

**PSYCHOLOGICAL AND BEHAVIOURAL SCIENCES D569/11  
ADMISSIONS ASSESSMENT**

**Thursday 2 November 2017**

**80 minutes**

**SECTION 1**

**INSTRUCTIONS TO CANDIDATES**

**Please read these instructions carefully, but do not open this question paper until you are told that you may do so.** This paper is Section 1 of 2.

A separate answer sheet is provided for this paper. A separate text booklet is also provided for **Part C**. Please check you have these. You also require a soft pencil and an eraser.

Please complete the answer sheet with your candidate number, centre number, date of birth, and name.

At the end of the 80 minutes, your supervisor will collect this question paper and answer sheet before giving out Section 2.

This paper contains **three** parts, **A**, **B** and **C**.

**All** candidates should complete **Part A** Thinking Skills (22 questions).

**All** candidates should then complete **one** further part chosen from:

- |               |  |
|---------------|--|
| <b>Part B</b> | Mathematics and Biology (30 questions) |
| <b>Part C</b> | Reading Comprehension (24 questions)   |

You are **strongly** advised to spend 40 minutes on **Part A** and 40 minutes on your chosen part.

There are no penalties for incorrect responses, only marks for correct answers, so you should attempt all of the questions in your **two** parts.

Questions ask you to show your choice between options. Choose the **one** option you consider correct and record your choice on the separate answer sheet. If you make a mistake, erase thoroughly and try again. You **must** complete the answer sheet within the time limit.

You can use the question paper and text booklet for rough working, but **no extra paper** is allowed. Only your responses on the answer sheet will be marked.

Dictionaries and calculators may NOT be used.

**Please wait to be told you may begin before turning this page.**

This question paper consists of 50 printed pages and 6 blank pages.

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**Paper content**

PART A Thinking Skills .....	5
PART B Mathematics and Biology .....	21
PART C Reading Comprehension .....	47

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**PART A Thinking Skills**

- 1 Leaders of enemy countries are often described by our own political leaders and by the media as “mad”. But some of the features that we associate with madness can be useful assets in a political leader. Self-absorption, obsession, addiction to risk-taking and frenzied creativity all apply to some leaders agreed to have been “great”, as well as to those described as “mad”. People without some of those characteristics would be unlikely either to seek power or to be successful. The label “mad” is cynically used as a way of dehumanising and discrediting leaders of countries with whom we are in dispute.

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

- A People who seek power do so for their personal aggrandisement.
  - B There is agreement on which leaders are “great” or “mad”.
  - C A definition of a successful leader is one who can obtain and hold power.
  - D Political leaders have personality traits not normally found in the general population.
  - E The use of the word “mad” is a propaganda tool rather than a genuine description.
- 2 A café owner makes 50 mini pizzas and 50 flapjacks for sale during the day. The pizzas are sold for \$2.00 each and the flapjacks are sold for \$1.00 each. However, by the end of lunchtime there are 10 mini pizzas still unsold and 15 flapjacks unsold, so the price of each is halved for the afternoon. At the end of the day there are still 2 mini pizzas and 1 flapjack left which are given away free to the last customer.

If the original 50 mini pizzas and 50 flapjacks had a combined production cost of \$30.00, how much profit is made on the sale of the mini pizzas and flapjacks for the day?

- A \$100.00
- B \$102.50
- C \$115.00
- D \$120.00
- E \$130.00

- 3** Several cities around the world have introduced congestion charging schemes. Drivers are expected to pay a fee in order to drive inside the charging zone. In recent years, some schemes have offered discounts or entirely waived the charge for vehicles that cause less pollution. This is, however, an illogical and unfair policy that should not continue. Congestion is unaffected by emissions, and those cars that have low emissions still contribute to congestion. Those who cannot afford to buy a low-emission car are still expected to pay the charge even if the roads they drive on remain congested.

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

- A** The principal purpose of a congestion charge is to reduce congestion.
  - B** It is not important to try to reduce car emissions in cities.
  - C** All drivers would buy low-emission vehicles if they could afford to do so.
  - D** Congestion charging has not had any positive effects where it has been used.
  - E** If everyone drove low-emission cars, nobody would have to pay the charges.
- 4** We live in an information-rich world where communication is quicker and easier than ever before. We don't have to wait for journalists and photographers to report news to us. Anyone can talk about or take photographs of significant events and share them immediately. Traditional ways of reporting meant that news could be effectively censored, but this is no longer the case. Similarly, incorrect information cannot be removed from the public domain without great difficulty. Governments and the traditional media will therefore need to find new ways to cope with these challenges and adapt to new technology.

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

- A** Some governments have successfully restricted the information available on the internet in their countries.
- B** Journalists occasionally film material on their mobile phones.
- C** Information can be posted anonymously on the internet, thus avoiding possible prosecution.
- D** Legal proceedings have been brought against those publishing false and incriminating material on the internet.
- E** In the past, individuals often took photographs that they then sold to the press.

- 5** Anyone who lends money to anyone else without a licence is committing an offence under UK law. Some unlicensed money lenders charge excessive rates of interest, and many use threats and violence to enforce payment. It is important to protect poor and vulnerable people from being exploited in this way. So anyone convicted of this offence should be sent to prison.

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

- A** It appeals to the reader's emotions by describing some people as 'poor and vulnerable'.
  - B** It draws a conclusion about all unlicensed money lenders on the basis of evidence about some of them.
  - C** It makes a personal attack on the unlicensed money lenders.
  - D** It restricts the options between licensed and unlicensed money lenders.
  - E** It wrongly assumes that licensed money lenders do not charge excessive rates of interest.
- 6** A picture 40 cm high by 30 cm wide is to be framed. There will be a mount between the edge of the picture and the frame. This mount will be 6 cm wide at the top and sides, and 9 cm wide at the bottom. The width of the wood used for the frame is 2 cm.

What is the overall height of the framed picture?

- A** 46 cm
- B** 49 cm
- C** 56 cm
- D** 59 cm
- E** 62 cm



- 7 The heptathlon is a seven-event athletics competition. In each event the time or distance recorded is converted into a points score. This is the scoring table that is used for the high jump:

<i>performance</i>	<i>points</i>	<i>performance</i>	<i>points</i>	<i>performance</i>	<i>points</i>	<i>performance</i>	<i>points</i>
2.19	1498	1.89	1093	1.59	724	1.29	399
2.18	1484	1.88	1080	1.58	712	1.28	389
2.17	1470	1.87	1067	1.57	701	1.27	379
2.16	1456	1.86	1054	1.56	689	1.26	369
2.15	1442	1.85	1041	1.55	678	1.25	359
2.14	1428	1.84	1029	1.54	666	1.24	350
2.13	1414	1.83	1016	1.53	655	1.23	340
2.12	1400	1.82	1003	1.52	644	1.22	331
2.11	1386	1.81	991	1.51	632	1.21	321
2.10	1373	1.80	978	1.50	621	1.20	312
2.09	1359	1.79	966	1.49	610	1.19	302
2.08	1345	1.78	953	1.48	599	1.18	293
2.07	1332	1.77	941	1.47	588	1.17	284
2.06	1318	1.76	928	1.46	577	1.16	275
2.05	1305	1.75	916	1.45	566	1.15	266
2.04	1291	1.74	903	1.44	555	1.14	257
2.03	1278	1.73	891	1.43	544	1.13	248
2.02	1264	1.72	879	1.42	534	1.12	239
2.01	1251	1.71	867	1.41	523	1.11	231
2.00	1237	1.70	855	1.40	512	1.10	222
1.99	1224	1.69	842	1.39	502	1.09	214
1.98	1211	1.68	830	1.38	491	1.08	205
1.97	1198	1.67	818	1.37	481	1.07	197
1.96	1184	1.66	806	1.36	470	1.06	188
1.95	1171	1.65	795	1.35	460	1.05	180
1.94	1158	1.64	783	1.34	449	1.04	172
1.93	1145	1.63	771	1.33	439	1.03	164
1.92	1132	1.62	759	1.32	429	1.02	156
1.91	1119	1.61	747	1.31	419	1.01	149
1.90	1106	1.60	736	1.30	409	1.00	141

Daphne is competing in a heptathlon competition and has just beaten her previous best high jump performance by 18 cm. This has increased her best points score in the high jump by 214.

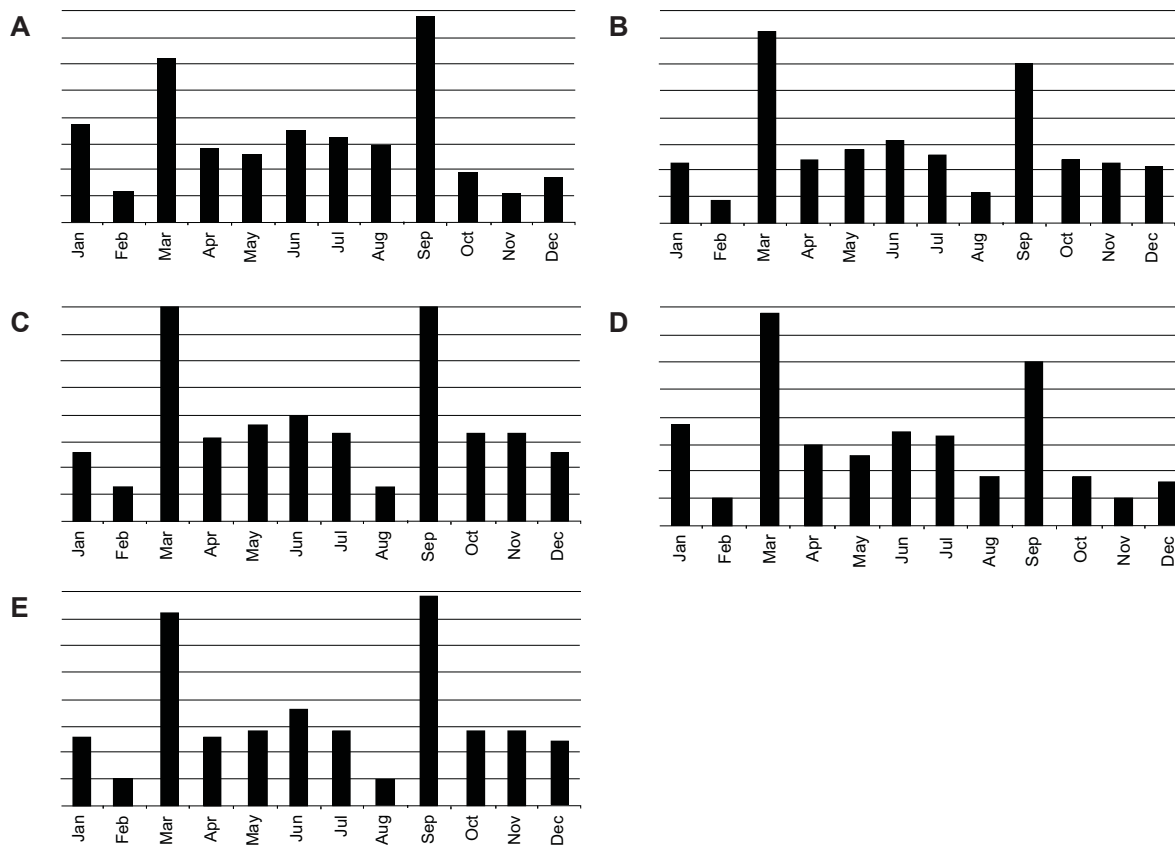
What is Daphne's new personal-best high jump performance?

- A** 1.09 metres
- B** 1.44 metres
- C** 1.74 metres
- D** 1.89 metres
- E** 2.09 metres

- 8 After the financial crash there were fewer new car registrations in the UK in 2012 than there were in 2007. The monthly figures for new car registrations for both years are given in the table below.

Jan 2012	124.1	Jan 2007	161.2
Feb 2012	61.4	Feb 2007	71.5
Mar 2012	367.9	Mar 2007	445.3
Apr 2012	138.0	Apr 2007	167.9
May 2012	159.0	May 2007	184.8
Jun 2012	185.5	Jun 2007	220.6
Jul 2012	141.7	Jul 2007	175.3
Aug 2012	57.5	Aug 2007	76.2
Sep 2012	359.0	Sep 2007	419.1
Oct 2012	149.7	Oct 2007	168.0
Nov 2012	150.3	Nov 2007	160.5
Dec 2012	123.1	Dec 2007	139.8

Which one of the following charts best represents the monthly differences between new car registrations for these two years?



- 9** A huge number of people have taken up cycling in recent years, and this is a welcome development. But if cycling helmets were made compulsory, it would deter people from cycling. There is risk in everything. And there is also such a thing as personal responsibility. It is not the role of the government to stop people from harming themselves. Forcing cyclists to wear helmets is undue state interference in personal choices.

Which one of the following illustrates the principle used in the above argument?

- A** Alcoholics should not receive publicly funded treatment for their addiction because it is too expensive.
  - B** Recreational drugs should be legalised.
  - C** Professional cyclists should promote the wearing of helmets.
  - D** The government should combat cyberbullying by passing appropriate legislation.
  - E** It is right for parents to be fined if their children are absent from school without permission.
- 10** The Human Rights Act (HRA) should apply to soldiers in the UK and at their overseas bases but not to those fighting in the heat of battle. The concern is that the HRA could damage the effectiveness of the armed forces. Commanders making split-second decisions in battle may be paralysed by fear that those decisions will become the subject of legal actions.

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

- A** The HRA should apply to British soldiers away from battle situations but not in them.
- B** The HRA could be a distraction to commanders in the heat of battle.
- C** The HRA should not be applied to the armed forces.
- D** The need to make split-second decisions in battle is incompatible with the HRA.
- E** The introduction of the HRA would undermine the efficiency of the armed forces.

- 11** Government advice on alcohol drinking limits is based on studies carried out twenty-five years ago. It has often been expressed in terms of a maximum number of units per day. But advising people about a daily rate implies that drinking alcohol every day is acceptable, when up-to-date research suggests that the body needs more 'recovery time' than one day. Health promotion advice should avoid being so simple that it inadvertently encourages unhealthy behaviour. Better to have more complex messages than simple messages which promote unhealthy behaviour.

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

- A** The research carried out twenty-five years ago is no longer valid.
  - B** Drinking alcohol every day is common practice.
  - C** People always follow the advice of health promotion messages.
  - D** The government should regularly revise its advice on all health issues.
  - E** Complex health promotion messages will be read and understood.
- 12** There are two ways of scoring points in a ball game: a 'major' scores 5 points and a 'minor' scores 3 points.

In a match played yesterday, the Reds beat the Blues 77–52 despite the fact that the Blues scored exactly twice as many majors as minors, whilst the Reds scored exactly half as many majors as minors.

How many majors were scored altogether in yesterday's match?

- A** 9
- B** 12
- C** 15
- D** 18
- E** 21

- 13 The following ingredient and nutrition information (rounded to the nearest 0.1 g or 1 kcal) appears on a 300 g packet of oatcakes.

Each oatcake provides:

energy	53 kcal
fat	2.2 g
saturated fat	0.6 g
salt	0.2 g
sugars	0.3 g

**Ingredients:** oatmeal (77%), vegetable oils, wheat flour, sugar, salt, raising agent: sodium hydrogen carbonate.

**Typical values per 100 g:** energy 1792 kJ, 427 kcal; protein 10.7 g; carbohydrate 56.45 g of which sugars 2.4 g, starch 53.7 g; fat 17.6 g of which saturates 5.0 g, mono-unsaturates 7.9 g, polyunsaturates 4.5 g; fibre 8.9 g; salt 1.4 g of which sodium 0.6 g.

How many oatcakes are there in a packet?

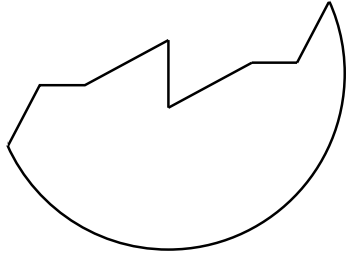
- A 7
- B 8
- C 21
- D 24
- E 27

- 14 When a mixed doubles tournament is held at my tennis club, partners are chosen by the following method.

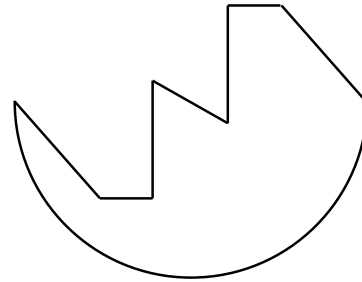
The appropriate number of tokens, all with a different shape, are placed into a box, and the male participants all pick one out. Each token has an identical 'twin' in a second box, from which the female participants all select one. Each pair of identical tokens fit together to make a complete disc. Couples with identical tokens partner each other in the tournament.

Which one of the following can **not** be a token used by my tennis club?

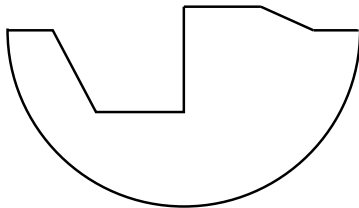
**A**



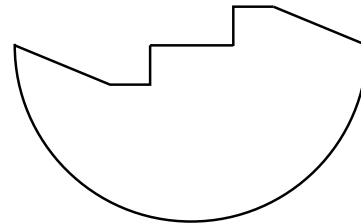
**B**



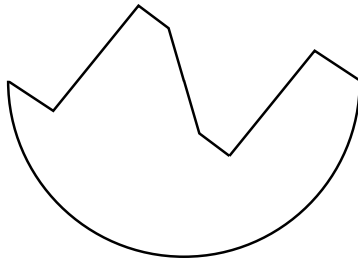
**C**



**D**



**E**



- 15** Studies of fossilised remains indicate that, every 20 to 30 million years, life on Earth experiences a sudden and mass extinction of all or most of its dominant species. Yet, in each case, within some 5 to 10 million years the diversity of species on the planet is as great, if not greater, than it had been previously, since the demise of the dominant species allows more minority species to flourish. Whatever disasters we may wreak on the planet, life in the long term will not only survive but actually increase in richness and diversity.

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

- A** The consequences of a global nuclear holocaust are not known.
  - B** It can be difficult to draw precise conclusions about dates from fossil records.
  - C** Human technology will soon be advanced enough to prevent most natural catastrophes.
  - D** Some species are able to withstand the most extreme forms of environmental change.
  - E** Some species have died out due to dramatic changes in climate.
- 16** Television has had an adverse effect on family communication. Why? Because instead of talking together, as they did in the past, families now tend to sit round the small, or not-so-small, screen. They watch and listen rather than discuss. They are passive rather than active. Instead of participating, they are content to be entertained. Consequently, television dampens people's ability to think for themselves.

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

- A** The initial assertion is contradicted by the conclusion.
- B** The reasons are not relevant to the stated conclusion.
- C** It makes a generalisation on the basis of a particular example.
- D** It assumes that what was right in the past is right for the present.
- E** The argument is circular in that it assumes what it sets out to conclude.

- 17** In a situation where every course of action is immoral, there still remains the ability to act for the greatest good for the greatest number. Therefore, the outsiders ought to be eliminated at the least possible cost and with the least possible delay. I am sorry to arrive at that conclusion, but it is the right step.

Which one of the following best illustrates the principle contained in the above argument?

- A** The swiftest and cheapest option is often the least immoral action.
  - B** The action that harms the least number of people is the best possible action.
  - C** Where all options are immoral, it is necessary to consider cost and speed.
  - D** An action cannot be considered totally immoral if it is the right action.
  - E** An action cannot be considered totally immoral if it is done for the greater good.
- 18** Joan has a cat called Tibber.

Every day Tibber is fed 2 sachets of wet food and 25 grams of dry food.

For some time, Joan has bought the cat food from the local pet shop where one box of 12 sachets costs £12.00 and one 400 gram packet of dry food costs £4.00.

Joan has now decided to buy all of the cat food from an online distributor.

Four boxes, each of 24 sachets of wet food, will cost £62.40, and one 2 kilogram packet of dry food will cost £16.00.

How much money will Joan save each day on cat food when she buys it from the online distributor rather than the local pet shop?

- A** 40p
- B** 75p
- C** 93p
- D** £1.50
- E** £2.25



- 19** A particular computer game involves the capturing of three types of mythical creatures: Arps, Orps and Urps.

Arps have 6 legs, 3 horns and a tail.

Orps have 4 legs and 2 horns, but no tail.

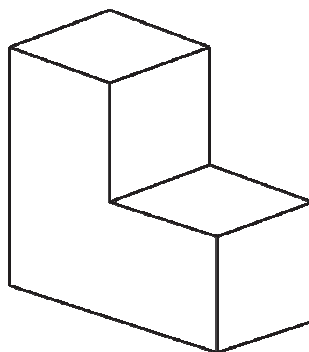
Urps have 3 legs and a tail, but no horns.

The last time Billy played this game he captured 45 creatures with a total of 222 legs, 99 horns and 33 tails.

How many of the 45 creatures that Billy captured were Urps?

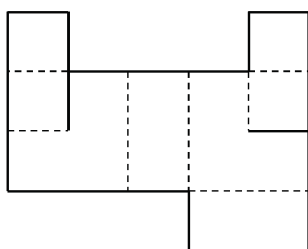
- A** 8
- B** 12
- C** 15
- D** 20
- E** 25

- 20 The drawing below shows an 'L' shaped box.

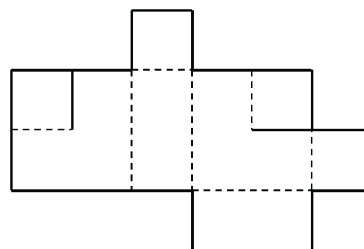


Which one of the nets below **cannot** be folded up to form the 'L' shaped box? (A dotted line indicates a fold and a solid line indicates a cut.)

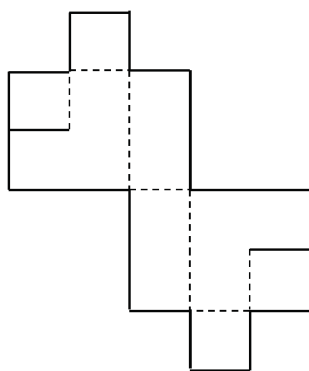
A



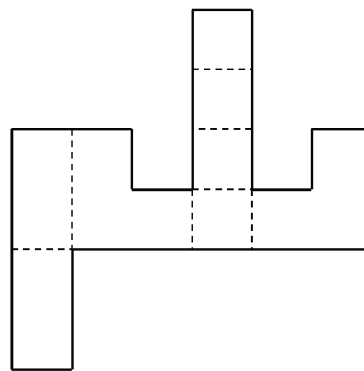
B



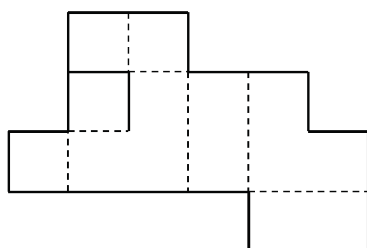
C



D



E



- 21** In the 1990s, there were two lines of argument against buying properties to let them out instead of living in them yourselves. One was the moral argument that you were driving the boom for your own profit and making houses unaffordable for everyone else; the other was the practical argument that houses were a risky investment. Despite these objections, the buy-to-let market continued to grow and now, twenty years later, the result is that the housing market is totally inaccessible to most of a generation. Rents in London have gone up eight times faster than wages. Plainly, no social good will come of this. Rents will continue to rise, and people who live in London will see their finances become more and more precarious.

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

- A** Buy-to-let has made housing unaffordable in London.
  - B** Rent increases have exceeded wage increases in London.
  - C** No social good will come of buy-to-let.
  - D** Rents in London will continue to rise.
  - E** Investing in buy-to-let is immoral.
- 22** Each word in a word game is scored by adding up the values of its letters. Each letter has the same value whenever it appears but different letters have different values. I know the word values for TEAR, RITE, TREE and RAT, but none of the letter values.

How many of the letter values can I now calculate?

- A** 0
- B** 1
- C** 2
- D** 3
- E** 4

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**PART B Mathematics and Biology**

23 Evaluate

$$\frac{(\sqrt{12} + \sqrt{3})^2}{(\sqrt{12} - \sqrt{3})^2}$$

- A 1
- B 3
- C  $\frac{5}{3}$
- D  $\frac{7}{3}$
- E  $3\sqrt{3}$
- F 9

24 Solve fully the inequality

$$2x^2 \geq 15 - x$$

- A  $x \leq -3$
- B  $x \geq 2.5$
- C  $x \leq -1.5, x \geq 5$
- D  $-1.5 \leq x \leq 5$
- E  $x \leq -3, x \geq 2.5$
- F  $-3 \leq x \leq 2.5$

25 The equation gives  $y$  in terms of  $x$ :

$$y = 3\left(\frac{x}{2} - 1\right)^2 - 5$$

Which one of the following is a rearrangement for  $x$  in terms of  $y$ ?

- A**  $x = 2 \pm 2\sqrt{\frac{y-5}{3}}$
- B**  $x = 2 \pm 2\sqrt{\frac{y+5}{3}}$
- C**  $x = 2 \pm 3\sqrt{\frac{y+5}{3}}$
- D**  $x = -2 \pm 2\sqrt{\frac{y+5}{3}}$
- E**  $x = -2 \pm 3\sqrt{\frac{y+5}{2}}$
- F**  $x = 2 + 2\left(\frac{y+5}{3}\right)^2$
- G**  $x = -2 + 2\left(\frac{y+5}{3}\right)^2$

**26** A fruit stall sells apples costing  $\pounds x$  each, and pears costing  $\pounds y$  each.

Sam bought 2 apples and 5 pears, and the total cost of these was  $\pounds P$ .

Lesley bought 3 apples and 2 pears, and the total cost of these was  $\pounds Q$ .

Which of the following is an expression for the cost, in pounds (£), of a pear?

**A**  $\frac{2Q - 3P}{3}$

**B**  $\frac{2Q - 3P}{11}$

**C**  $\frac{Q - P}{3}$

**D**  $\frac{Q - P}{11}$

**E**  $\frac{P - Q}{3}$

**F**  $\frac{3P - 2Q}{3}$

**G**  $\frac{3P - 2Q}{11}$



27  $P$  is directly proportional to  $Q$  squared.

When  $P$  is 2,  $Q$  is 4.

$Q$  is inversely proportional to  $R$ .

When  $Q$  is 2,  $R$  is 5.

What is  $P$  in terms of  $R$ ?

**A**  $P = \frac{5}{R}$

**B**  $P = \frac{5}{4R}$

**C**  $P = \frac{1}{800R^2}$

**D**  $P = \frac{5}{4R^2}$

**E**  $P = \frac{25}{2R^2}$

**F**  $P = \frac{800}{R^2}$

**G**  $P = \frac{R^2}{50}$

**H**  $P = \frac{25R^2}{2}$

**28** Two sequences are defined by the following rules:

In sequence *S* the  $n^{\text{th}}$  term is  $7n + 1$

In sequence *T* the  $n^{\text{th}}$  term is  $99 - n^2$

What is the smallest value of  $n$  for which the  $n^{\text{th}}$  term of sequence *S* is greater than the  $n^{\text{th}}$  term of sequence *T*?

- A** 6
- B** 7
- C** 8
- D** 13
- E** 14
- F** 15

**29** Which one of the following is a simplification of

$$2 - \frac{x^2(9x^2 - 4)}{x^3(2 - 3x)}$$

- A**  $-1 - \frac{2}{x}$
- B**  $-1 + \frac{2}{x}$
- C**  $5 - \frac{2}{x}$
- D**  $5 + \frac{2}{x}$
- E**  $5 - \frac{3}{x}$
- F**  $5 + \frac{3}{x}$

- 30** What is the value of  $x$  that makes the following expression correct?

$$2^{3+2x}4^x8^{-x} = 4\sqrt{2}$$

- A**  $-2.25$
- B**  $-1.75$
- C**  $-1.5$
- D**  $-0.5$
- E**  $-0.25$
- 
- 31** There are 100 students in Year 10.  
 Each student studies exactly one of French, German, and Spanish.  
 $X$  girls study French and there are  $3X$  girls in total.  
 $2Y$  boys study German.  
 There are 35 students studying Spanish of which  $Y$  are boys.  
 Which of the following is an expression for the total number of students studying German?
- A**  $X + 2Y$
- B**  $X + Y + 35$
- C**  $X + 3Y - 35$
- D**  $2X + 2Y$
- E**  $2X + Y - 35$
- F**  $2X + 3Y - 35$
- G**  $2X + Y + 35$

- 32** An exterior angle of a regular polygon with  $n$  sides is  $4^\circ$  larger than an exterior angle of a regular polygon with  $(n + 3)$  sides.

What is the value of  $n$ ?

- A** 10
  - B** 12
  - C** 15
  - D** 18
  - E** 21
  - F** 24
  - G** 27
- 33** The bearing of a ship  $R$  from a lighthouse  $L$  is  $220^\circ$   
A canoe  $C$  is due North of  $R$ .  
 $C$  is the same distance from the ship and the lighthouse.  
What is the bearing of  $L$  from  $C$ ?
- A**  $070^\circ$
  - B**  $080^\circ$
  - C**  $090^\circ$
  - D**  $100^\circ$
  - E**  $140^\circ$

- 34** The hands of a 12-hour analogue clock move continuously. When the time on the clock is 4:00, the angle between the minute hand and the hour hand is  $120^\circ$ .

What is the angle between the two hands at 4:40?

- A**  $80^\circ$
  - B**  $100^\circ$
  - C**  $110^\circ$
  - D**  $120^\circ$
  - E**  $140^\circ$
- 35** A pet shop has 4 female rabbits and  $x$  male rabbits for sale.

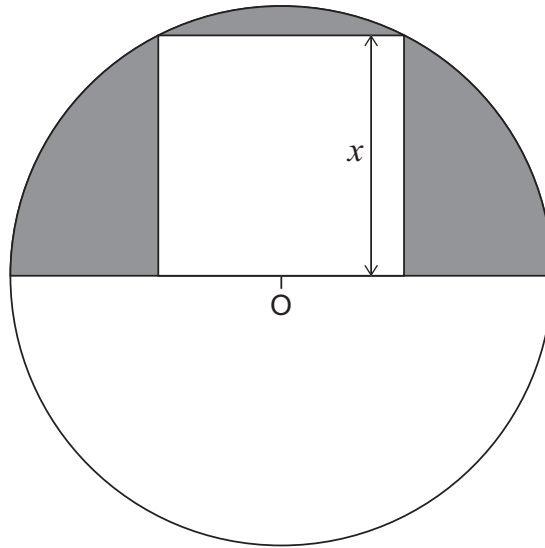
A customer buys 2 of the rabbits, chosen at random, and each rabbit is equally likely to be chosen.

The probability that both the chosen rabbits are male is  $\frac{1}{3}$ .

What is the value of  $x$ ?

- A** 2
- B** 4
- C** 6
- D** 8
- E** 9
- F** 11
- G** 12

36



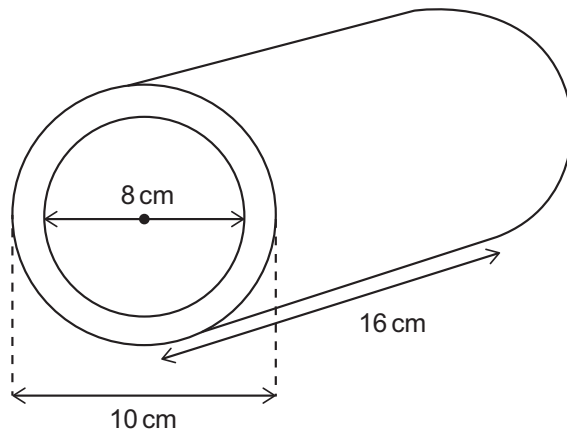
The diagram shows a square with side of length  $x$  cm. A circle is drawn with centre  $O$  which lies at the mid-point of one of the sides of the square. This side forms part of a diameter of the circle. The circle passes through two corners of the square as shown.

What is the area, in  $\text{cm}^2$ , of the shaded part of the semi-circle?

- A**  $(\pi - 1)x^2$
- B**  $\left(\frac{\pi - 2}{2}\right)x^2$
- C**  $\left(\frac{3\pi - 2}{2}\right)x^2$
- D**  $\left(\frac{3\pi - 4}{4}\right)x^2$
- E**  $\left(\frac{5\pi - 4}{4}\right)x^2$
- F**  $\left(\frac{5\pi - 8}{8}\right)x^2$

- 37 A cylindrical hollow metal pipe is 16 cm long.  
It has an external diameter of 10 cm and an internal diameter of 8 cm.  
The density of the metal from which the pipe is made is 8 grams per  $\text{cm}^3$ .

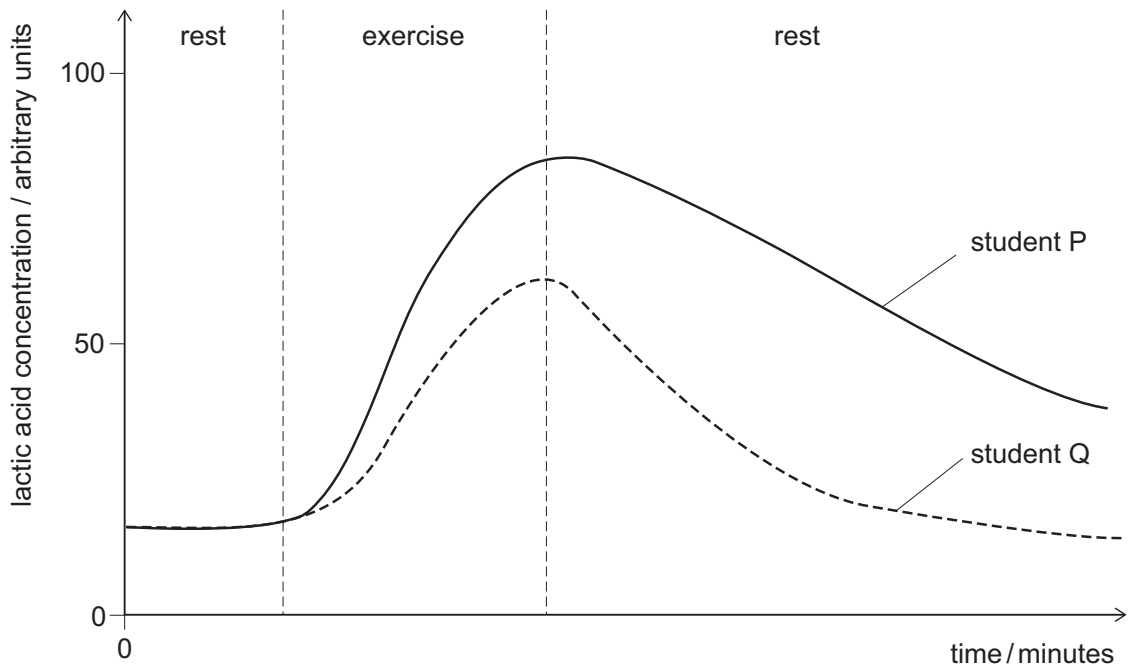
[diagram not to scale]



What is the mass of the pipe in grams?

- A  $8\pi$
- B  $16\pi$
- C  $18\pi$
- D  $72\pi$
- E  $128\pi$
- F  $512\pi$
- G  $1152\pi$
- H  $4608\pi$

- 38 The graph shows the concentration of lactic acid in the blood of two students at rest, then carrying out the same level of exercise for 15 minutes, and then at rest again.



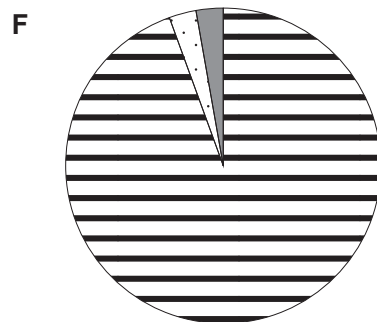
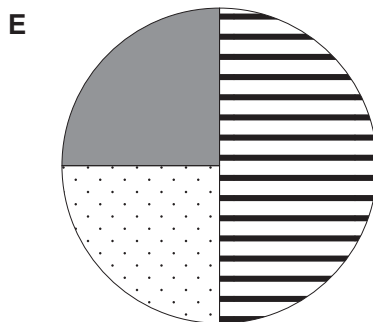
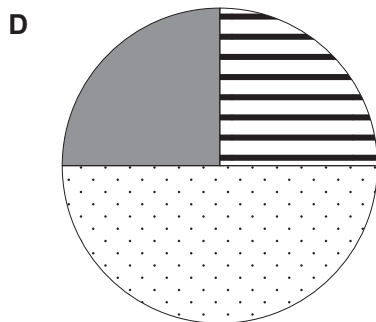
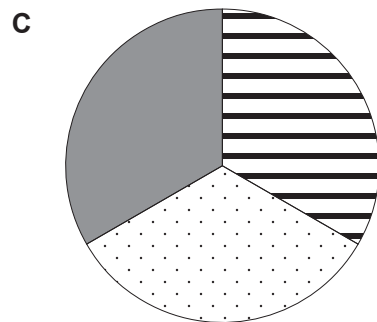
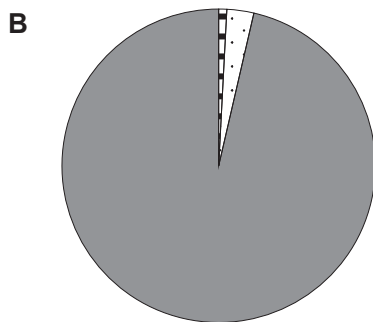
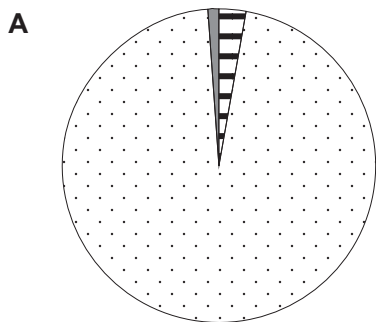
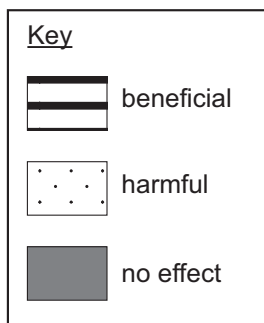
Which of the following statements correctly describe(s) the two students?

- 1 Student P's oxygen debt is repaid much quicker than student Q's.
  - 2 Student P has a lower oxygen debt than student Q.
  - 3 Student P has a higher level of fitness than student Q.
- A** none of them  
**B** 1 only  
**C** 2 only  
**D** 3 only  
**E** 1 and 2 only  
**F** 1 and 3 only  
**G** 2 and 3 only  
**H** 1, 2 and 3



- 39 Spontaneous mutations occur in the genetic material of all living organisms.

Which pie chart best represents the proportion of mutations that are beneficial, mutations that are harmful, and mutations that have no effect?



- 40 Ten randomly placed quadrats were used to estimate the frequency of occurrence of three plant species in a field.

<i>quadrat number</i>	<i>number of individuals of</i>		
	<i>species X</i>	<i>species Y</i>	<i>species Z</i>
1	4	1	5
2	11	0	12
3	3	5	13
4	0	0	9
5	2	9	4
6	1	8	2
7	7	2	6
8	14	24	0
9	6	0	2
10	7	3	0

What was the correct lowest frequency of occurrence calculated from X or Y or Z?

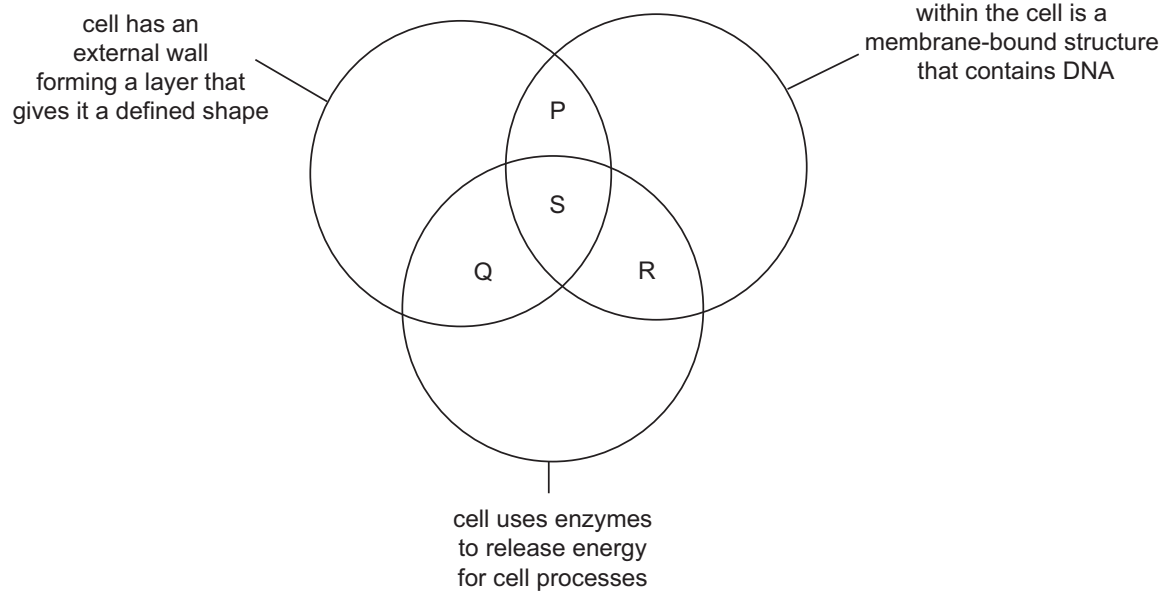
- A 0
- B 0.2
- C 0.7
- D 1.0
- E 1.4
- F 5.2
- G 52.0

- 41** Which of the following statements about stem cells in a healthy human female is/are correct?
- 1** An adult stem cell contains the same genes as an epithelial cell from that organism.
  - 2** Stem cells from this human will all contain two X chromosomes.
  - 3** When a stem cell divides it produces a new stem cell plus two specialised body cells.

(Assume that no mutations have occurred.)

- A** none of them
- B** 1 only
- C** 2 only
- D** 3 only
- E** 1 and 2 only
- F** 1 and 3 only
- G** 2 and 3 only
- H** 1, 2 and 3

- 42 The diagram shows three features which are used to group organisms.



Fungi, bacteria and animals can each be placed in one of the regions labelled P, Q, R or S on the diagram.

Which row in the following table is correct?

	<i>fungi</i>	<i>bacteria</i>	<i>animals</i>
<b>A</b>	P	S	R
<b>B</b>	P	R	S
<b>C</b>	Q	R	P
<b>D</b>	S	Q	R
<b>E</b>	S	S	S
<b>F</b>	R	P	Q
<b>G</b>	R	Q	P

43 A desert food chain is shown below.



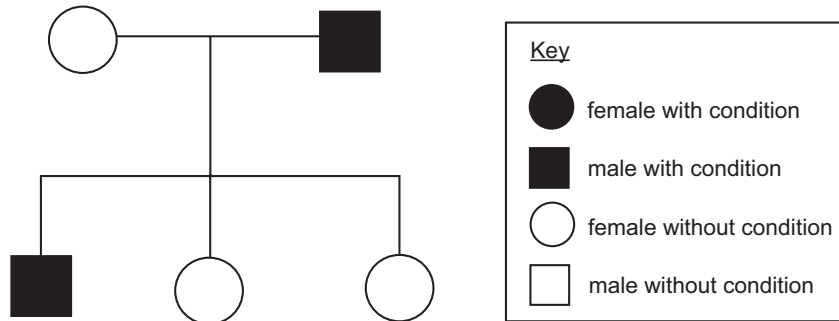
Assume that 10% of the energy from each stage in the food chain is passed on.

If 150 000 units of energy are contained in the producer, how much energy will be lost in the transfer between the primary and secondary consumers?

- A 1500
  - B 13 500
  - C 15 000
  - D 135 000
  - E 148 500
- 44 Which of the following statements about bacterial cell division is/are correct?
- 1 Daughter cells show a large degree of genetic difference to the parent cell.
  - 2 After each division, two daughter cells are produced by mitosis.
  - 3 Chromosome replication occurs in the cytoplasm of the bacteria.
- A none of them
  - B 1 only
  - C 2 only
  - D 3 only
  - E 1 and 2 only
  - F 1 and 3 only
  - G 2 and 3 only
  - H 1, 2 and 3

45 An inherited condition is caused by a recessive allele.

The family tree shows the inheritance of this condition in one family.



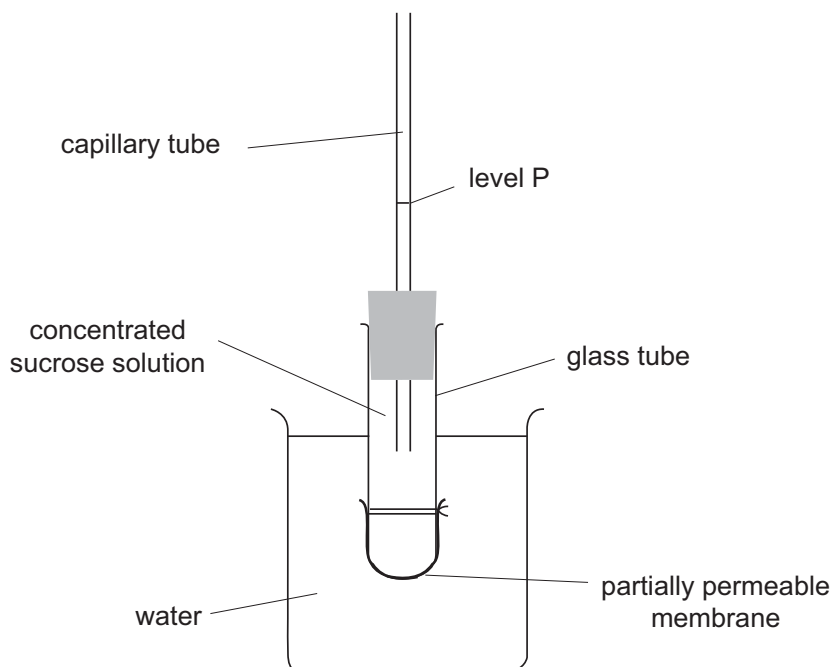
One of the daughters in this family tree has children with a man who does not have the condition.

For the two situations described in the table, which row shows the probability that their first child will be a girl who has the condition?

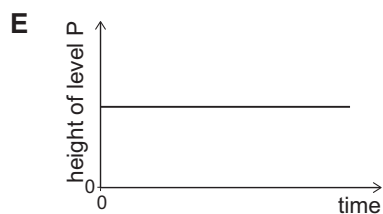
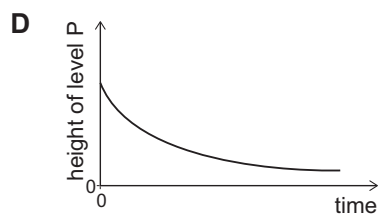
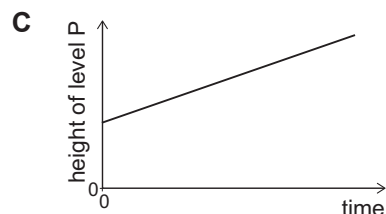
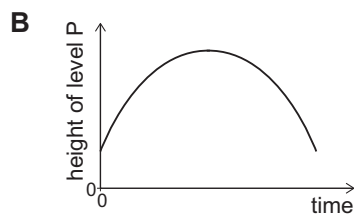
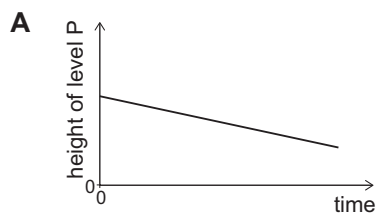
(Assume no new mutations.)

	<i>father is homozygous dominant</i>	<i>father is heterozygous</i>
<b>A</b>	0	0
<b>B</b>	0	0.125
<b>C</b>	0	0.25
<b>D</b>	0.5	0
<b>E</b>	0.5	0.125
<b>F</b>	0.5	0.25

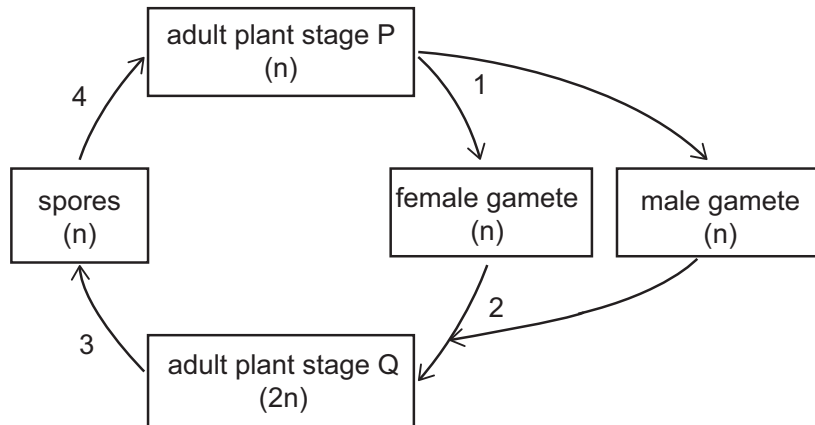
- 46 The diagram shows the apparatus used to investigate the movement of molecules across a partially permeable membrane. Sucrose is unable to cross the partially permeable membrane.



Which graph correctly shows how the height of solution in the capillary tube changes over 15 minutes?



47 The diagram shows the life cycle of a simple type of plant.



Key  
n = haploid number of chromosomes  
2n = diploid number of chromosomes

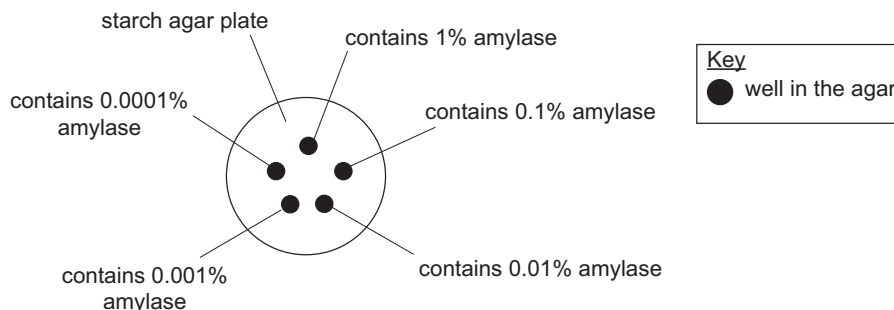
At which two of the numbered stages does only mitosis occur?

- A 1 and 2 only
- B 1 and 3 only
- C 1 and 4 only
- D 2 and 3 only
- E 2 and 4 only
- F 3 and 4 only



- 48 A student carried out an experiment to investigate the effect of enzyme concentration on the rate of an enzyme-controlled reaction.

The student used a starch agar plate with five identically sized small wells cut into the agar. The wells were filled with identical volumes of different concentrations of amylase solution, as shown in the diagram.



The starch agar plate was incubated overnight and the plate was then flooded with iodine solution. Most of the agar stained blue, but there was a clear area around each well where starch had been digested by the amylase. The student measured and recorded the diameter of the clear area that formed. The results are shown in the table below.

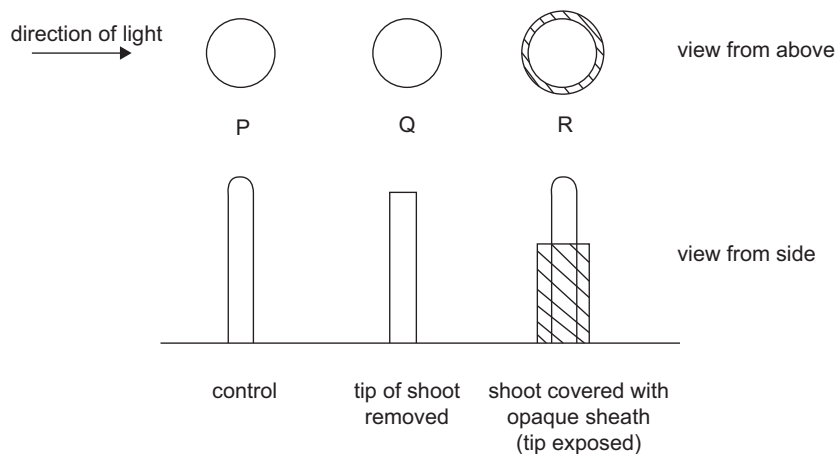
<i>percentage concentration of amylase</i>	<i>diameter of clear area that forms around the well containing amylase / mm</i>
1.0	27
0.1	24
0.01	15
0.001	12
0.0001	9

Which of the following factors **could** have affected the diameter of the clear area around the wells containing amylase?

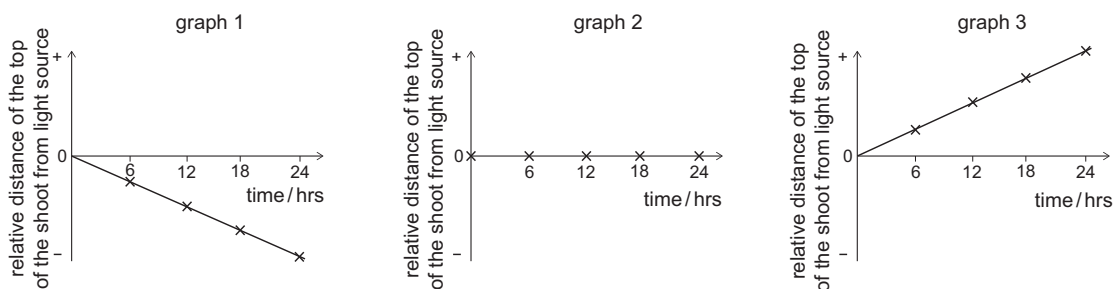
- 1 pH of the starch agar
  - 2 concentration of the amylase solution
  - 3 temperature at which the plates were incubated
- A none of them
- B 1 only
- C 2 only
- D 3 only
- E 1 and 2 only
- F 1 and 3 only
- G 2 and 3 only
- H 1, 2 and 3

- 49 The diagram shows the start of an experiment on the effect of light direction on young shoots. All of the shoots were growing vertically. All of the shoots were the same distance from the light source. All of the shoots were continually exposed to the light from one side for 24 hours.

(All other variables were kept constant.)



Every six hours, the distance between the light source and the top of each shoot was measured. The distance from the light source relative to the position at the start of the experiment was plotted on the following graphs.



Which row represents the responses of the shoots to the light over 24 hours?

	<i>P</i>	<i>Q</i>	<i>R</i>
<b>A</b>	1	2	1
<b>B</b>	1	3	1
<b>C</b>	1	3	2
<b>D</b>	2	1	3
<b>E</b>	2	2	1
<b>F</b>	3	1	3
<b>G</b>	3	2	2

- 50 The table shows some of the genetic codes for amino acids:

<i>genetic code</i>	<i>amino acid coded for (three-letter abbreviations)</i>
AGA	Arg
AGG	Arg
ATG	Met
CCC	Pro
CCG	Pro
CGA	Arg
CTG	Leu
GAC	Asp
GGA	Gly
GTC	Val
GTG	Val
TAG	Stop (ends protein synthesis)
TGG	Trp
TTA	Leu
TTG	Leu

The base sequence below shows the middle part of a gene coding for a protein:

ATG CGA GAC ATG TTA AGG TGG GAC CCC CGA GTC

Mutations took place in both the 4<sup>th</sup> and 20<sup>th</sup> base in this sequence.

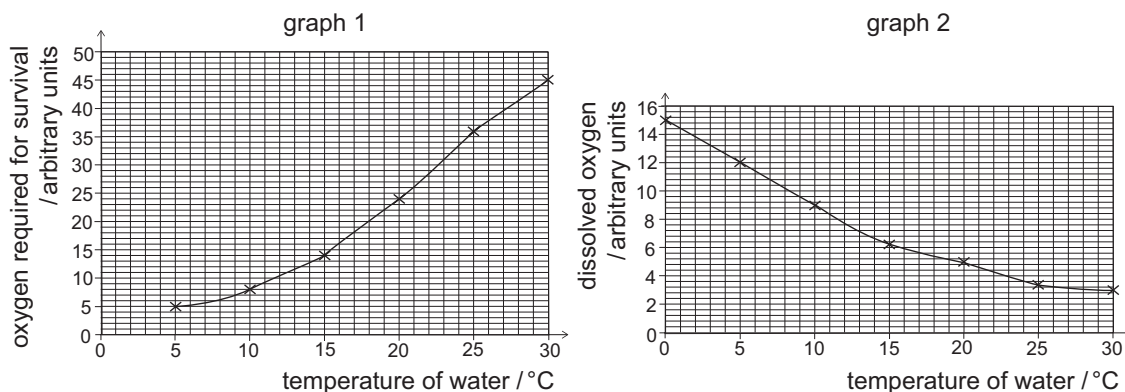
Using **only** the information provided and reading the sequence from left to right, which of the following statements **could** be correct for the resulting amino acid sequence after the two mutations took place?

- 1 This sequence could be only six amino acids long.
  - 2 The second amino acid in this sequence could be unaffected by the mutation.
  - 3 This amino acid sequence could contain seven different amino acids.
- A** none of them
- B** 1 only
- C** 2 only
- D** 3 only
- E** 1 and 2 only
- F** 1 and 3 only
- G** 2 and 3 only
- H** 1, 2 and 3

- 51 A power station released warm water into a river. This is an example of water pollution because the temperature of the river water was increased.

A student was interested in the effects of the temperature increase on a pollution indicator species.

The student studied two graphs. Graph 1 showed the oxygen required by the pollution indicator species for survival and graph 2 showed the effect of temperature on the oxygen dissolved in the water.



The student wrote the following statements:

- 1 As the oxygen required by the pollution indicator species for survival increases, the water temperature rises.
- 2 There is less dissolved oxygen available to the pollution indicator species as the water temperature rises.
- 3 The pollution indicator species will survive better in water at 30 °C than at 5 °C because it has a greater oxygen uptake at 30 °C.

Which of the student's conclusions could be correct using only the information provided?

- A** none of them
- B** 1 only
- C** 2 only
- D** 3 only
- E** 1 and 2 only
- F** 1 and 3 only
- G** 2 and 3 only
- H** 1, 2 and 3

- 52** In a monohybrid cross, two heterozygotes were allowed to mate and the resulting offspring showed a 2 : 1 phenotypic ratio.

Which of the following statements could explain this ratio?

- 1** The number of offspring produced was small.
  - 2** The recessive condition was lethal prior to birth.
  - 3** Being homozygous dominant was lethal prior to birth.
- A** none of them
- B** 1 only
- C** 2 only
- D** 3 only
- E** 1 and 2 only
- F** 1 and 3 only
- G** 2 and 3 only
- H** 1, 2 and 3

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**PART C Reading Comprehension**

For part C, you will need to refer to the separate text booklet.

**Task 1**

Look at the two texts on page 3. For questions 53 – 58, choose the option (A, B, C, or D) which you think fits best according to the texts.

---

- 53** In Abstract One, the writer points out that research on the impact of museums' cultural activities on individuals
- A** is already well established.
  - B** has received scant attention up to now.
  - C** was pioneered by Galloway and Stanley (2004).
  - D** is limited to studies of self-esteem and self-confidence.
- 54** The main purpose of the paper described in Abstract One is
- A** to evaluate the quality of the research on museums' community programmes.
  - B** to determine the factors that led to museums prioritising non-traditional audiences.
  - C** to assess the value of museums' attempts to engage certain marginalised groups.
  - D** to advocate the need for one aspect of interaction between museums and the community.
- 55** In Abstract Two, the writer suggests that the research being described
- A** will identify a weakness in an existing initiative.
  - B** will have an impact on a range of stakeholders.
  - C** will be of particular interest to museum volunteers.
  - D** will raise serious questions about museum management.



- 56** The writer of Abstract Two suggests that the 'Touching Heritage' programme
- A** has demonstrated educational benefits for participants.
  - B** has been the subject of scrutiny by other researchers.
  - C** can serve as an exemplar for other projects.
  - D** is inspiring healthcare professionals.
- 57** In Abstract Two, which phrase in the text picks up on the idea of going out to the community?
- A** 'reflexive feedback'
  - B** 'sustainable practice'
  - C** 'satellite programming'
  - D** 'best practice'
- 58** Public attitudes to museum-based health and wellbeing programmes are discussed in
- A** neither abstract.
  - B** both abstracts.
  - C** Abstract One only.
  - D** Abstract Two only.

**Task 2**

Look at the four texts on pages 4 and 5. For questions 59 – 66, choose the option (A, B, C or D) which you think best answers the question.

---

- 59** Which writer reports the view that, as a pre-emptive measure, AI and humanity should move in the same direction?
- 60** Which writer dismisses a successful achievement as evidence of real intelligence?
- 61** Which writer mentions the difficulties of resolving issues raised by a potential situation in which the invention becomes the inventor?
- 62** Which writer denies that AI will have the independent capacity to endanger humans?
- 63** Which writer suggests that there is little value in speculating about hypothetical situations?
- 64** Which writer mentions efforts to assign certain entitlements to machines?
- 65** Which writer mentions the relative seriousness of AI malfunctions?
- 66** Which writer uses a comparison to make the point that a computer is merely an inanimate object?

**Task 3**

Look at the text on pages 6 and 7. For questions 67 – 76, choose the option (A, B, C or D) which you think fits best according to the text.

---

- 67** The purpose of paragraph 1 is to establish
- A** that the assumed behaviour of a rational person is the key to understanding economic phenomena.
  - B** that rationality involves being selfish and constant in one's preferences.
  - C** some historical background on the relationship of economics with the concept of rationality.
  - D** the value of developments in economics in advising people how to make rational choices.
- 68** According to the writer, one of the ways in which PT departs from EUT is in
- A** its view of risk.
  - B** its evolutionary explanation.
  - C** its focus on making choices.
  - D** its lack of preconceptions about rationality.
- 69** The word 'asymmetry' in paragraph 3 refers to
- A** the complexity of prospect theory and the simplicity of expected utility theory.
  - B** the motivation to avoid one type of choice and the motivation to pursue another type.
  - C** the predictions of economic theory and the explanation for these provided by evolution.
  - D** the behaviour of humans and the behaviour of other animals.

- 70** In paragraphs 4 and 5, the writer implies that economists disagree about whether
- A** rational agents are selfish.
  - B** rational agents should be free.
  - C** mistakes can be made by rational agents.
  - D** decision-makers are rational agents.
- 71** The writer refers to statistics on small businesses in paragraph 7 to exemplify
- A** a cognitive bias of the human mind.
  - B** financial risks of capital investment.
  - C** that the rationality of individuals is limited by the information they have.
  - D** that professionals are no better at making predictions than non-professionals.
- 72** Which conclusion is supported by Kahneman's analogy of stock selection being more like 'rolling dice than like playing poker'?
- A** Given that the world is unpredictable, errors are inevitable when we try to make predictions.
  - B** Experts can share the same biases as everyone else, though these may be weaker.
  - C** Results that appear to be due to chance may have more complex causes.
  - D** Valuable insights into the near future are more likely than accurate long-term forecasts.
- 73** What view does the writer attribute to Kahneman regarding the Google story?
- A** The impact of leadership style and management practices is declining.
  - B** Chance is a more important factor in some types of business than in others.
  - C** Leadership style is not as significant as sometimes considered.
  - D** The contributions of the company's workforce are underplayed.

- 74** In paragraph 10, the writer implies that
- A** contemporary behavioural economics might not be as original and distinct a view as Kahneman's work suggests.
  - B** the science of economics has failed to make significant progress since its birth in the 18<sup>th</sup> century.
  - C** the soundness of Kahneman's arguments is questionable given his apparent unfamiliarity with the groundwork of the subject.
  - D** the future direction of economics will depend upon advances made in the natural sciences.
- 75** In the text as a whole, what focus is shared by Kahneman and Tversky's joint work and Kahneman's solo research?
- A** the predictions of economists about society's trends
  - B** the possible evolutionary explanations for our decisions
  - C** how humans behave when confronted with risk
  - D** the influence of the choices of individuals upon the economy
- 76** What earlier idea in the text is referred to at the end?
- A** Human rationality can be explained by our evolutionary history.
  - B** Psychological models of human behaviour are at the forefront of the most recent developments in economics.
  - C** The soundness of standard economic theory is supported by the findings of modern behavioural economics.
  - D** Our understanding of the human brain complements our understanding of economic behaviour.

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