is correct about the first and second electron affinities of oxygen?

A first = slightly exothermic; second = very endothermic

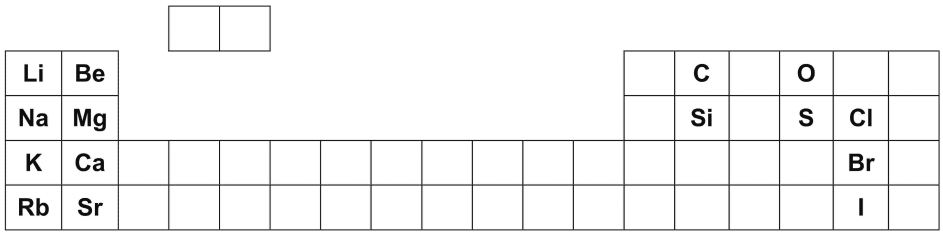
B first = slightly exothermic; second = very exothermic

C first = slightly endothermic; second = very exothermic

D first = slightly endothermic; second = very endothermic

E first = very exothermic; second = very exothermic

66 The positions of some elements in the Periodic Table are shown below.



Which one of the following pairs of elements is most likely to form a covalent bond?

A magnesium and bromine

B strontium and oxygen

C potassium and chlorine

D calcium and chlorine

E beryllium and iodine

67 Consider the following reactions.

$C_2H_5Br + OH^- \rightarrow C_2H_5OH + Br^-$

$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

$Mg(s) + Cu^{2+}(aq) \rightarrow Mg^{2+}(aq) + Cu(s)$

Which one of the following types of reaction is **NOT** included in this list?

A substitution
B oxidation/reduction
C displacement
D precipitation
E elimination

68 Which rows of the table correctly describe the reactions of the aqueous acids with amines and amides?

		Amines	**Amides**
Row 1	**Ethanoic acid**	reacts	does not react
Row 2	**Nitrous acid**	reacts	reacts
Row 3	**Sulphuric acid**	does not react	hydrolyses

A Rows 2 and 3
B Rows 1 and 3
C None of the rows
D All of the rows
E Rows 1 and 2

69 Which one of the following is **NOT** the correct formula for a lithium compound?

A Li_2S
B $LiCO_3$
C CH_3CO_2Li
D $LiHSO_4$
E Li_3N

Physics and Mathematics

70 What is the set of values of x for which $x^2 < 9$ and $2x + 3 \geq 5$?

A $x > 3$

B $x \geq -1$

C $1 \leq x < 3$

D $x < -3$ or $x \geq 1$

E $x > -3$

71 A block of iron at 100 ^{o}C is transferred to a plastic cup containing water at 20 ^{o}C.

Which one of the following is **NOT** necessary in order to find the specific heat capacity of iron?

A The specific heat capacity of water.

B The mass of the block of iron.

C The thermal conductivity of the iron.

D The final temperature.

E The mass of water.

72 At the melting point, which of the following are correct about paraffin wax?

1. The substance becomes more disordered.
2. The wax takes in heat but its temperature stays the same.
3. Bonds between the carbon and hydrogen atoms are broken.

A 1, 2 and 3

B 2 and 3 only

C 2 only

D 1 and 3 only

E 1 and 2 only

73 When cooled below 4.2 K, mercury becomes a superconductor, which means it has no electrical resistance. When a current is passed through mercury under these conditions, which of the following effects will be present?

1. thermal
2. chemical
3. magnetic

A 1 and 3 only

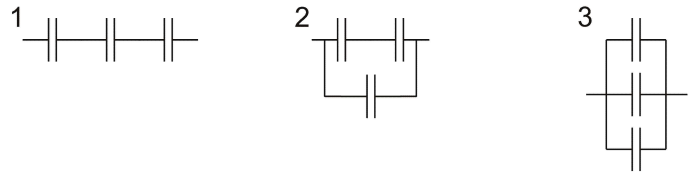
B 1, 2 and 3

C 2 only

D 3 only

E 1 only

74 Three identical capacitors are connected as follows:



Which of the following shows the order of increasing capacitance (smallest first)?

A 3, 2, 1
B 1, 3, 2
C 2, 1, 3
D 1, 2, 3
E 2, 3, 1

75 Which one of the following is **NOT** a vector?

A velocity
B weight
C electric charge
D electric field
E acceleration

76 Which of the following is equivalent to $\ln(x^2y) - 2\ln(xy) + 3\ln y$?

A 0
B $\ln x + \ln y$
C $2\ln y$
D $2\ln x + 2\ln y$
E $\ln x + 2\ln y$

77 In a group of students, exactly $\frac{2}{5}$ are male and exactly $\frac{1}{3}$ study mathematics. The probability that a male student chosen at random from the group studies mathematics is p.

Which of the following is the range of possible values of p?

A $\frac{1}{3} \leq p \leq 1$

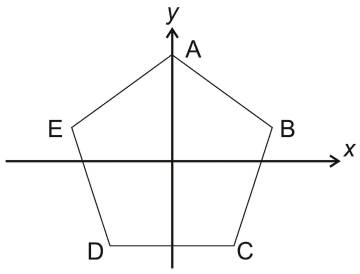
B $0 \leq p \leq \frac{5}{6}$

C $\frac{1}{3} \leq p \leq \frac{2}{5}$

D $\frac{2}{5} \leq p \leq \frac{5}{6}$

E $0 \leq p \leq \frac{1}{3}$

78 ABCDE is a regular pentagon. The transformation R is a rotation about the origin and maps A to B, B to C, C to D, etc. The transformation S is a reflection in the y-axis.



Which of the following sequences of transformations (performed in the order that they are listed) would **NOT** leave vertex D in the same position?

A R R S R S R

B S R

C S R R S R S

D R S R S

E R S R R

79 The line L has equation $y = 2x - 1$.

Four of the following five points are the same distance from the line L. Which one is at a different distance?

A (1, -1)

B (1, 3)

C (4, 9)

D (6, 9)

E (5, 13)

80 A man of mass 75 kg lies on a bed of 10 000 nails. The tip of each nail has an area of 1.0 square millimetre.

What pressure does the man experience?

[g = 10 N/kg]

A 7.5×10^6 Pa

B 7.5×10^4 Pa

C 7.5×10^3 Pa

D 7.5×10^7 Pa

E 7.5×10^5 Pa

IMAT 2012

Answer Key

Question	Answer
1	C
2	A
3	B
4	C
5	A
6	D
7	E
8	E
9	C
10	E
11	E
12	D
13	D
14	A
15	D
16	D
17	B
18	A
19	D
20	E
21	B
22	A
23	D
24	E
25	A
26	A
27	D
28	A
29	C
30	B
31	B
32	A
33	C
34	C
35	E
36	B
37	D
38	A
39	B
40	A

Question	Answer
41	E
42	E
43	A
44	B
45	A
46	B
47	A
48	A
49	A
50	D
51	A
52	D
53	C
54	D
55	B
56	B
57	D
58	C
59	D
60	E
61	D
62	C
63	E
64	D
65	A
66	E
67	E
68	E
69	B
70	C
71	C
72	E
73	D
74	D
75	C
76	C
77	B
78	A
79	E
80	B

ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2011/2012

General Knowledge and Logical Reasoning

1 Which of the following states is NOT a permanent member of the UN Security Council?

A China

B France

C Japan

D United Kingdom

E USA

2 Which ancient Greek is referred to as the father of Western medicine?

A Aristophanes

B Aristotle

C Hippocrates

D Plato

E Socrates

3 Amnesty International (AI), a non-governmental organisation for the protection of human rights enshrined in the Universal Declaration of Human Rights, opposes the death penalty. Which one of the following reasons for opposing the death penalty is inconsistent with the principles of AI.

A The death penalty can be carried out on an innocent person.

B The death penalty is contrary to theological principles.

C The death penalty is cruel, inhuman and degrading.

D The death penalty is not a deterrent against crime.

E The death penalty, once carried out, cannot be reversed.

4 Three red balls, three yellow balls and one green ball are placed in a bag and the bag is shaken. I place my hand in the bag and pull out a red ball followed by a green ball. I do not replace either ball.

Which one of the following statements is true?

A The next ball could be any one of red, yellow or green.

B The next ball will definitely be yellow.

C The next two balls cannot both be red.

D At least one of the next three balls must be yellow.

E At least one of the next three balls must be red.

5 My friend has three children, Alice, George and Hannah and I need to buy two presents for them to share. I want to buy two different toys and I want to make sure that Alice, George and Hannah will each like at least one of them. I don't want the toys to have small parts.

Toy	***Small Parts?***	***Liked by Alice?***	***Liked by George?***	***Liked by Hannah?***	***Price***
Jigsaw	Yes	No	Yes	Yes	€12
Building bricks	Yes	Yes	Yes	No	€9
Car	No	No	No	Yes	€12
Bear	No	Yes	No	Yes	€7
Train	No	No	Yes	No	€8

How much am I going to pay in total?

A €15

B €16

C €19

D €20

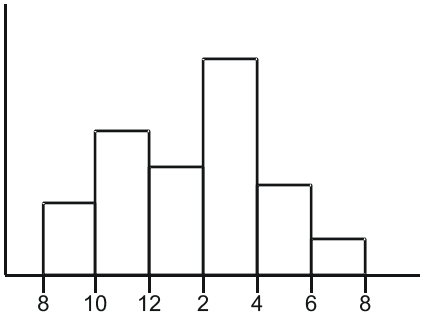
E €24

6 The number of visitors to the local swimming pool at different times on Wednesday last week is recorded in this table:

Time	Number of visitors
8am - 10am	23
10am - 12 noon	41
12 noon - 2pm	35
2pm - 4pm	60
4pm - 6pm	40
6pm - 8pm	15

Which chart shows the data from the table?

A



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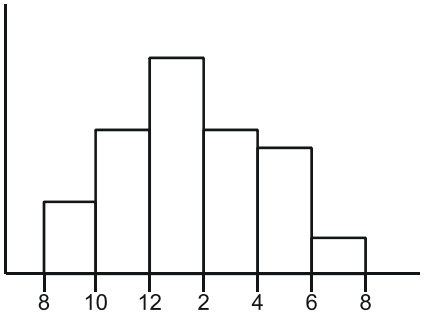

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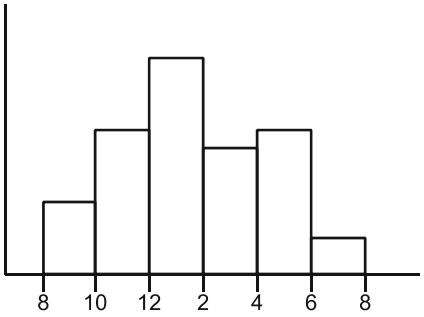

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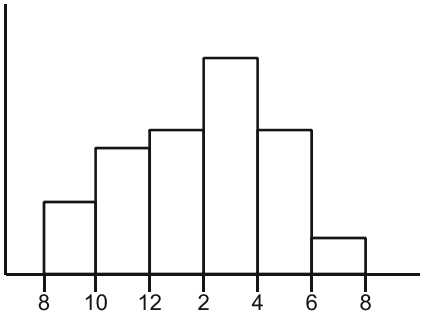
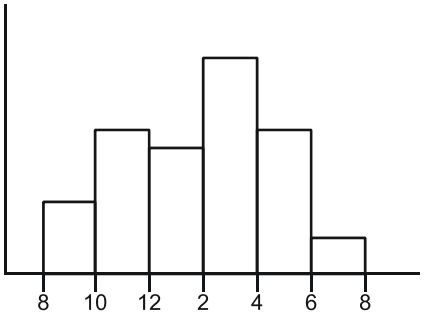


E



7 The polis is the most important institutional expression of the classical Greek way of life. What type of state is it?

A A city state

B A federal state

C A modern state

D A monarchical state

E A tyrannical state

8 Which set of statements about Dante Alighieri is correct?

A he was from Florence, wrote poetry, died before 1400

B he was from Milan, was born in the thirteenth century, died before 1400

C he was from Milan, was the son of Giulia Beccaria, wrote poetry

D he was from Tuscany, wrote poetry, was the son of Giulia Beccaria

E he was of noble family, was born in the fourteenth century, wrote tragedies

9 Which of the following is NOT true of the Enlightenment?

A It was a cultural trend, according to which the only real art was rational, understandable by all, and identified itself with Greek and Roman art.

B It was a cultural trend that highlighted all the social and economic inequalities, and paved the way for the French Revolution.

C It was a cultural trend that spread across Europe, mainly in France, in the early 1700s.

D It was a cultural trend that spread across Europe, which emphasised the sovereignty of the people, as a carrier of values.

E It was a cultural trend that was based on the exaltation of reason that, eliminating any irrational element of knowledge, by itself, revealed the truth without the help of the transcendental realm. In France this lead to materialism and atheism.

10 Two security guards, Dave and Geoff, are patrolling an airbase. Dave passes the front gate every 8 minutes. Geoff passes the front gate every 15 minutes. They have just set off on their individual routes at the start of their shift.

How long will it be before they meet up at the front gate again?

A 1h 00mins

B 1h 30mins

C 2h 00mins

D 2h 30mins

E 3h 00mins

11 Employees at a printing company are paid a basic rate of €11 per hour during the day Monday to Friday. During weekday evenings and on Saturdays they are paid at one and a half times the basic rate and on Sundays they are paid at double the basic rate.

The table below shows the hours worked by employees last week:

	Mon-Fri daytime	**Mon-Fri evenings and Saturdays**	**Sundays**
Alice	32	8	6
Ben	27	8	8
Chetan	36	8	2
Daniel	30	8	6
Ellen	35	8	4

Which employee earned most last week?

A Alice

B Ben

C Chetan

D Daniel

E Ellen

12 A teacher in a school for children from 11 to 16 years old sets a code number to unlock his classroom door. He has a method for remembering his code. He uses:

- the 2 digits of his birth month reversed (for example, February would be 02 reversed to 20);
- then the age of the children in his class at the start of the year with the digits reversed;
- and finally, the date of his birthday in the month, also reversed.

Which one of the following could **not** be the code to unlock his door?

A 215150

B 903121

C 701131

D 602124

E 115191

13 It has long been thought that birds are much less intelligent than humans and apes. But now it seems that some species of birds have the same kind of thinking skills as apes. Crows can create and use tools and are socially sophisticated when finding and protecting food. So how can a bird with a walnut-size brain be capable of such achievements? The answer is that both crows and apes have much bigger brains than you would expect from the size of their bodies. The same pattern is found in humans, parrots and chimps - all intelligent animals.

Which one of the following can be drawn as a conclusion from the above passage?

A Apes are not as similar to humans as had been thought.

B Crows are more intelligent than other species of birds.

C Animals that cannot create tools are not intelligent.

D Relative brain size is a better indicator of intelligence than absolute brain size.

E It could be argued that birds are as intelligent as apes.

14 There is a higher than average risk of death or injury to young drivers and their passengers. In 2007, 32 per cent of car driver deaths and 40 per cent of car passenger deaths were people aged between 17 and 24. Young male drivers were much more likely to be killed or seriously injured than young female drivers. So in order to reduce the number of road accidents and the numbers of people killed or injured, young people should not be allowed to drive until they reach the age of 24.

Which one of the following is an assumption on which this argument depends?

A Young people would not accept the raising of the legal driving age.

B Most of the accidents involving young people were the fault of the young drivers.

C The driving test does not effectively test the skill of drivers.

D The majority of drivers aged between 17 and 24 drive dangerously.

E Amongst drivers aged between 17 and 24 there are more male drivers than female drivers.

15 Some disabled people find it difficult to gain access to some of our older public buildings because the entrances have steps. The problem is most often solved by installing ramps. All public buildings must be accessible to everyone therefore they must all install ramps.

Which one of the following identifies the flaw in this argument?

A Disabled people must have access to all buildings not just public ones so all buildings should have ramps.

B Installing ramps in all public buildings would be extremely expensive.

C It is unreasonable to suggest that disabled people should be able to access all public buildings.

D Some older public buildings without ramps may be accessible to disabled people.

E Inaccessible public buildings should be replaced by buildings accessible to all.

16 A street of houses is numbered starting on one side with 1,2,3,4.... At the far end the numbers continue down the other side in the opposite direction so the largest number is opposite number 1. The houses are of identical widths so each house has another directly opposite it.

If number 17 is directly opposite number 56, how many houses are there in the street?

A 36

B 37

C 39

D 72

E 73

17 A courier starts the day in London and makes two round trips to Prague in the day. When she arrives at either airport, she takes the next available flight back.

The daily timetable is shown below (all times are local):

London	**Prague**	**Prague**	**London**
depart	*arrive*	*depart*	*arrive*
06:30	09:30	10:10	11:20
09:45	12:45	13:25	14:35
12:30	15:30	16:40	17:50
15:45	18:45	19:55	21:05

How long is the courier's day from first take-off to last landing?

A 4 hours 50 minutes

B 8 hours 5 minutes

C 8 hours 20 minutes

D 11 hours 20 minutes

E 14 hours 35 minutes

18 My three local supermarkets all currently have offers on my favourite breakfast cereal as follows:

1 Buy one standard pack get a second half price.

2 Price of a standard pack reduced by 1/3.

3 Normal price of a standard pack, pack contains 25% extra.

Which of the offers are equivalent in terms of price per unit amount of cereal?

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

E none

19 If the Carnival Committee does not follow the new European regulations then it may be impossible to guarantee safety. The probable consequence of this would be a heavy fine, which would severely reduce the carnival fund, and could be disastrous for the committee's finances. Either the committee must meet the safety requirements or the future of the carnival may be under threat.

Which one of the following best expresses the conclusion of this argument?

A Safety at the carnival has reached dangerously low levels.

B If the European regulations are not followed the carnival may not survive.

C Failure to improve safety could result in a heavy fine.

D A heavy fine could mean financial disaster for the carnival.

E If the regulations are followed then the carnival will take place again next year.

20 87% of the world population are right-handed. The human world is organised to make success in life easier for the majority. Left-handed people should therefore be considered as having a disability and receive appropriate support.

Which one of the following, if true, weakens this argument?

A Amongst top scientists, sportsmen, actors, musicians and politicians the percentage of left-handed people is much higher than 13%.

B Left-handed people have poorer spatial skills which makes them more likely to have car crashes and other serious accidents.

C Left-handed people are more likely to have health problems such as allergies, depression, epilepsy and sleeping disorders.

D Hand tools, musical instruments and scissors are designed for use by the majority.

E Many left-handed people were forced to write with their right hand when they were at school.

21 In North America in the 1800s, arguments were often settled by gunfights, in which two people stood face to face a distance apart and tried to shoot one another. Recent experiments on human response times have shown that people act more quickly when responding to an action than when they are the first to move. This supports the view that our brain uses different routes in our nervous system to send messages for intentional and reactive movements.

Which one of the following can be drawn as a conclusion from the above passage?

A Scientific experiments produce interesting findings.

B Gunfighters are best advised to wait for their opponents to move to fire.

C Gunfighters who wait for their opponent to move first would always win.

D Brains cannot control our reactive movements.

E Humans can be trained to react more quickly.

22 A taxi driver charges €1.00 per kilometre for the first 3 kilometres of a journey, and 70c per kilometre for the rest of the journey. I travel home from the train station by taxi. I pay the taxi driver €10.00 including a tip of 70c.

How far is my house from the station?

A 9 kilometres

B 10 kilometres

C 12 kilometres

D 13 kilometres

E 14 kilometres

23 The table below relates to electricity generation in the United Kingdom:

Category of Station	**Millions of units (kWh)**		
	1990	**1995**	**2000**
Coal, Oil and Gas	242,300	228,500	245,700
Nuclear	37,000	61,100	65,700
Gas Turbines and Oil Engines	500	1,100	400
Hydro-Electric (Natural Flow)	3,900	4,100	5,100
Hydro-Electric (Pumped Storage)	1,200	2,800	2,000
TOTAL	284,900	297,600	318,900

Which category of station made the largest contribution to the increase in total units generated over the 10 years covered by the table?

A Coal, Oil and Gas

B Nuclear

C Gas Turbines and Oil Engines

D Hydro-Electric (Natural Flow)

E Hydro-Electric (Pumped Storage)

24 The pie chart shows the favourite ice cream flavour for a sample of students in a school.

Which one of the rows in the table below could show the number of students who chose each flavour?

	Vanilla	Raspberry	Strawberry	Chocolate	Mint
A	23	41	35	35	16
B	5	34	36	35	10
C	15	29	32	31	13
D	26	61	73	73	37
E	36	55	71	72	36

25 If more workers worked for only four days each week there would be fewer commuters, and therefore less traffic congestion and less pollution. Also, fewer people would be unemployed because there would be more work to go around. There is evidence that part-time workers are absent from work less often than full-time workers, so a person working a four-day week would be more productive. Less work means less pressure, which means less stress and people would be happier.

Which one of the following can be drawn as a conclusion from the above passage?

A People choosing to work a four-day week would have to take a 20% pay cut.

B There would be less pressure on the health services if most workers were on a four-day week.

C The economy would be more competitive if people worked more productively.

D The government should enforce a four-day working week.

E There would be many benefits to working a four-day week.

26 Migratory birds which are unable to fly long distances without resting have to use the shortest distance over water in their flights to and from Africa, and so they cross at the Straits of Gibraltar. It is essential for these birds, some of which are very rare, that the route remains open. For that reason, it is important that plans to build electricity-generating wind farms on the hills surrounding the Straits of Gibraltar do not go ahead.

Which one of the following is an assumption on which this argument depends?

A The birds that migrate across the Straits of Gibraltar are close to extinction.

B Electricity-generating wind farms have to be built on hills.

C The planned wind farms will make it dangerous for migratory birds to use their route.

D Other species of bird can fly further and can thus use other routes in their migration.

E There are no plans to build wind farms at other places along the coast.

27 When mobile phones were introduced there were concerns about the microwaves produced and the effects that these could have on the brain, given that phones would be held close to the ear when being used. These concerns have been shown to be mistaken since mobile phones are used for sending text messages far more than for making phone calls. Sending a text message does not require the phone to be anywhere near to the brain so it cannot cause any problems.

Which one of the following identifies the flaw in this argument?

A It ignores research showing that microwaves from the phones cannot penetrate far enough to reach the brain.

B It ignores evidence suggesting that text messaging is only popular in certain age groups.

C It does not consider uses of mobile phones other than making phone calls and sending text messages.

D It does not consider other technology such as wireless internet which could cause similar problems.

E It ignores the possible effects of the phone calls that are made.

28 I have two cousins. One was born the year before me, on June 3rd. The other was born the year after me, on April 28th.

My birthday is May 15th.

For how many days each year am I the same age as one or other of my cousins?

A 35

B 36

C 37

D 38

E 39

29 The table shows the number of people aged 20-35, 36-50 and 51-65 who participated in given sports at a leisure centre on a Sunday morning:

Sport	**20-35**	**36-50**	**51-65**
Swimming	31	42	59
Squash	26	30	44
Aerobics	10	21	30
Tennis	40	35	32
Bowls	6	8	11
Table Tennis	28	32	46

In which of the other sports was the proportion of participants in the three age ranges closest to that for swimming?

A Aerobics

B Bowls

C Squash

D Table Tennis

E Tennis

30 Apples cost 30c each, bananas cost 40c each and oranges cost 50c each. Daniel spends exactly €2 buying fruit.

Which of the statements below are correct?

1 He cannot have exactly 3 apples.

2 He must have at least one banana.

3 He has 4, 5 or 6 fruits.

4 If he has all 3 types of fruit, he must have fewer apples than bananas and oranges combined.

A 1, 2 and 3 only

B 1, 2 and 4 only

C 1, 3 and 4 only

D 2, 3 and 4 only

E 1, 2, 3 and 4

31 A comparison has been made between fast food restaurants and factories. This is not as unrealistic as it might first appear. Fast food is mass-produced, as heavily processed as any other factory product, and restaurant workers have jobs which are just as routine and boring as those in manufacturing. So not only does fast food taste the same everywhere, but all workers involved are on low wages and have little power to improve their conditions.

Which one of the following best expresses the conclusion of this argument?

A Workers who do routine and boring jobs are often poorly paid.

B Mass production in factories leads to poor working conditions.

C It is not unrealistic to compare fast food restaurants with factories.

D All fast food tastes the same because it is heavily processed.

E Working in a fast food restaurant is no different from working in a factory.

32 Recent research suggests that people are becoming less inclined to follow medical advice about how to prevent ill-health. They say that there is too much advice and it is often contradictory. However the general population is living longer and is healthier. This suggests that people are more aware of what is good for their own health and wellbeing than the medical profession is.

Which one of the following, if true, weakens this argument?

A Advances in medicine have meant that doctors give advice on a wider range of issues.

B People now have easy access to websites giving information on health.

C People believe that they know better than doctors how to improve their own health and wellbeing.

D The health improvements are in areas that exactly match the medical advice given by doctors.

E Doctors prefer to give advice rather than medication.

33 Over the last twenty years the number of people, including children, classed as overweight, and therefore at risk of serious health problems, has risen alarmingly. This trend could be caused by an increase in the amount people eat or by a decrease in the amount of exercise they take. Most of us exercise less than people did twenty years ago, and the average number of calories consumed per person is now less than it was twenty years ago. So the increase in the number of overweight people is clearly caused by lack of exercise. Thus the government does not need to worry about trying to change people's diets.

Which one of the following identifies the flaw in this argument?

A Some people may exercise more than the average.

B Some individuals may have increased their calorie intake.

C The government may need to worry about costs to the health service.

D Children may use up more calories through exercise than adults.

E Some individuals may have health problems which cause an increase in weight.

34 In 2005, Peter's age was exactly four times that of his son, Quentin. In 2021, Peter will be exactly twice Quentin's age.

What is the difference between their ages?

A 16

B 20

C 24

D 28

E 36

35 I have far too much small change in my pocket: 6 x 1c coins, 3 x 2c coins, 2 x 5c coins, 3 x 10c coins and 2 x 50c coins.

I want to buy a chocolate bar for 37c using as many coins as possible.

What is the largest number of coins I can use to pay the exact price?

A 5

B 9

C 10

D 12

E 14

36 A fishing club wishes to send out a mailing to its 1000 members. All members receive a magazine (100 g). There are 50 committee members who receive minutes (50 g). A questionnaire (75 g) will be sent to 100 members. No committee members will be sent a questionnaire. The envelope used for all mailings weighs 10 g.

The postal rates are:

Up to 120 g: 20c

Up to 160 g: 30c

Up to 250 g: 35c

What is the minimum cost of this mailing?

A € 67 .00

B € 215 .00

C € 220 .00

D € 230 .00

E € 350 .00

37 The general public cannot understand laws and legal documents unless they are written in clear and simple language. Therefore, the traditional style in which laws and legal documents are written must change. Citizens in a democracy must be able to understand what their legal rights and duties are.

Which one of the following best expresses the conclusion of this argument?

A There must be a change in the style in which laws and legal documents are written.

B It is necessary in a democracy for citizens to know their legal rights and duties.

C Many laws and legal documents are written in old-fashioned and complicated language.

D The general public can fully understand only those laws and documents written in simple language.

E If citizens can understand laws and legal documents, they will be able to play their proper role in a democracy.

38 Many countries spent billions on vaccines in response to advice that a virus had the potential to kill millions. These countries are now trying to sell the stockpiles of vaccines which they do not need. There is concern that advice given by officials may have been influenced by pharmaceutical companies. Clearly, such companies would have an interest in making sure that governments spent large quantities of money on vaccines that they produced. It is essential that an investigation into this matter takes place as soon as possible so that those responsible can be held to account.

Which one of the following is an assumption on which this argument depends?

A The pharmaceutical companies influenced the advice given by officials.

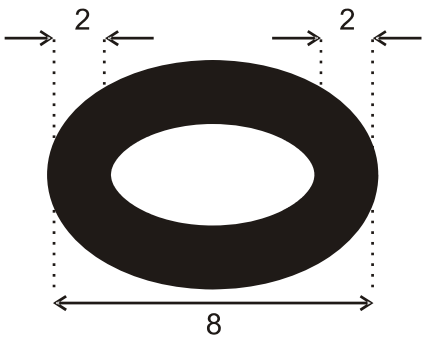
B The advice given by officials was not appropriate.

C It will not be possible for the stockpiles of vaccines to be sold.

D The pharmaceutical companies misjudged the dangers of the virus.

E Groups with financial interests do not advise officials in other areas of decision making.

39 A chain link has the following dimensions:



If you join six of these links together, and stretch the chain to its full extent, what is the total length of the chain?

A 24

B 28

C 30

D 32

E 36

40 Consider the following statements:

1 There are fewer rats than people.
2 There are not more people than rats.
3 There are at least as many rats as people.
4 There are not more rats than people.

Which two of the above statements are equivalent?

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

E 3 and 4

Biology

41 In a DNA sample, the percentage of guanine present was 28%. What is the percentage of thymine in the sample?

A 22%

B 27%

C 28%

D 44%

E 54%

42 Which property of water is most important when heat is lost from human skin?

A dipole properties so salts can dissolve in sweat

B high specific heat capacity

C latent heat of vaporisation

D boiling point of water

E water density is greatest at 4°C

43 What would be the chemical formula of a polysaccharide made up of five glucose monomers?

A $C_6H_{12}O_6$

B $C_{30}H_{52}O_{26}$

C $C_{30}H_{60}O_{30}$

D $C_5H_{10}O_5$

E $(CH_{n-1}O)_2$

44 Which of the features below may be present in both prokaryotic cells and eukaryotic animal cells?

1 glycogen

2 a cell wall

3 DNA in loops

4 cytoplasm containing ribosomes

A 1 only

B 1 and 2 only

C 1, 2 and 3 only

D 1 and 4 only

E none

45 Which is likely to contain the most mitochondria?

A red blood cell

B lymphocyte (white blood cell)

C cardiac muscle cell

D epidermal cell

E cheek cell

46 If an animal body cell contained 36 chromosomes, which row in the table is correct?

	Chromosome number		
	Zygote	**Daughter cell made by mitosis**	**Daughter cell made by meiosis**
A	72	18	18
B	36	18	36
C	18	72	36
D	18	36	72
E	36	36	18

47 A food item was burned in pure oxygen and released 830 kJ of energy. An identical food item of the same mass was found to produce 8 ATP's in respiration.

Assuming it takes 31 kJ to produce one ATP molecule, estimate the efficiency of respiration.

A 10%

B 25%

C 30%

D 45%

E 50%

48 The statements below show three stages in glycolysis.

1 2 x 3 carbon compounds

2 6 carbon compound

3 phosphorylated 6 carbon compound

The correct sequence is:

A 1, 2, 3

B 2, 3, 1

C 3, 2, 1

D 1, 3, 2

E 2, 1, 3

49 During vigorous exercise a variety of products will be generated in muscle cells.
Which answer correctly lists some of the products?

A water, lactic acid, heat and carbon dioxide

B water, sweat, heat and lactic acid

C usable energy (ATP), carbon dioxide and oxygen

D carbon dioxide, lactic acid and ethanol

E useable energy (ATP), heat, glycogen and carbon dioxide

50 Haemophilia is caused by a recessive allele carried only on the X chromosome.
A carrier female and a non-haemophiliac male decide to have a child.
Which of the following four statements are correct?

1 they have a 25% chance of producing a haemophiliac son

2 they have a 25% chance of producing a haemophiliac daughter

3 they have a 25% chance of producing a carrier son

4 they have a 25% chance of producing a carrier daughter

A 1 and 2 only

B 1 and 4 only

C 2 and 3 only

D 2 and 4 only

E 3 and 4 only

51 Cross over values (COV's) can be considered as the relative distance between genes and are used to help construct chromosome maps. Four genes, called P, Q, R and S, are found on the same chromosome. Use the following COV's to work out the sequence of the four genes.

P to Q = 33 Q to R = 8 R to S = 15 P to S = 10 P to R = 25

The sequence of the genes is

A P Q R S

B S P Q R

C R S P Q

D Q S R P

E P S R Q

52 In a dihybrid cross between two heterozygous individuals, which is the most likely combination in their offspring?

A AaBB

B AaBb

C aaBB

D aaBb

E AABB

53 The base sequence of a section of DNA is shown below.

C A T G C A C A T C G T G C C C A A

The maximum number of **different** amino acids this section codes for is:

A 4

B 5

C 6

D 9

E 18

54 Which of the components of DNA listed below are found on the outside of a DNA double helix?

1 Pentose sugar

2 Phosphate

3 Purine bases

4 Pyrimidine bases

A 1 and 2 only

B 3 and 4 only

C 1, 2 and 3 only

D 2, 3 and 4 only

E 1, 2, 3 and 4

55 Which of the following organisms are subject to natural selection?

1 prokaryotes that reproduce asexually

2 single-celled eukaryotes that reproduce sexually

3 organisms living in a changing environment

4 organisms living in a stable environment

A 1 and 2 only

B 2 and 3 only

C 3 and 4 only

D 1, 2 and 3 only

E 1, 2, 3 and 4

56 Which adaptation **cannot** help increase the speed of transmission in a motor neurone?

A long axon

B nodes of Ranvier

C synapse

D presence of an insulating myelin sheath

E greater axon diameter

57 In the process of ventilation the following occur:

1 pressure in thorax increases

2 volume of thorax increases

3 diaphragm goes down

4 ribcage goes down

Which of these occur during inhalation?

A 1 and 2 only

B 2 and 3 only

C 3 and 4 only

D 1 and 3 only

E 2 and 4 only

58 Which answer correctly identifies roles of the brain and the pancreas in the normal physiological regulation of the concentration of glucose in the blood?

	Brain	**Pancreas**
A	Detects a decrease in blood glucose concentration	Detects an increase in blood glucose concentration
B	Detects an increase in blood glucose concentration	Detects a decrease in blood glucose concentration
C	Detects both a decrease and an increase in blood glucose concentration	Secretes either glucagon or insulin
D	No role	Detects both a decrease and an increase in blood glucose concentration
E	No role	Secretes only insulin

Chemistry

59 Which of the following shows how the atomic radius of the elements changes on crossing from left to right in the row of the Periodic Table from potassium to bromine?

	K to Ca	**Sc to Zn**	**Ga to Br**
A	decrease	increase	decrease
B	decrease	decrease	increase
C	decrease	decrease	decrease
D	increase	decrease	increase
E	increase	increase	increase

60 How many nitrogen electrons are involved in bond formation in $HONO_2$?

A 3

B 4

C 5

D 6

E 7

61 Which one of the following compounds can be made from ethanol using **only** a substitution reaction?

A Ethene

B Ethanal

C Ethanoic acid

D Ethoxyethane

E Bromoethane

62 An aromatic compound consists of two benzene rings joined together. Which of the following could be its formula?

1. $C_{10}H_8$ 2. $C_{10}H_{10}$ 3. $C_{10}H_{12}$ 4. $C_{12}H_{10}$ 5. $C_{12}H_{12}$

A 1 and 4

B 2 and 4

C 3 and 4

D 2 and 5

E 3 and 5

63 8.0 g of copper oxide is reduced to 5.6 g of copper using hydrogen gas.
[relative atomic mass: Cu=64, O=16]

$$CuO + H_2 \rightarrow Cu + H_2O$$

What is the yield of copper as a percentage of the theoretical maximum?

A 14.3%

B 43.9%

C 56.0%

D 70.0%

E 87.5%

64 The positions of some elements in the Periodic Table are shown below.

				H	**He**												
Li													**C**				**Ne**
Na																**S**	**Cl**	
																	Br	**Kr**

Which two of the elements shown react most energetically with each other?

A Li and Kr

B Ne and Na

C C and He

D Li and Br

E Na and Cl

65 Which one of the following is **not** an acid/base reaction?

A $HNO_3 + HClO_4 \rightarrow H_2NO_3^+ + ClO_4^-$

B $2NH_3 \rightarrow NH_2^- + NH_4^+$

C $Al(H_2O)_6^{3+} + H_2O \rightarrow Al(H_2O)_5(OH)^{2+} + H_3O^+$

D $CH_4 + H(SbF_6) \rightarrow CH_5^+ + SbF_6^-$

E $FeCl_3 + 6H_2O \rightarrow Fe(H_2O)_6^{3+} + 3Cl^-$

66 What is the total number of electrons in an ammonium ion, NH_4^+ ?

A 8

B 9

C 10

D 11

E 12

67 One group of elements in the Periodic Table contains, in descending order, boron, aluminium, gallium, indium and thallium. Which of the following are correct about these elements?

1 Indium forms the oxide In_2O_3

2 Boron is the least reactive element in the group

3 Gallium forms the sulphate $GaSO_4$

A 1 only

B 1 and 2

C 1 and 3

D 2 and 3

E 1, 2 and 3

68 Sodium chloride (relative molecular mass = 58.5) has a solubility of 36.0 g per 100 g of water. The density of the solution is 1.13 g/ml. Which of the following calculations would give the solubility in moles per litre?

A 36.0 x 10/58.5

B 36.0 x 1000/(58.5 x 1.13)

C 36.0 x 10 x 1.13/58.5

D 36.0 x 10 x 1.13/(58.5 x 136)

E 36.0 x 1000 x 1.13/(58.5 x 136)

69 Which one of the following is **not** an oxidation/reduction reaction?

A $2Fe + 3Cl_2 \rightarrow 2\ FeCl_3$

B $Cl_2 + H_2O \rightarrow HCl + HClO$

C $KClO_4 \rightarrow KCl + 2O_2$

D $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

E The electrolysis of sodium chloride solution

Physics and Mathematics

70 Which one of the following is **not** an example of simple harmonic motion?

A The motion of the Moon around the Earth as observed from Mars.

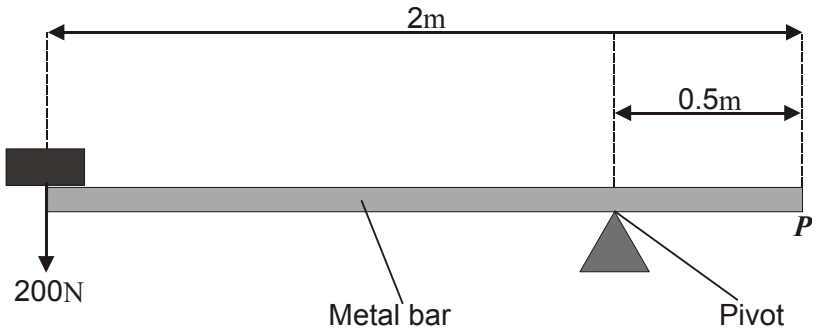
B The ripples produced when a stone is dropped into a tank of water.

C A weight moving up and down at the end of a spring.

D The motion of a ball bouncing on the floor.

E A vibrating violin string.

71 A uniform bar of length 2.0 m and weight 1000 N has its centre of gravity at its centre. The bar is pivoted in the position shown, and supports a weight of 200 N in the position shown in the diagram.



What weight is needed at position ***P*** to balance the bar?

A 600 N

B 800 N

C 1000 N

D 1600 N

E 1800 N

72 Which of the following systems has an overall entropy closest to zero?

A A weight moving up and down on a spring.

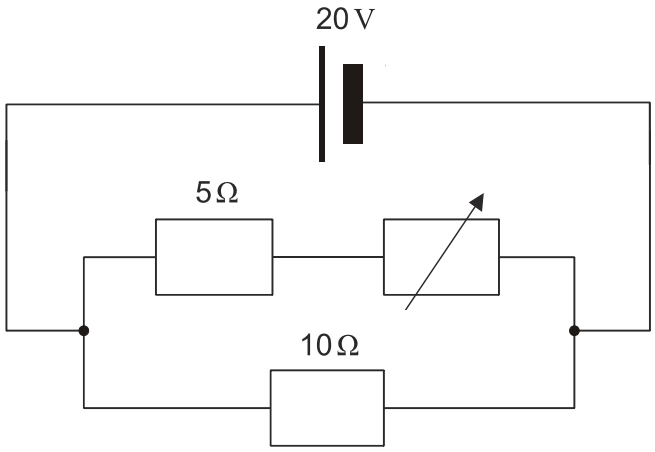
B A satellite in orbit 25 000 km above the Earth.

C The evaporation of ether at room temperature.

D An object in free fall when it has reached terminal velocity.

E A metal object being rapidly electroplated.

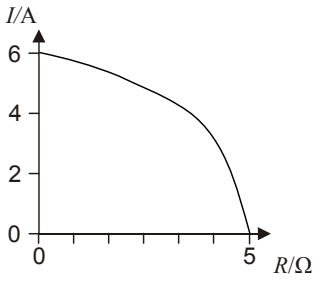
73 Three resistors are connected to a 20 V battery with a constant supply. One of the resistors is a variable resistor.



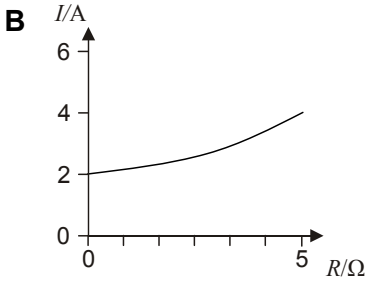
The resistance of the variable resistor is gradually increased from zero to 5 Ω.

Which graph shows how the current from the battery varies with the resistance (R) of the variable resistor?

A



B



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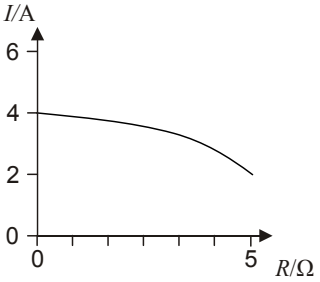
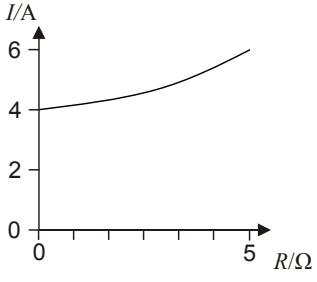
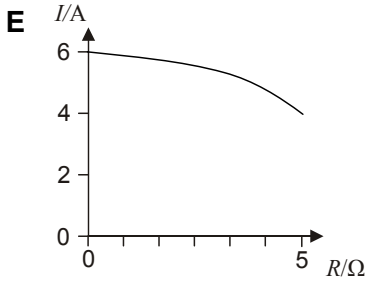


D



E



74 An object of mass 50 g just floats in a liquid of density 2.5 g/ml. When the object is placed in a liquid of density 2.0 g/ml, it sinks to the bottom of the container. What is the force that the object exerts on the bottom of the container?

[g = 10 m/s^2 = 10 N/kg]

A 0.1 N

B 0.4 N

C 10 N

D 40 N

E 400 N

75 The law of gravitation states that the gravitational force between two bodies of mass m_1 and m_2 is given by:

$$F = \frac{Gm_1m_2}{r^2}$$

G (gravitational constant) = 7 x10^{-11} Nm^2 kg $^{-2}$
r (distance between the two bodies) in the case of the Earth and Moon = 4 x 10^8 m
m_1 (Earth) = 6 x 10^{24} kg
m_2 (Moon) = 7 x 10^{22} kg

What is the gravitational force between the Earth and the Moon?

A 1.8375 x 10^{19} N

B 1.8375 x 10^{20} N

C 1.8375 x 10^{25} N

D 1.8375 x 10^{26} N

E 1.8375 x 10^{28} N

76 David has two boxes containing shapes.
In box A there are 4 stars and 2 hearts.
In box B there are 2 stars and 1 heart.
David takes, at random, a shape from box A and puts it into box B.
He then takes a shape from box B.

What is the probability that this shape is a star?

A $\frac{1}{12}$

B $\frac{4}{9}$

C $\frac{2}{3}$

D $\frac{3}{4}$

E $\frac{4}{3}$

77 Which of the expressions below has the largest value for $0 < x < 1$?

A $\frac{1}{x}$

B x^2

C $\frac{1}{(1+x)}$

D $\frac{1}{\sqrt{x}}$

E $\sqrt{x}$

78 How many different integers, n, are there such that the difference between $2\sqrt{n}$ and 7 is less than 1?

A 0

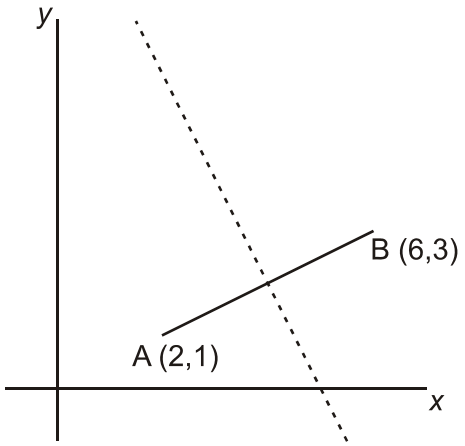
B 2

C 4

D 6

E 8

79 The graph below shows the line joining A (2,1) and B (6,3), and its perpendicular bisector (shown dashed: ----------).



Which of the following is the equation of the dashed line?

A $y = 2x - 10$

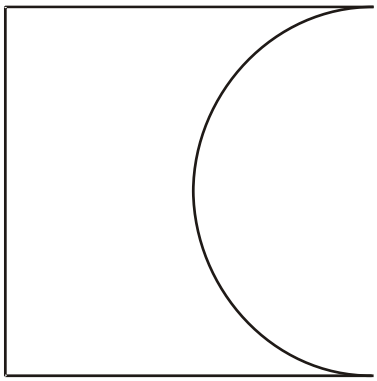
B $y = 2x - 6$

C $y = 10 - 2x$

D $y = 4 - \frac{x}{2}$

E $y = 4 - 2x$

80 A square piece of metal has a semicircular piece cut out of it as shown. The area of the remaining metal is $100\,\text{cm}^2$.



Which of the following is a correct expression of the length of the side of the square in cm?

A $10\sqrt{\frac{1}{8-\pi}}$

B $10\sqrt{\frac{2}{4-\pi}}$

C $20\sqrt{\frac{2}{8+\pi}}$

D $20\sqrt{\frac{2}{8-\pi}}$

E $20\sqrt{\frac{1}{4-\pi}}$

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IMAT 2011

Answer Key

Question	Answer
1	C
2	C
3	B
4	D
5	A
6	E
7	A
8	A
9	D
10	C
11	A
12	D
13	D
14	B
15	D
16	D
17	D
18	E
19	B
20	A
21	B
22	C
23	B
24	D
25	E
26	C
27	E
28	B
29	B
30	C
31	C
32	D
33	B
34	C
35	D
36	C
37	A
38	B
39	B
40	C

Question	Answer
41	A
42	C
43	B
44	D
45	C
46	E
47	C
48	B
49	A
50	B
51	E
52	B
53	B
54	A
55	E
56	C
57	B
58	D
59	C
60	C
61	E
62	A
63	E
64	E
65	E
66	C
67	B
68	E
69	D
70	D
71	D
72	B
73	E
74	A
75	B
76	C
77	A
78	D
79	C
80	D