Ministero dell'Istruzione, dell'Università e della Ricerca

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ADMISSION TEST FOR THE DEGREE COURSE IN MEDICINE AND SURGERY

Academic Year 2021/2022

Cambridge Assessment Admissions Testing

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1 A young woman (A), knowing that she was dying, requested that her mother (B), who was awaiting a kidney transplant, should be allowed to receive her kidneys after her death. The request was not allowed, and A's kidneys were received by another patient (C), who was higher up the waiting list than B because his medical need for a transplant was more urgent. The committee overseeing transplant decisions argued that the system it used had to be administered solely in accordance with the rationale behind its waiting list. Their decision seemed to others unduly bureaucratic, especially as B will be left to care for A's young child.

Which one of the following best illustrates the principle behind the committee's decision?

A Decisions on transplants should focus on the medical need of the potential recipient.

B Decisions on transplants cannot be influenced by emotions.

C Donations between family members are not allowed.

D Decisions on transplants should include social considerations.

E The donor's wishes should not be considered.

2 From ever younger ages, people are reporting symptoms of anxiety due to the pressure to be 'perfect' in all areas of life. It seems that, in many cultures, there is an increasing sense of competition in everything from school results to the job market to personal appearance and even how one's social life looks on social media. As a result, many people experience problems associated with low self-confidence. But rather than reach for a pill or a self-help book to tackle their problems, more of these individuals should just go outside for a run or a walk. While it sounds simplistic, this recommendation is supported by the research finding that people who do a lot of outdoor activities tend to have high self-esteem.

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

A It ignores the possibility that people with higher self-esteem might be more inclined to take part in outdoor activities.

B It assumes that high levels of self-confidence or self-esteem are all that are needed for a person to enjoy good mental health.

C It ignores the fact that not everyone with low self-esteem has the desire to go for a run or a walk outside.

D It assumes that people who manage to appear 'perfect' in the different parts of their lives will not suffer from problems with self-confidence.

E It ignores the likelihood that many people with varying levels of self-confidence would benefit from the advice of a mental health professional.

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3 For many years, children and young people have been protected from exploitation by the entertainment industry. In recent years, however, the number of young people suddenly thrust into the limelight has increased, and many of them feel that they must seize any opportunity to achieve recognition before this window passes them by. Dealing with fame, performing in front of large audiences, the rigours of rehearsal and the general stresses of what is a difficult occupation take maturity and can rob children of their childhood. Rejection, disappointment and failure are felt more keenly by young people because they lack wider experience and this can make for a very unhappy childhood. These factors would indicate that young performers need further protection by law.

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

A Young performers need further protection by law.

B Young people can be suddenly thrust into the limelight.

C Young performers are robbed of their childhood by the demands of performing.

D Young people feel rejection, disappointment and failure more because they lack wider experience.

E Young people have been protected from exploitation by the entertainment industry for many years.

4 Our three local universities have agreed that they will offer a place to everyone from our school who applies to them. Because you attend a different school, you are not guaranteed an offer from these universities.

Which one of the following most closely parallels the reasoning used in the above argument?

A Everyone over the age of 60 is entitled to a bus pass, which gives them free travel on buses after 9:30 am. Since you are younger than 60, you are not entitled to free bus travel.

B Everyone who becomes a student at our college has achieved a high score in their high school examinations. You have a high score, and therefore you are sure to be accepted as a student at our college.

C Everyone who has a free bus pass is entitled to travel on buses after 9:30 am without payment. Since it is after 9:30 am and you have a free bus pass, you do not have to pay for this bus journey.

D In our country, everyone who becomes a teacher must have a university degree. Since you do not have a degree, you are not qualified to become a teacher.

E The only way to stand for election to Parliament is to be nominated by voters in a geographical constituency. Since you have not been nominated, you cannot stand for election.

5 Of all the food we buy, bread suffers the worst fate when it comes to waste. 32% of it ends up being thrown away. We value other types of food a lot more, as the average for all food and drink being wasted is 15%. The proportion of meat and fish thrown away is below average (13%) and our most precious item is alcohol – we throw away just 6% of it.

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

A The main reason why we throw food away is that we do not value it much.

B Bread is a low-quality food.

C We should be more moderate when it comes to buying bread.

D The more expensive a food or drink is, the less likely it is that it will be wasted.

E Bread goes stale faster so is more likely to be thrown away.

6 In a survey of cats' eating habits, 10% of the cats tested showed a clear preference for Moggiemeat, 20% preferred Fuss-a-Puss and 40% preferred Yummy Paws. An additional 6 cats did not seem to care at all which of the three foods they ate, while the remaining 27 cats in the survey would not touch any of these foods.

How many cats were involved in the survey?

A 110

B 33

C 63

D 90

E 103

7 It is usual, when seating people round a table at a social function, to alternate males with females, but if there are unequal numbers of each, this is impossible.

At one party, 14 women and only 6 men were present. They were seated round a circular table so that as few women as possible had no male sitting directly next to them.

How many women had no male sitting directly next to them?

A 2

B 4

C 6

D 7

E 8

8 Simon plans to send Christmas cards to 35 friends. He is going to choose a single design to send to them all and knows that some of the recipients really do not like glitter cards so he will not buy this type. He wants 2-fold cards so that he can write a letter on the inside for 5 of them.

The following table shows the possibilities that he is considering.

card type	*no. in pack*	*glitter*	*1-fold*	*2-fold*	*pack price*
religious	5	no		yes	£1.80
robins	8	no	yes		£1.95
village scene	20	yes		yes	£2.50
cartoon	12	no	yes		£2.20
father xmas	10	no		yes	£3.10

What is the lowest amount of money that Simon could spend on his cards?

A £12.40

B £12.60

C £5.00

D £6.00

E £9.75

9 When I first woke up early this morning the display of my bedside digital clock showed:

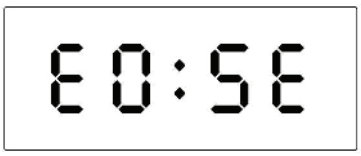
I presumed that it was faulty, but, after drifting off to sleep again, when I next awoke and saw the clock I realised that someone must have turned the clock upside down and that it was exactly an hour and a half since I had looked at it before.

What did I see when I woke up the second time?

A

B

C



D

E

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10 Teams from five US states have reached the final of a competition. The event organisers are trying to design a sign for each state. One idea involves the name, in capital letters, being placed vertically on a sign board which spins when one of the team presses their buzzer to answer a question. They want the sign to read correctly regardless of whether it is read from the front or the back.

Unfortunately they realise that most of the states for which this would have worked have not reached the final.

Which one of the following is the only state in the final for which this style of sign would work?

A Hawaii

B Alabama

C Idaho

D Montana

E Oklahoma

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

A Hans Jonas – medicine

B John Maynard Keynes – economics

C Maria Montessori – pedagogy

D Max Planck – physics

E B. F. Skinner – psychology

12 Which one of the following writers is the author of the best-selling novel *My Brilliant Friend*?

A Elena Ferrante

B Khaled Hosseini

C Ian McEwan

D Paulo Coelho

E Kazuo Ishiguro

13 What does the letter A stand for in the international organisation FAO?

A Agriculture

B Architecture

C Aerospace

D Automotive

E Aesthetics

14 Which of the following pairs of theatre/city is the only correct one?

A Metropolitan Opera House – New York

B San Carlo – Venice

C The Bolshoi Theatre – Saint Petersburg

D La Fenice – Florence

E The Palais Garnier Opera House – Brussels

15 The Rosetta Stone provided the key to decipher

A Egyptian hieroglyphs.

B characters of the Phoenician alphabet.

C characters of the Ancient Greek alphabet.

D the Code of Hammurabi.

E the Sumerian language.

16 Which one of the following institutions of the European Union is elected by direct universal suffrage?

A European Parliament

B European Commission

C Court of Justice of the European Union

D European Economic and Social Committee

E Council of the European Union

17 Which one of the following directors directed the films that make up *The Godfather* trilogy?

A Francis Ford Coppola

B Martin Scorsese

C Sergio Leone

D Brian De Palma

E Matteo Garrone

18 Which one of the following pairs of scholar/scientific discovery is NOT correct?

A Niels Bohr – electron microscope

B Dmitri Mendeleev – periodic table of elements

C Wilhelm Conrad Röntgen – x-ray

D Hans Wilhelm Geiger – particle detector

E Evangelista Torricelli – mercury barometer

19 Which one of the following treaties established the European Coal and Steel Community (ECSC)?

A Paris

B Lisbon

C Amsterdam

D Nice

E Rome

20 Which one of the following global organisations sets and enforces rules of trade between nations?

A WTO

B World Bank

C IMF

D OECD

E World Economic Forum

21 Which one of the following pairs of Russian writers/works is NOT correct?

A Mikhail Bulgakov – Uncle Vanya

B Vladimir Nabokov – Lolita

C Fyodor Dostoyevsky – The Brothers Karamazov

D Leo Tolstoy – Anna Karenina

E Boris Pasternak – Doctor Zhivago

22 The expression ‘perfect bicameral system’ refers to

A the legislative procedure that assigns identical powers to the two chambers of a parliament.

B the judicial system whereby the first sentence must be confirmed by the first round of appeal.

C the form of government that assigns identical power to two institutional figures.

D the kind of parliamentary monarchy where monarch and parliament have the same powers.

E the perfect separation of the magistrate judge and public prosecutor.

23 Which of the following types of nucleic acid is/are found in viruses?

1 single-stranded DNA

2 double-stranded DNA

3 RNA

A 1, 2 and 3

B 1 and 2 only

C 2 only

D 1 and 3 only

E 2 and 3 only

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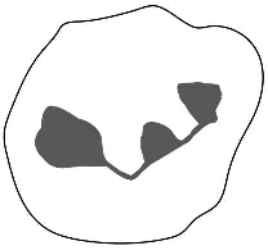
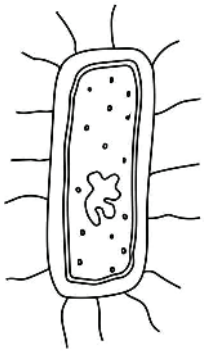
24 Which one of the diagrams (not drawn to scale) represents a structure that is formed by mitosis?

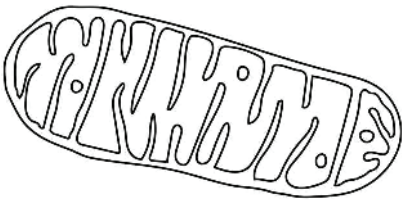
A



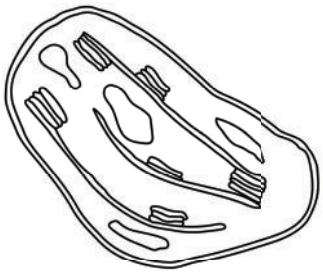
B



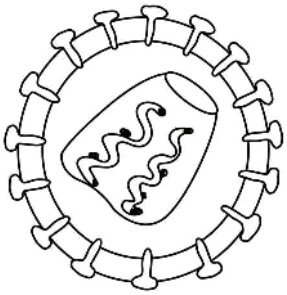
C



D



E



25 Three fatty acids with the formula $C_8H_{16}O_2$ react with glycerol ($C_3H_8O_3$) to form a triglyceride.

Which of the following is the correct formula for the triglyceride?

A $C_{27}H_{50}O_6$

B $C_{27}H_{48}O_5$

C $C_{27}H_{48}O_6$

D $C_{27}H_{52}O_7$

E $C_{27}H_{56}O_9$

26 Which of the following is correct for cholesterol in humans?

A It maintains the fluidity of the cell membrane.

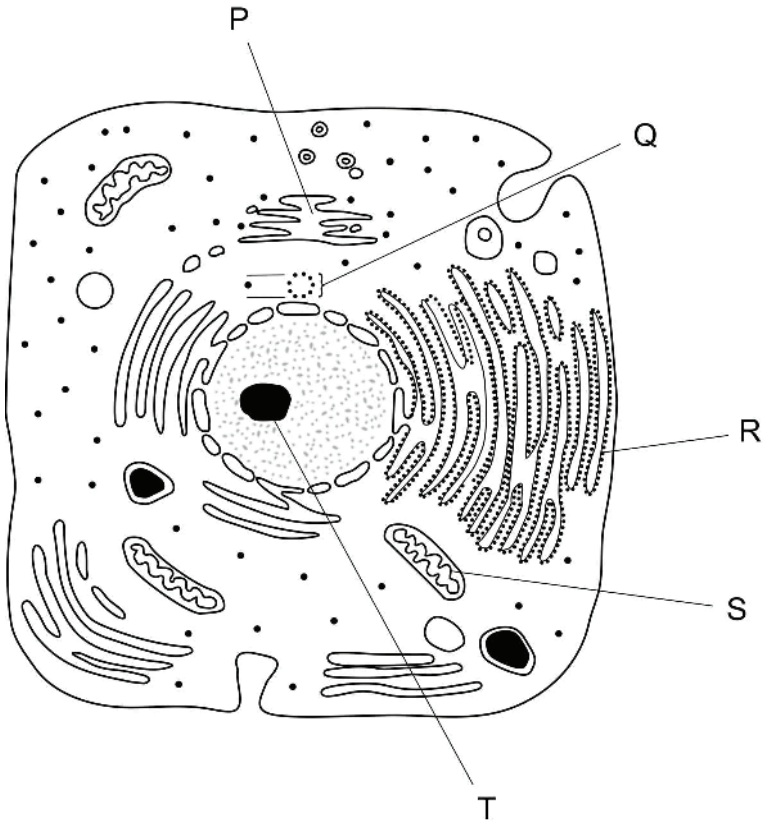
B It is used to make all hormones.

C It is a good source of energy because of the number of hydrogen atoms.

D It forms hydrogen bonds with water which stabilises the cell membrane.

E It transports fatty acids around the body.

27 The diagram represents an animal cell with five organelles labelled P, Q, R, S and T.



Which row correctly matches the label with the name and function of the cell organelle?

	label	*name of cell organelle*	*function of cell organelle*
row 1	P	mitochondrion	protein synthesis
row 2	Q	centrioles	holds sister chromatids together
row 3	R	ribosome	formation of lysosomes
row 4	S	Golgi apparatus	anaerobic respiration
row 5	T	nucleolus	formation of ribosomal sub-units

A row 5

B row 2

C row 3

D row 4

E row 1

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28 Which of the following cell structures contain(s) biological catalysts?

1 cytoplasm

2 nucleus

3 mitochondria

A 1, 2 and 3

B 2 only

C 3 only

D 2 and 3 only

E 1 only

29 Which of the following reactions or biological processes involves a redox reaction?

A $NAD^+ + H_2 \rightleftharpoons NADH + H^+$

B glucose + glucose ⇌ maltose + water

C a cytosine and guanine pairing

D polymerisation of amino acids

E depolarisation of a neuron

30 The SRY gene is normally located on the human Y chromosome. This gene initiates the development of male characteristics.

Using this information, which of the following statements about the SRY gene is/are correct?

1 Insertion of the SRY gene into an X chromosome of a female zygote could give it male characteristics.

2 A sperm cell arising from incorrect division, which has a functional SRY gene, could give rise to a female with a sex chromosome trisomy following fertilisation with a normal ova.

3 During meiosis, crossing over could result in the formation of 'X' sperm with the SRY gene, which could cause male characteristics after fertilisation.

A 1 and 3 only

B 2 only

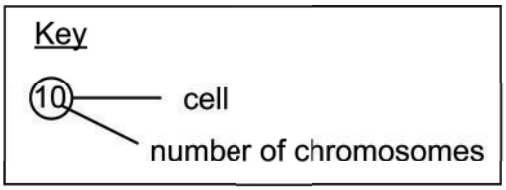
C 3 only

D 1 and 2 only

E 1 only

31 A cell containing four pairs of homologous chromosomes divides by meiosis.

Which row shows the cells produced and the number of chromosomes that they contain?



row	*parent cell*	*end of meiosis I*	*after meiosis II*
1	(4)	(2) (2)	(2) (2) (2) (2)
2	(4)	(4) (4)	(2) (2) (2) (2)
3	(8)	(4) (4)	(4) (4) (4) (4)
4	(8)	(8) (8)	(4) (4) (4) (4)
5	(8)	(16) (16)	(8) (8) (8) (8)

A row 3

B row 2

C row 1

D row 4

E row 5

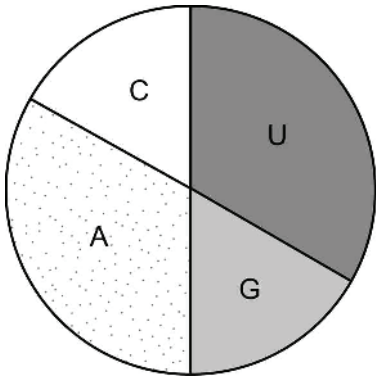
32 The sequence of bases in part of a DNA strand is:

TATGATCTTAGGCAACAT

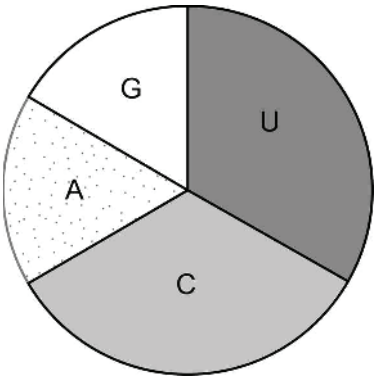
A strand of mRNA is transcribed using this sequence of bases.

Which one of the following charts shows the correct proportions of the bases in the mRNA?

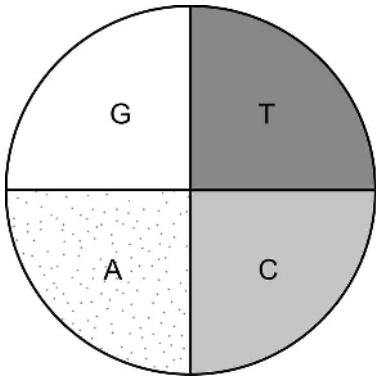
A



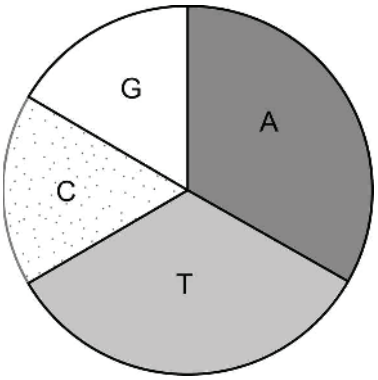
B



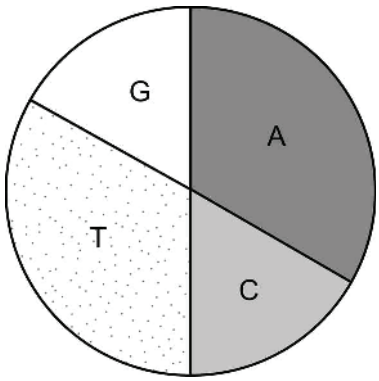
C



D

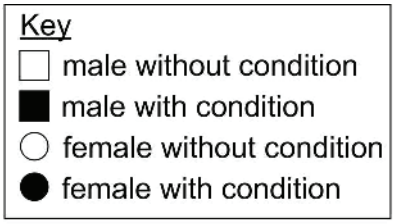


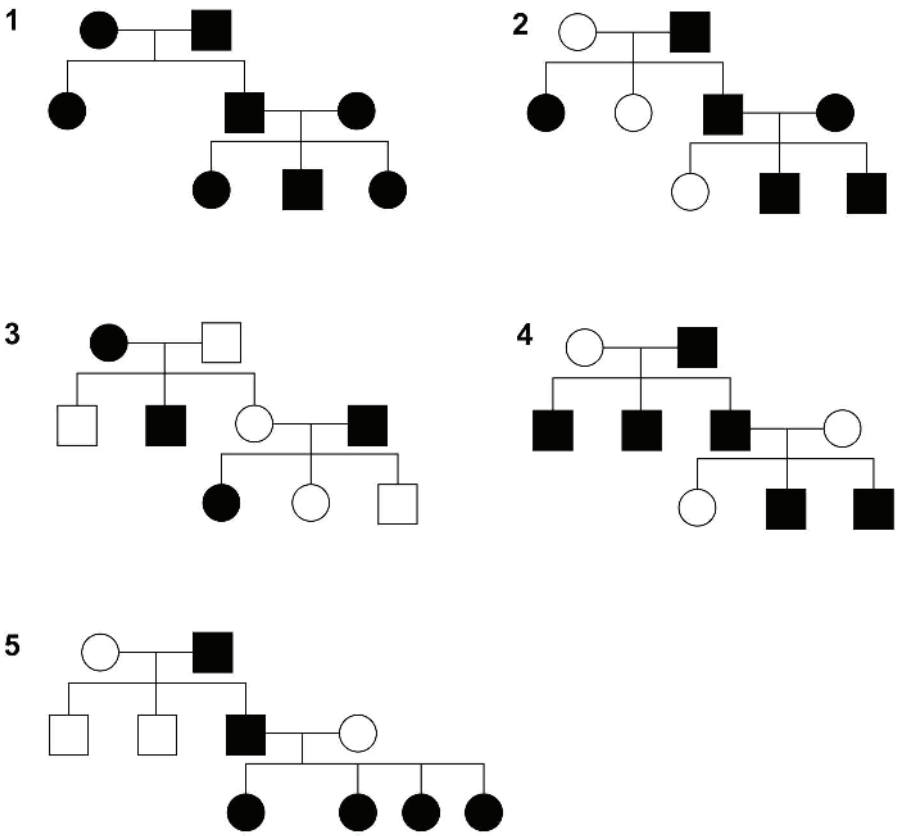
E



33 Polydactyly is a condition caused by a gene mutation. Animals affected by polydactyly have extra digits on one or more limbs.

Five inheritance patterns of polydactyly in a species are shown in the diagrams.





Which inheritance pattern can ONLY occur when polydactyly is caused by an autosomal dominant allele and NOT when it is caused by an autosomal recessive allele?

[Assume normal cell divisions in all individuals.]

A 2

B 1

C 3

D 4

E 5

34 In which of the following places are proton pumps found?

1 the chloroplast stroma

2 the gap between the thylakoid membranes

3 the membrane of the granum

A 3 only

B 2 only

C 1 only

D 1 and 2 only

E 1 and 3 only

35 Which row could be correct for directional selection?

Key
✓ yes
x no

	a low-frequency phenotype is selected	*a predator could be the cause*	*the frequency of a recessive allele increases*
row 1	✓	x	x
row 2	x	✓	x
row 3	x	x	✓
row 4	x	✓	✓
row 5	✓	✓	✓

A row 5

B row 2

C row 3

D row 4

E row 1

36 Which one of the following statements is correct about the cardiac cycle of a healthy human?

A When the left ventricle relaxes, the aortic valve closes.

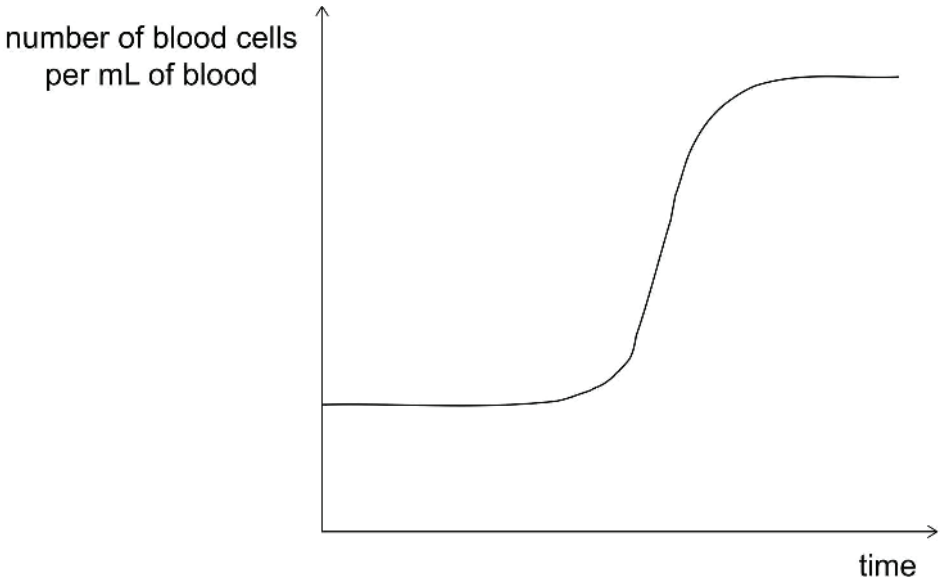
B When the left atrium contracts, the aortic valve opens.

C When the right atrio-ventricular valve closes, the left atrio-ventricular valve opens.

D When the right atrium contracts, the left ventricle contracts.

E When the right ventricle contracts, the right atrio-ventricular valve opens.

37 The graph below shows the change in blood cell count of a human over time.



Which of the following could explain the shape of the above graph?

1 a reduction in the concentration of oxygen in the atmosphere

2 a response to a bacterial infection

3 increased differentiation of bone marrow stem cells

A 1, 2 and 3

B 1 and 2 only

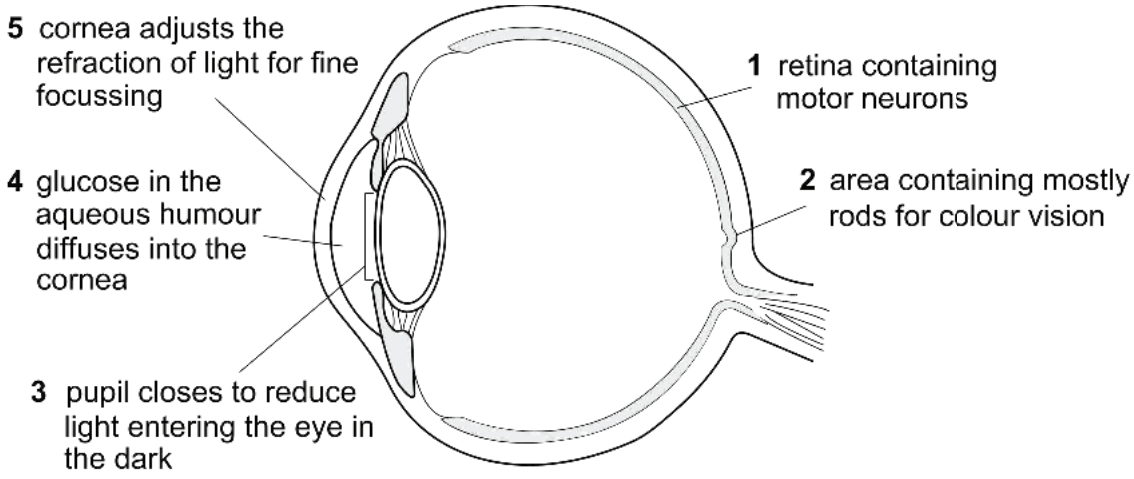
C 2 and 3 only

D 1 only

E 2 only

38 The diagram shows a cross section through a human eye. Some parts of the eye are labelled 1 to 5 with notes.

Which one of the following notes is correct?



A note 4

B note 2

C note 3

D note 1

E note 5

39 Organ or tissue transplants normally require that the donor's antigens must be closely matched to those of the recipient.

Which one of the following types of transplant can typically be carried out WITHOUT the need for a match between donor and recipient?

A cornea

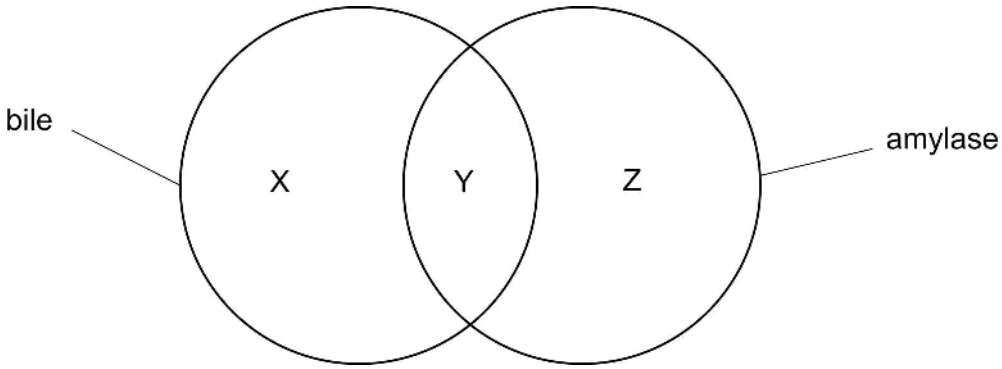
B liver

C lung

D heart

E kidney

40 The diagram shows the relationship between the features of two substances involved in digestion: bile and amylase.



Which of the following rows is correct for X, Y and Z?

	X	*Y*	*Z*
row 1	assimilates lipid	stored in the gall bladder	digests maltose
row 2	digests lipid	works in the small intestine	digests starch
row 3	digests lipid	produced by the pancreas	produces maltose
row 4	emulsifies lipid	produced by the pancreas	digests maltose
row 5	emulsifies lipid	works in the small intestine	digests starch

A row 5

B row 2

C row 3

D row 4

E row 1

41 As Group VII of the Periodic Table (F to I) is descended, which of the following properties of the elements DECREASE?

1 melting points

2 electronegativities

3 first ionisation energies

A 2 and 3 only

B 2 only

C 1 only

D 1 and 3 only

E 1, 2 and 3

42 An atom has a mass number of 18 and contains 10 neutrons.

A common ion of this atom has a charge of -2.

What is the electron configuration of this ion in its lowest energy state?

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

B $1s^2 2s^2 2p^4$

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

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

E $1s^2 2s^2 2p^6 3s^2 3p^4$

43 Which of the following changes is/are correct?

1 The addition of 1 g of salt to 100 g water will increase the freezing point.

2 A change in temperature from 150 °C to 120 °C will increase the average kinetic energy of water molecules.

3 A change in the surrounding air pressure from 100 kPa to 120 kPa will increase the boiling point of water.

A 3 only

B 2 only

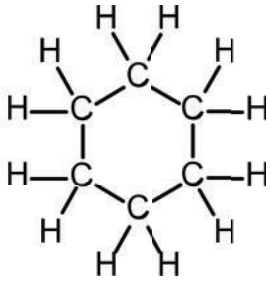
C 1 only

D 1 and 3 only

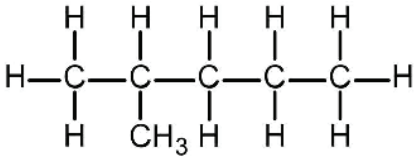
E 1, 2 and 3

44 Which of the following hydrocarbons are structural isomers of hexane?

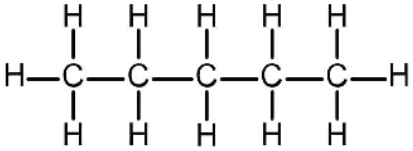
1



2



3



A 2 only

B 1 only

C 3 only

D 1 and 2 only

E 1 and 3 only

45 Which of the following equations is associated with the first electron affinity of chlorine?

A $Cl(g) + e^- \rightarrow Cl^-(g)$

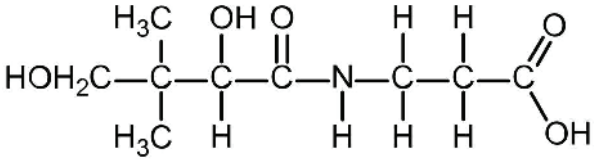
B $Cl(g) \rightarrow Cl^-(g) + e^-$

C $Cl_2(g) + 2e^- \rightarrow 2Cl^-(g)$

D $2Cl^-(g) - 2e^- \rightarrow Cl_2(g)$

E $Cl^-(g) + e^- \rightarrow Cl(g)$

46 Vitamin B5 has the structure:



Which of the following functional groups are contained in a molecule of vitamin B5?

1 alcohol

2 aldehyde

3 amide

4 amine

5 carboxylic acid

6 ketone

A 1, 3 and 5 only

B 1, 2 and 4 only

C 1, 3 and 6 only

D 2, 4 and 6 only

E 4, 5 and 6 only

47 X is 50.0 mL of a 0.050 mol L^{-1} aqueous solution of nitric acid (HNO_3).

Y is 100 mL of a 0.050 mol L^{-1} aqueous solution of sulfuric acid (H_2SO_4).

Which of the following statements about these solutions is/are correct?

1 The hydrogen ion concentration in Y is four times greater than the hydrogen ion concentration in X.

2 Only the acid in Y will be completely dissociated into ions.

3 Y has a pH value of less than 2 at 25 °C.

A 3 only

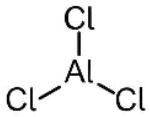
B none of them

C 1 only

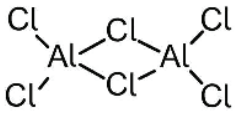
D 1 and 3 only

E 2 and 3 only

48 Which row gives the correct shapes around the aluminium centres in $AlCl_3$ and Al_2Cl_6 molecules?



$AlCl_3$



Al_2Cl_6

	$AlCl_3$	Al_2Cl_6
row 1	trigonal planar	square planar
row 2	trigonal pyramidal	tetrahedral
row 3	tetrahedral	square planar
row 4	trigonal planar	tetrahedral
row 5	trigonal pyramidal	square planar

[atomic numbers: Al = 13; Cl = 17]

A row 4

B row 2

C row 3

D row 1

E row 5

49 At room temperature and pressure, which of the following substances has the strongest hydrogen bonds between their molecules?

A ethanoic acid, CH_3COOH

B propanal, CH_3CH_2CHO

C fluoromethane, CH_3F

D trimethylamine, $(CH_3)_3N$

E hydrogen sulfide, H_2S

50 100 mL of a solution contained 3.2 g of potassium nitrate.

25 mL of this solution was added to an empty 250 mL volumetric flask. Distilled water was added up to the 250 mL mark and the flask was shaken to ensure that mixing was complete.

A pipette was used to transfer 25 mL of the resulting solution from the volumetric flask to an empty conical flask.

What is the concentration of the potassium nitrate solution, in $g\,L^{-1}$, in the conical flask?

A $3.20\,g\,L^{-1}$

B $0.80\,g\,L^{-1}$

C $0.32\,g\,L^{-1}$

D $8.00\,g\,L^{-1}$

E $0.08\,g\,L^{-1}$

51 The general formula of an oxoacid is $H_m XO_n$

Which of the following expressions gives the oxidation state of element X?

A $2n - m$

B $m - 2n$

C $m + 2n$

D $2m - n$

E $n - 2m$

52 A sample of an oxide of iron contains 1.68 g of iron and 0.64 g of oxygen only.

What is the formula of this oxide?

[A_r values: Fe = 56; O = 16]

A Fe_3O_4

B Fe_4O_3

C Fe_2O_3

D Fe_3O_2

E FeO

53 Which one of the following is a simplification of

$$\frac{(x+2)^2}{x^2+x-2}$$

A $\dfrac{x+2}{x-1}$

B $\dfrac{(x+2)^2}{(x-2)(x+1)}$

C $\dfrac{4x+4}{x-2}$

D $\dfrac{x+2}{x-2}$

E -4

54 Find the complete set of values of x which satisfy the inequality

$$\tfrac{1}{2}(2x+3)-\tfrac{2}{3}(x+1) < 2x$$

A $x > \frac{1}{2}$

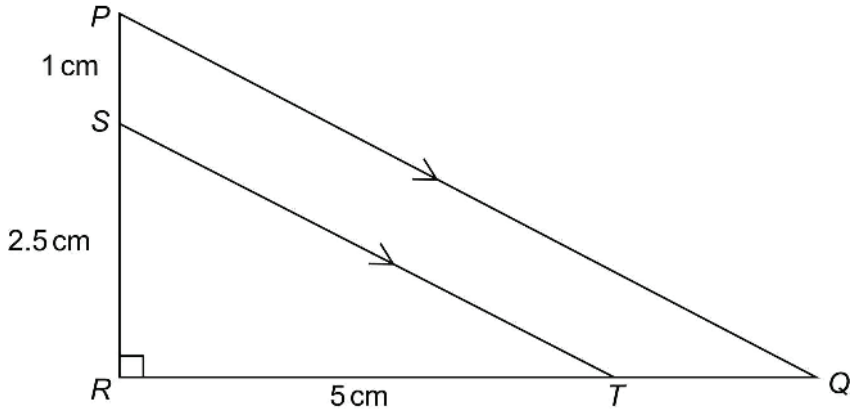
B $x > \frac{5}{14}$

C $x > \frac{7}{8}$

D $x > \frac{5}{4}$

E $x < -5$

55



[diagram not to scale]

PQR is a right-angled triangle with angle PRQ equal to 90°.

Point S is on the side PR.

Point T is on the side RQ.

The line ST is parallel to the line PQ.

$RS = 2.5\,\text{cm}$

$PS = 1\,\text{cm}$

$RT = 5\,\text{cm}$

What is the perimeter of the trapezium $PQTS$ in cm?

A $3\left(1+2\sqrt{5}\right)$

B $2\left(1+3\sqrt{3}\right)$

C $3\left(1+2\sqrt{3}\right)$

D $2\left(1+3\sqrt{5}\right)$

E $2\left(1+3\sqrt{6}\right)$

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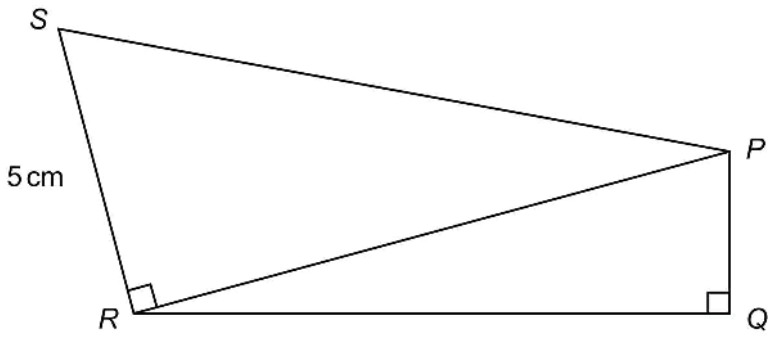
56



[diagram not to scale]

PQR and *PRS* are right-angled triangles.

Angle *PRS* = Angle *PQR* = 90°

RS = 5 cm

The area of triangle *PQR* is 14 cm^2 and $\tan PRQ = \frac{1}{\sqrt{7}}$

What is the value of $\cos RPS$?

A $\frac{2\sqrt{2}}{3}$

B $\frac{\sqrt{2}}{4}$

C $\frac{\sqrt{2}}{2}$

D $\frac{\sqrt{6}}{3}$

E $\frac{1}{3}$

57 At an athletics competition, a hammer thrower swings a hammer in a horizontal circle.

Immediately before releasing the hammer, the ball at the end of the hammer is moving at a constant angular velocity of 10 rad / s in a horizontal circular path of radius 2.5 m.

Which row in the table gives the speed and the magnitude of the acceleration of the ball just before release?

	speed (m / s)	*acceleration* (m / s²)
row 1	25	250
row 2	25	40
row 3	15	50
row 4	10	40
row 5	10	0

A row 1

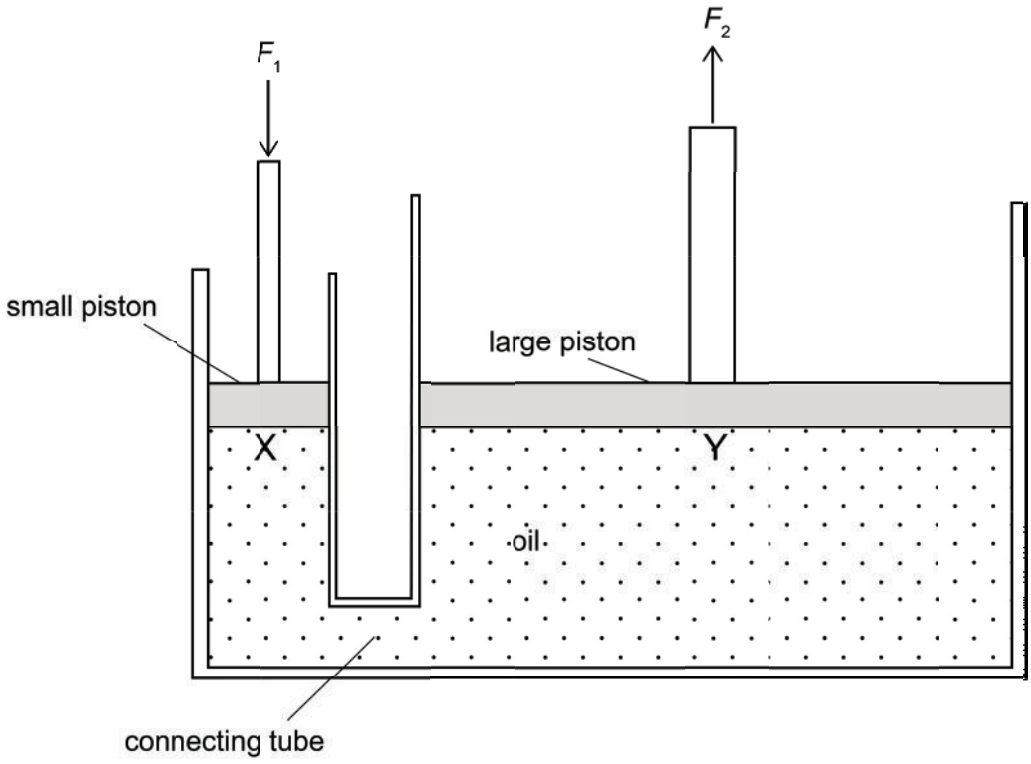
B row 2

C row 3

D row 4

E row 5

58 A hydraulic jack consists of a piston with a small cross-sectional area connected by a tube to a piston with a larger cross-sectional area. The cylinders of the pistons and the tube contain oil.



A downward force F_1 is applied to the smaller piston, which results in an upwards resultant force F_2 being exerted on the larger piston. Points X and Y are in the oil, immediately underneath the pistons, which are at the same height.

Which of the following statements about the pressure and forces in the hydraulic jack is/are correct?

1 The pressure at Y is less than the pressure at X.

2 The pressure at Y is equal to the pressure at X.

3 F_2 is greater than F_1.

4 F_2 is less than F_1.

A 2 and 3 only

B 3 only

C 1 only

D 2 and 4 only

E 1 and 4 only

59 A metal has a specific heat capacity of 500 J / (kg °C). A block of this metal has a mass of 1.20 kg and is provided with thermal energy by a heater for 5.00 minutes. The temperature of the block increases from 40.0 °C to 90.0 °C without a phase change.

What is the power of the heater?

[Assume that no thermal energy is lost to or gained from the surroundings and that the metal is at a uniform temperature at all times.]

A 100 W

B 6000 W

C 180 W

D 10 800 W

E 80 W

60 Which of the following expressions gives a quantity that can be measured in joules (J)?

[Assume that all quantities are magnitudes.]

A momentum × velocity

B $(\text{charge})^2 \times \text{resistance}$

C $(\text{mass})^2 \times \text{velocity}$

D $\dfrac{\text{specific heat capacity}}{\text{mass} \times \text{temperature change}}$

E $\dfrac{\text{voltage}}{\text{current} \times \text{time}}$