

COMBINED SCIENCE

5129/12

Paper 1 Multiple Choice

October/November 2016

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 2 2 1 1 8 5 0 4 8 5 *



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

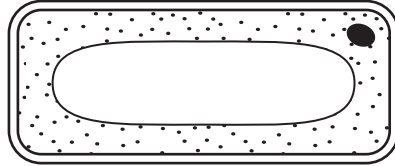
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

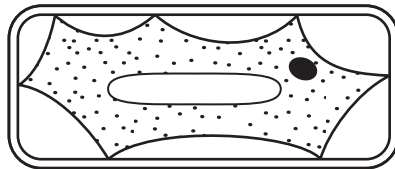
This document consists of **16** printed pages.

- 1 Which sentence about red blood cells is correct?
- A They transport carbon dioxide and contain chlorophyll.
 - B They transport carbon dioxide and contain haemoglobin.
 - C They transport oxygen and contain chlorophyll.
 - D They transport oxygen and contain haemoglobin.
- 2 The first diagram shows an onion cell in pure water.



onion cell in pure water

The cell is now placed in a concentrated sugar solution. The second diagram shows it after one hour.

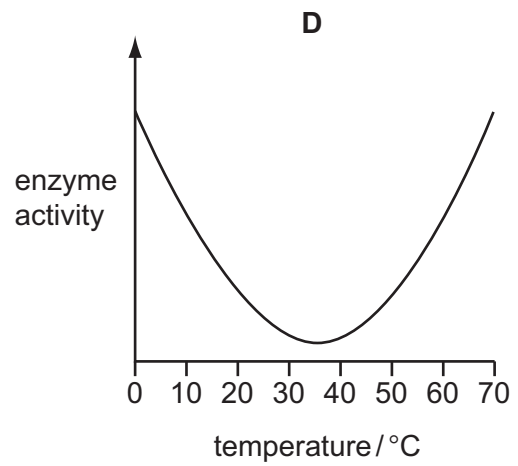
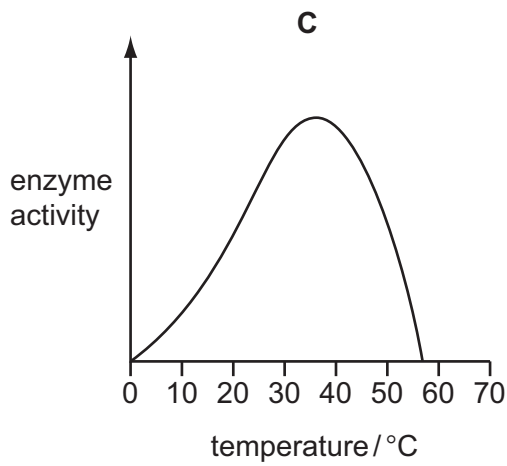
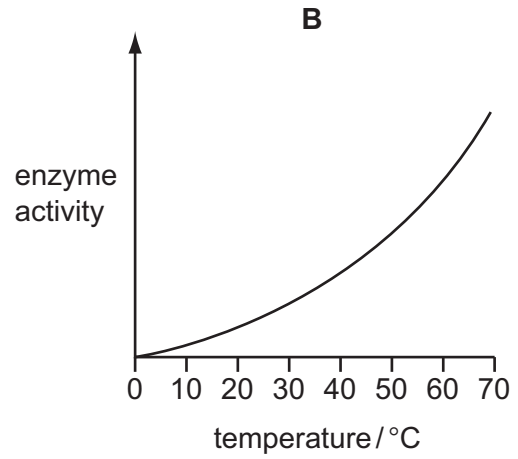
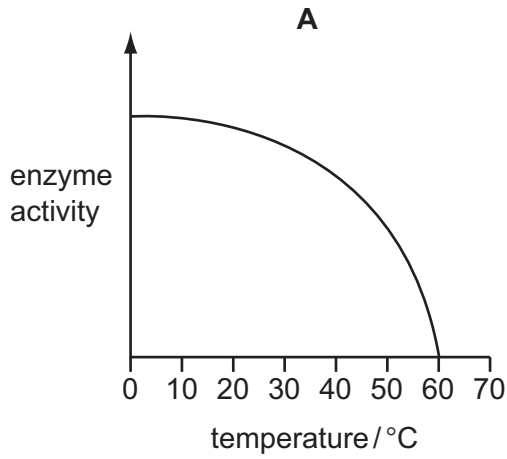


onion cell after one hour in
concentrated sugar solution

Which statement explains the change?

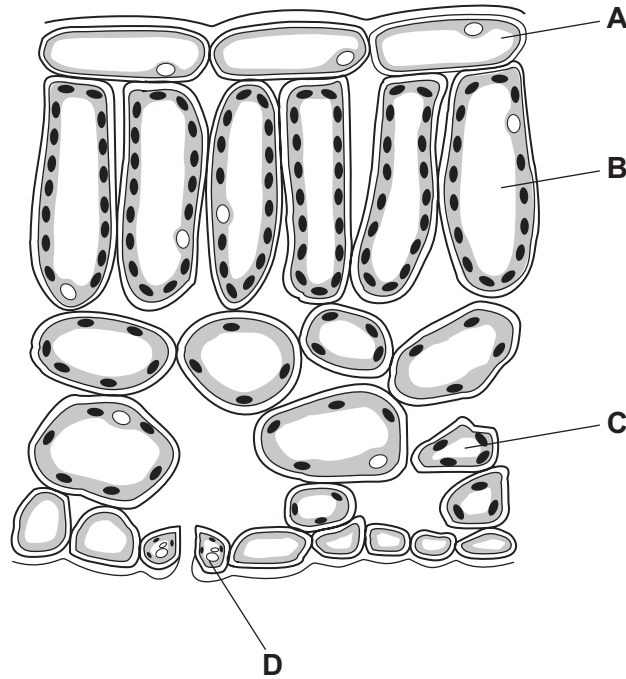
- A Sugar has moved into the cell.
- B Sugar has moved out of the cell.
- C Water has moved into the cell.
- D Water has moved out of the cell.

- 3 Which graph shows how the activity of an enzyme in the human alimentary canal varies with temperature?



4 The diagram shows a cross-section of part of a leaf.

In which cell does most photosynthesis take place?



5 The table shows information about the average daily energy demand of three age groups of males and females who have different levels of activity.

sex	age	average daily energy requirement in kJ		
		at rest	moderately active	very active
female	14–18	7500	8400	10 000
	19–30	8400	8800	10 000
	31–50	7500	8400	9200
male	14–18	9200	10 000	12 600
	19–30	10 000	11 300	12 600
	31–50	9200	9700	10 900

What can be concluded from the table?

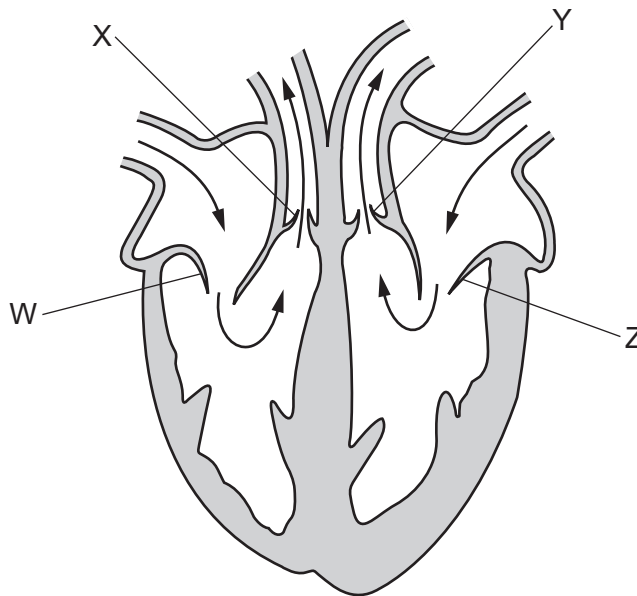
- A Activity has a greater effect than age on energy demand.
- B Females always require more energy than males.
- C Increasing age always increases energy demand.
- D The lowest energy demand is in the 14–18 age group.

6 What causes wilting to occur in a plant?

	water loss	water uptake
A	high	high
B	high	low
C	low	high
D	low	low

7 The diagram shows a human heart.

The four valves in the heart are labelled W, X, Y and Z.



Which valves would be open and which valves would be closed as blood leaves the heart?

	open	closed
A	X and Z	W and Y
B	X and Y	W and Z
C	W and Z	X and Y
D	W and Y	X and Z

8 Respiration occurs in living cells.

What is released during respiration?

- A energy
- B glucose
- C nutrients
- D oxygen

9 Which substances are excreted from the body by the kidneys?

- A carbon dioxide and nitrogen
- B carbon dioxide and urea
- C nitrogen and water
- D urea and water

10 Which structure in the eye responds to changes in the brightness of light?

- A ciliary muscle
- B iris
- C lens
- D suspensory ligaments

11 Using the drug heroin can lead to someone becoming a heroin addict.

What does 'being an addict' mean?

- A An addict has an increased reaction time.
- B An addict has to keep decreasing the amount of drug taken.
- C An addict is depressed.
- D An addict is physically dependent on the drug.

12 Orangutans live in tropical rainforests and are herbivores.

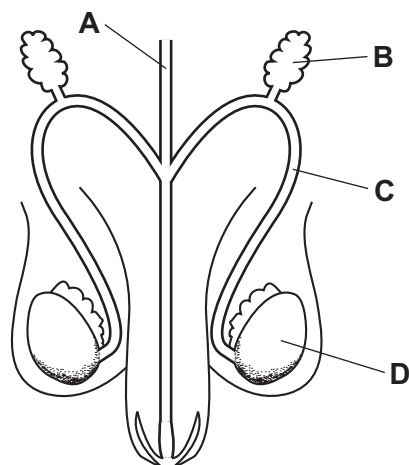
Tigers eat orangutans.

What happens to these animals if some of the rainforest is destroyed?

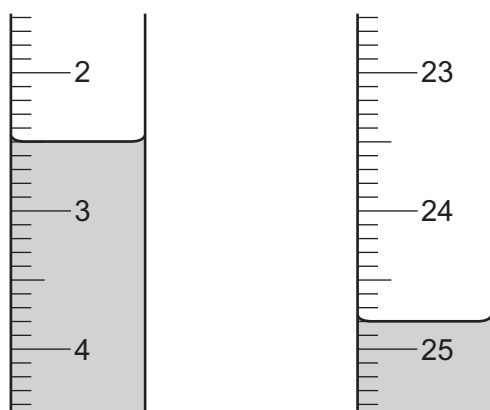
- A The number of orangutans decreases and the number of tigers remains the same.
- B The number of tigers decreases and the number of orangutans remains the same.
- C The numbers of both orangutans and tigers decrease.
- D The numbers of both orangutans and tigers remain the same.

13 The diagram shows the male reproductive system.

Which is the prostate gland?



14 Hydrochloric acid is titrated with sodium hydroxide. A hydrochloric acid solution is added to the sodium hydroxide solution from a burette. The initial and final burette readings are shown.



initial reading

final reading

Which volume of hydrochloric acid is used in the titration?

- A** 21.70 cm³ **B** 22.30 cm³ **C** 22.80 cm³ **D** 22.90 cm³

15 How many protons, neutrons and electrons are in an atom of ${}_{92}^{238}\text{U}$?

	protons	neutrons	electrons
A	92	238	92
B	92	146	92
C	146	92	238
D	238	92	146

16 Element X has an electronic structure 2,8,8,1.

Element Y has an electronic structure 2,8,6.

What is made when X and Y react?

	type of compound	formula
A	covalent compound	X_2Y
B	covalent compound	XY_2
C	ionic compound	X_2Y
D	ionic compound	XY_2

17 QR_2 is a covalently bonded compound.

Which statement is **not** correct?

- A** Element Q is a metal.
- B** Element R is a non-metal.
- C** The atoms share electrons.
- D** The compound has a low boiling point.

18 The ion of a newly discovered metal X has the symbol X^{3+} .

What is the formula of its chloride?

- A** XCl_3 **B** X_2Cl_3 **C** X_3Cl **D** X_3Cl_2

19 What is the colour of Universal Indicator when in a neutral solution?

- A** blue
- B** green
- C** purple
- D** red

20 Element X is in Group I of the Periodic Table.

The proton number of element Z is one more than the proton number of X.

Which statement is **not** correct?

- A Atoms of X have one electron in their outer shell.
- B Element Z is a metal.
- C X^+ ions have the same electron arrangement as a noble gas.
- D Z^{2+} ions have two electrons in their outer shell.

21 Which statement explains why aluminium is used to make aircraft parts?

- A It conducts electricity.
- B It conducts heat.
- C It has a low density.
- D It is reactive.

22 Which gas makes up 21% by volume of clean air?

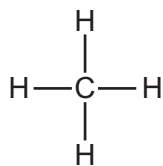
- A argon
- B carbon dioxide
- C nitrogen
- D oxygen

23 Hydrogen has many uses and is formed in different reactions.

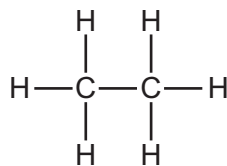
Which row correctly describes hydrogen?

	reaction to form hydrogen	use of hydrogen	test for hydrogen
A	iron + acid	manufacture of margarine	relights a glowing splint
B	sodium + water	rocket fuel	pops when a lighted splint is added
C	zinc oxide + acid	manufacture of ammonia	pops when a lighted splint is added
D	zinc + water	manufacture of ammonia	relights a glowing splint

24 The names and molecular structures of two alkanes are shown.



methane



ethane

What is the next alkane in the homologous series?

	name	formula
A	butane	C_3H_6
B	butane	C_3H_8
C	propane	C_3H_6
D	propane	C_3H_8

25 Petroleum is separated using a fractionating column. The boiling temperature of each fraction is different.

Which statement is **not** correct?

- A** Fractions with larger molecules condense at the bottom.
- B** Fractions which condense at the top are used as fuels.
- C** Fractions with lower boiling points condense nearer the top.
- D** The column is hotter at the top than the bottom.

26 An alkene can be made by heating an alkane in the presence of a catalyst.

What is the name of this process?

- A** cracking
- B** crystallisation
- C** distillation
- D** polymerisation

27 Ethanol is a clear colourless liquid that mixes with water. It has a boiling point of 78°C .

What is **not** a use for ethanol?

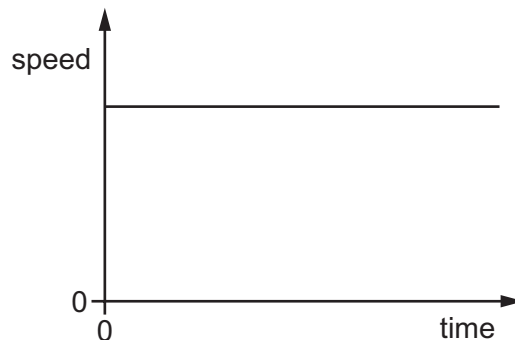
- A fertiliser
- B fuel
- C solvent
- D wine

28 A scientist needs to measure the internal diameter of a test-tube as accurately as possible.

Which instrument should be used?

- A measuring tape
- B metre rule
- C micrometer
- D vernier calipers

29 The motion of an object is represented by a speed-time graph.



Which statement about this object is correct?

- A It is at rest.
- B It is moving at uniform speed.
- C It is moving with increasing speed.
- D It is moving with uniform non-zero acceleration.

30 The table shows the masses and volumes of four objects.

Which object has the largest density?

	mass / g	volume / cm ³
A	2.0	12
B	4.0	16
C	6.0	10
D	8.0	14

31 Which energy source is used in a nuclear power station?

- A coal
- B hydrogen
- C natural gas
- D uranium

32 What is power?

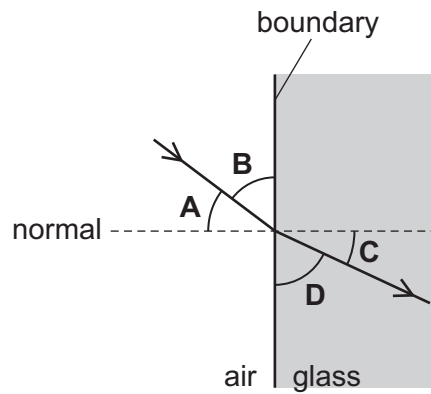
- A $\frac{\text{energy transferred}}{\text{time taken}}$
- B energy transferred \times time taken
- C $\frac{\text{force}}{\text{time taken}}$
- D force \times distance moved

33 A wave has a speed of 1.4 km/s and a wavelength of 7.0×10^{-4} m.

What is the frequency of the wave?

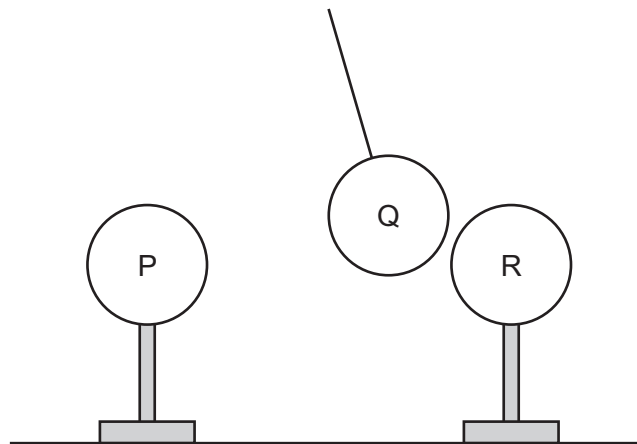
- A 9.8×10^{-4} Hz
- B 9.8×10^{-1} Hz
- C 2.0×10^3 Hz
- D 2.0×10^6 Hz

34 What is the angle of refraction for this ray of light moving from air to glass?



35 A charged sphere is suspended between two fixed spheres that are also charged.

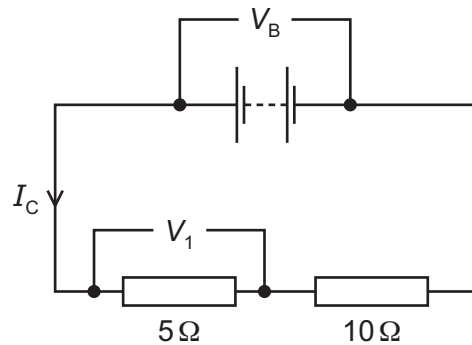
The three spheres are identical and the size of the charge on all three spheres is the same.



Which row gives the sign of the charge on each sphere?

	P	Q	R
A	negative	negative	negative
B	negative	negative	positive
C	negative	positive	negative
D	positive	positive	positive

- 36 A 5Ω resistor in series with a 10Ω resistor is connected to a battery of e.m.f. V_B . There is a current I_C through the 5Ω resistor and the p.d. across it is V_1 .



What is the current through and the p.d. across the 10Ω resistor?

	current	p.d.
A	I_C	$V_B + V_1$
B	$\frac{I_C}{2}$	$V_B - V_1$
C	$\frac{I_C}{2}$	$V_B + V_1$
D	I_C	$V_B - V_1$

- 37 A 2 kW electric heater is connected to a 240 V supply.

What is the current in the heater?

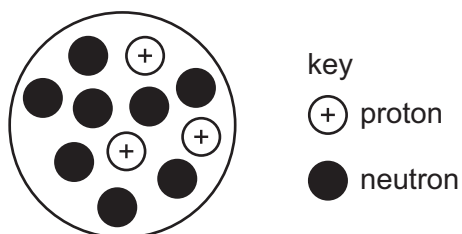
- A** 0.12 A **B** 8.3 A **C** 120 A **D** 480 A

- 38 When making a core for an electromagnet, iron is chosen in preference to steel.

Which statement gives the main reason for choosing iron?

- A** Iron easily loses its magnetism but steel does not.
B Iron is magnetic but steel is not.
C Steel easily loses its magnetism but iron does not.
D Steel is magnetic but iron is not.

- 39 The diagram represents the nucleus of a radioactive isotope of element X.



The nucleus decays by emitting a beta-particle to become the nucleus of an isotope of element Y.

Which notation represents the nuclide of element Y?

- A ${}_{10}^3\text{Y}$ B ${}_{7}^4\text{Y}$ C ${}_{4}^{10}\text{Y}$ D ${}_{4}^{11}\text{Y}$
- 40 The half-life of a radioactive material is 24 years.

The activity of a sample falls to a fraction of its initial value after 72 years.

What is the fraction?

- A $\frac{1}{3}$ B $\frac{1}{4}$ C $\frac{1}{6}$ D $\frac{1}{8}$

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The Periodic Table of Elements

		Group															
I	II	III	IV	V	VI	VII	VIII										
3 Li lithium 7	4 Be beryllium 9	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Key atomic number atomic symbol name relative atomic mass </div>										2 He helium 4					
11 Na sodium 23	12 Mg magnesium 24											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —	114 Fl flerovium —	116 Lv livermorium —	—	—	—	—

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	96 Cm curium —	97 Bk berkelium —	98 Cf californium —	99 Es einsteinium —	100 Fm fermium —	101 Md mendelevium —	102 No nobelium —	103 Lr lawrencium —

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)