



Cambridge O Level

COMBINED SCIENCE

5129/12

Paper 1 Multiple Choice

May/June 2021

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

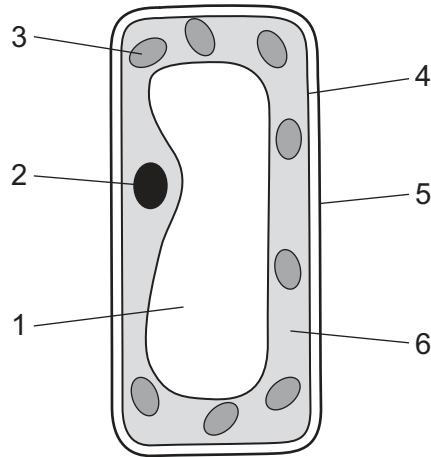
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages.



1 The diagram shows a plant cell.



Which parts of the cell are only present in plant cells?

- A** 1, 2 and 3 **B** 1, 3 and 5 **C** 2, 4 and 6 **D** 4, 5 and 6

2 Which definition of diffusion is correct?

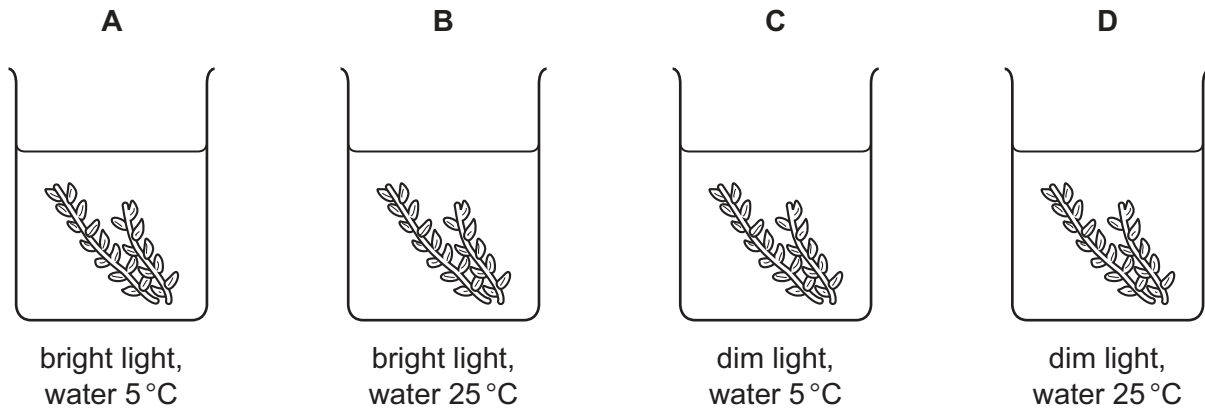
- A** the movement of molecules from a higher to a lower concentration, against a concentration gradient
B the movement of molecules from a higher to a lower concentration, down a concentration gradient
C the movement of molecules from a lower to a higher concentration, against a concentration gradient
D the movement of molecules from a lower to a higher concentration, down a concentration gradient

3 Enzymes are vital in changing insoluble materials into soluble forms so that a germinating seed can make use of them.

Which factor is important in speeding up these changes?

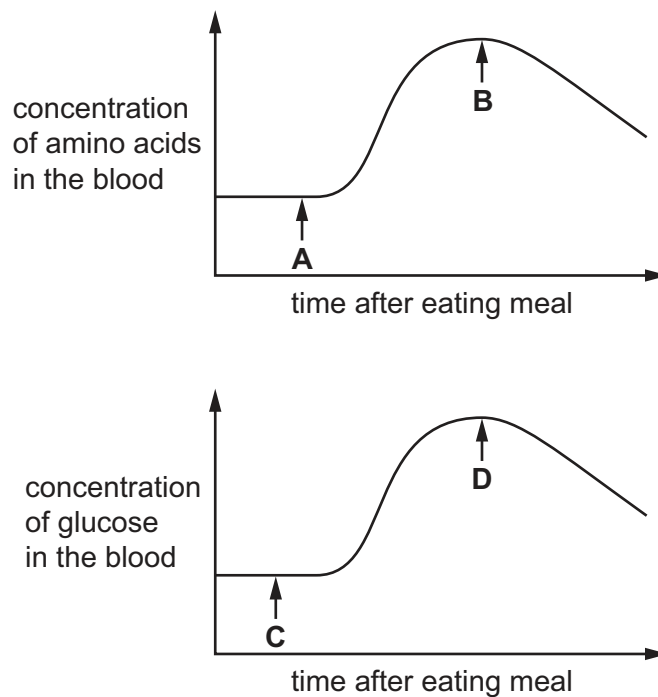
- A** carbon dioxide
B humidity
C light
D temperature

- 4 Which of the aquatic plants in the diagram below is likely to have the lowest rate of photosynthesis?



- 5 The graphs show how the concentration of amino acids and glucose in the blood change during and after a meal.

Which point shows carbohydrate has been absorbed through the wall of the small intestine?

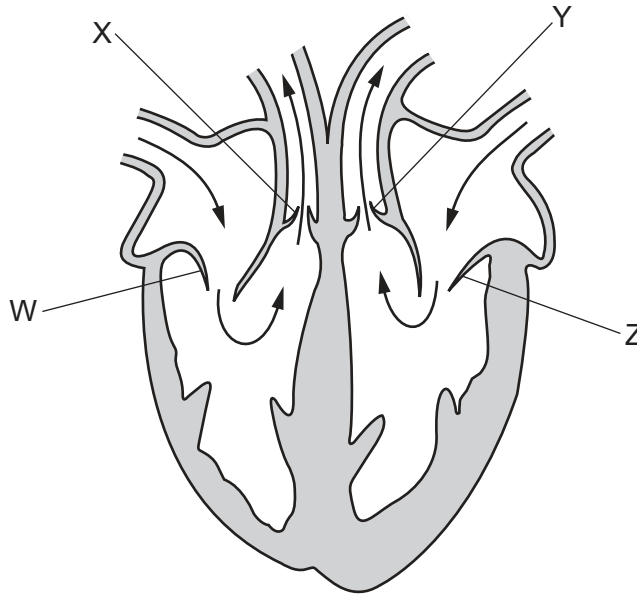


- 6 What causes a plant to wilt?

- A** when the amount of water lost during transpiration is greater than the water uptake through the roots
- B** when the amount of water lost during transpiration is less than the water uptake through the roots
- C** when the amount of water used during photosynthesis is greater than the water uptake through the roots
- D** when the amount of water used during photosynthesis is less than the water uptake through the roots

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?

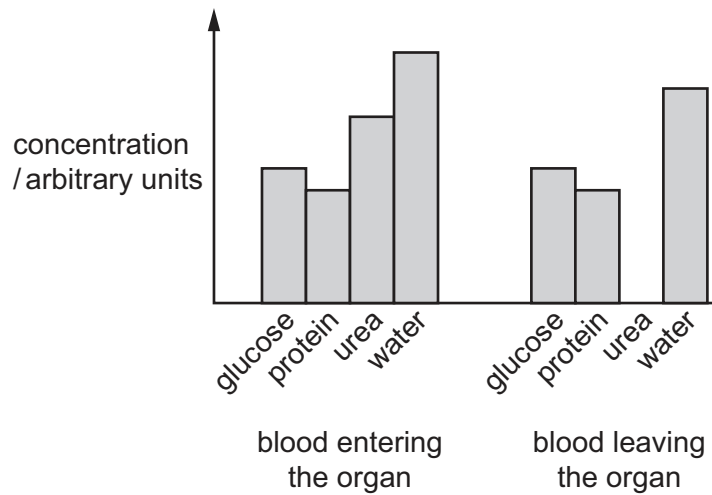
	open	closed
A	X and Z	W and Y
B	X and Y	W and Z
C	W and Z	X and Y
D	W and Y	X and Z

8 Which statements about anaerobic respiration are correct?

- 1 It produces carbon dioxide.
- 2 It produces lactic acid.
- 3 It releases more energy than aerobic respiration.
- 4 It takes place in the absence of oxygen.

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

- 9 Blood is tested for glucose, protein, urea and water before entering and after leaving an organ. The results are shown on the graph.



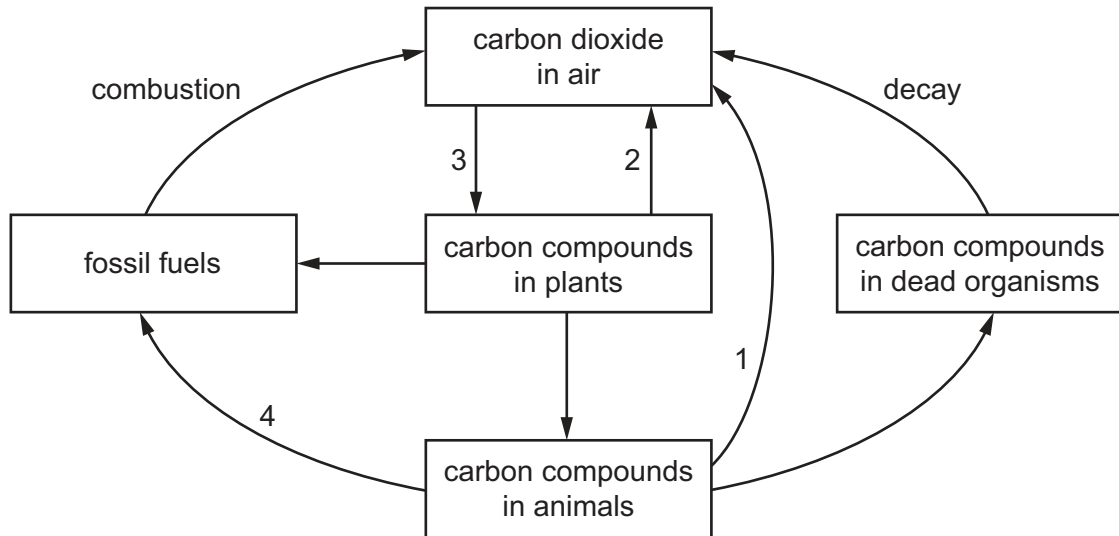
What is the organ?

- A** intestine
- B** kidney
- C** liver
- D** lungs
- 10 What is the function of the ciliary muscles of the eye?
- A** to blink the eyelids
- B** to change the shape of the lens
- C** to enlarge the size of the pupil
- D** to move the eyeball around
- 11 A drug is an1..... administered substance which modifies2..... reactions in the body.

Which words correctly complete gaps 1 and 2?

	1	2
A	externally	chemical
B	externally	physical
C	internally	chemical
D	internally	physical

12 The diagram shows the carbon cycle.



Which arrows represent respiration?

- A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

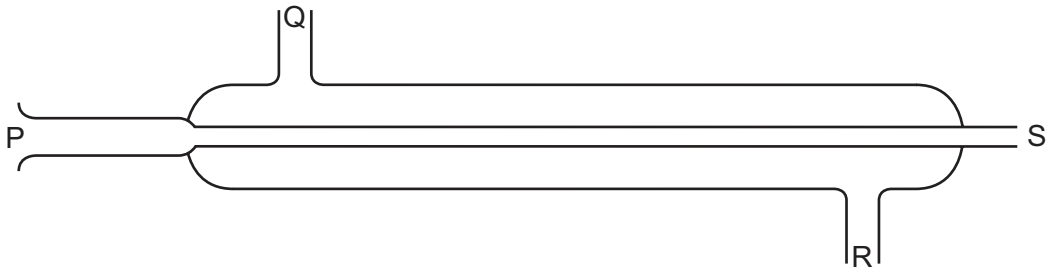
13 Strawberry plants can reproduce:

- asexually by runners
- sexually by seeds.

Which statement is correct?

- A** Plants from runners have one parent and are genetically identical.
B Plants from runners have two parents and are genetically different.
C Plants from seeds have one parent and are genetically different.
D Plants from seeds have two parents and are genetically identical.

14 The diagram shows a condenser.



Where do the hot vapour and the cooling water enter the condenser?

	hot vapour	cooling water
A	P	Q
B	P	R
C	Q	P
D	Q	S

15 Which row describes the arrangement and movement of particles in solid sodium chloride?

	arrangement	movement
A	random	moving rapidly through the solid
B	random	vibrating about a fixed point
C	regular	moving rapidly through the solid
D	regular	vibrating about a fixed point

16 Which statement describes isotopes of the same element?

- A** They have the same number of electrons and neutrons.
- B** They have the same number of neutrons and a different number of protons.
- C** They have the same number of protons and a different number of neutrons.
- D** They have the same number of protons and neutrons.

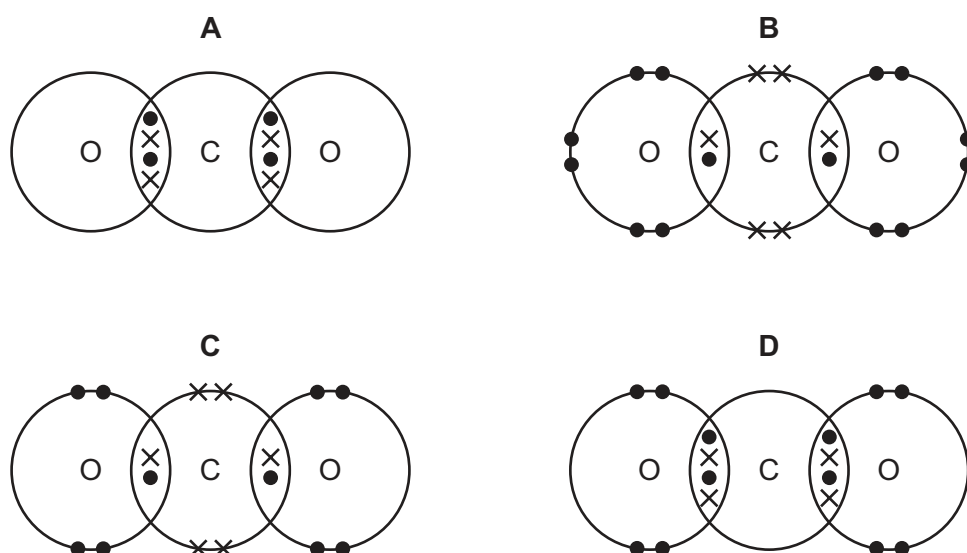
17 The atomic structure of four particles is shown.

particle	neutrons	protons	electrons
W	15	11	10
X	16	11	11
Y	16	15	16
Z	17	17	17

Which particles are ions?

- A** W and X **B** W and Y **C** X and Z **D** Y and Z

18 Which dot-and-cross diagram shows the arrangement of the outer electrons in a molecule of carbon dioxide?



19 Which formula has the greatest number of atoms?

- A** $\text{Fe}_2(\text{SO}_4)_3$
B $\text{Cu}(\text{CH}_3\text{COO})_2$
C $\text{Ca}_3(\text{PO}_4)_2$
D $(\text{NH}_4)_2\text{CO}_3$

- 20 Substance X dissolves readily in water. When X dissolves it releases positive ions and hydroxide ions.

Which statement about the solution of substance X is correct?

- A It has a pH below 7.
- B It reacts rapidly with magnesium to release hydrogen.
- C It reacts with ammonium chloride to release ammonia gas.
- D It turns universal indicator paper red.

- 21 Which electronic structure is that of a non-metal?

- A 2,5
- B 2,3
- C 2,2
- D 2,1

- 22 Four metals, W, X, Y and Z, are tested with water, steam and dilute hydrochloric acid.

The results are shown.

W does not react with cold water or steam and only reacts slowly with dilute hydrochloric acid.

Z reacts slowly with cold water, reacts moderately fast with steam and reacts rapidly with dilute hydrochloric acid.

Y reacts vigorously with cold water.

X does not react with cold water, reacts very slowly with steam and reacts moderately fast with dilute hydrochloric acid.

What is the order of reactivity of the metals?

	most reactive	→	least reactive	
A	W	X	Z	Y
B	W	Z	X	Y
C	Y	X	Z	W
D	Y	Z	X	W

- 23 What is a use of zinc?

- A containers for food
- B electrical wiring
- C making brass
- D making cutlery

24 The global atmospheric concentration of carbon dioxide has increased in the last 200 years.

Which processes are causing this increase?

- 1 emissions from motor vehicles
- 2 photosynthesis
- 3 power stations using coal and oil

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

25 Which statement about the manufacture of ammonia by the Haber process is correct?

- A** The hydrogen is obtained from the air.
- B** The process uses powdered iron as a catalyst.
- C** The process uses a low temperature.
- D** The process uses atmospheric pressure.

26 Which statement about members of an homologous series is correct?

- A** Alkanes are an homologous series with a general formula of C_nH_{2n+2} .
- B** Each member of the series has different chemical properties.
- C** Each member of the series has a different functional group.
- D** Each member of the series differs from the next by a CH_3 group.

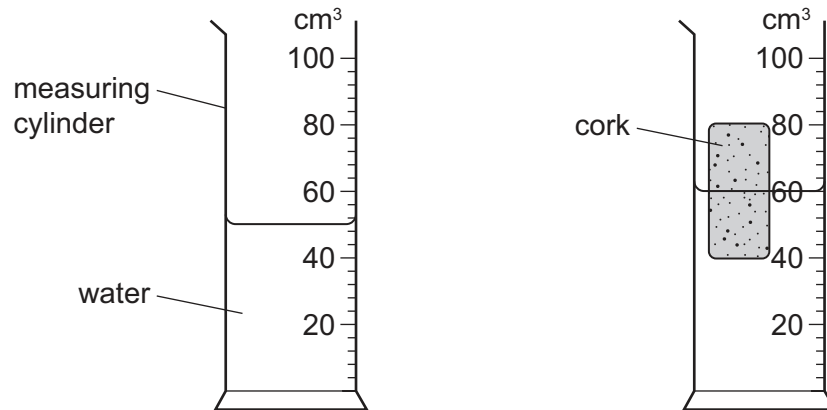
27 Petroleum is separated into fractions by fractional distillation.

Which statements are correct?

- 1 Petroleum is vaporised before it enters the fractionating tower.
- 2 Fractions with low boiling points are used as fuels.
- 3 Fractions with high boiling points condense at the top of the fractionating tower.
- 4 The fractionating tower is cool at the bottom and hot at the top.

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

- 28 The diagrams show a measuring cylinder containing water before and after a cork is placed in the cylinder.



Exactly half of the volume of the cork is under the water.

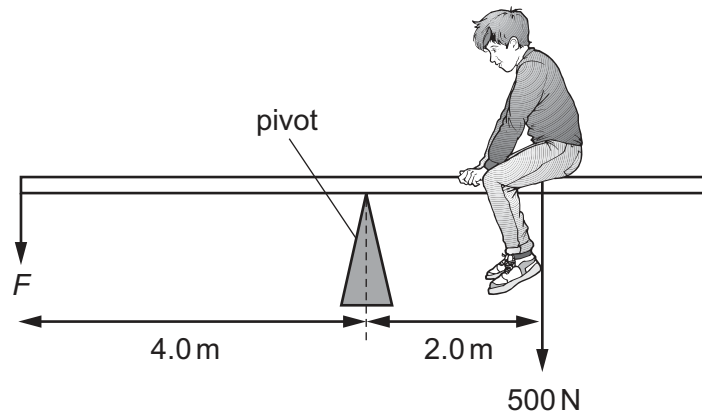
What is the total volume of the cork?

- A** 10 cm³ **B** 15 cm³ **C** 20 cm³ **D** 40 cm³
- 29 Which line on a speed–time graph shows when a body is moving at constant speed?
- A** a horizontal line
B a line that slopes downwards
C a line that slopes upwards
D a vertical line
- 30 A block of metal has a mass of 1.00 kg on Earth. The density of the metal is 8000 kg/m³.

On a planet with a weaker gravitational field, which row could be correct for the block?

	mass/kg	weight/N	density/kg/m ³
A	0.500	5	2000
B	0.500	5	8000
C	1.00	2	2000
D	1.00	2	8000

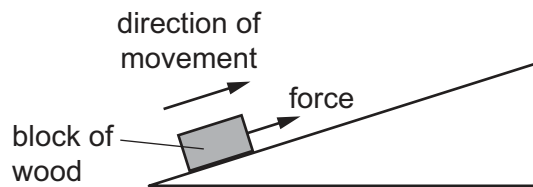
31 The diagram shows a boy of weight 500 N sitting on a see-saw. He sits 2.0 m from the pivot.



What force F is applied 4.0 m from the pivot to balance the see-saw?

- A** 250 N **B** 750 N **C** 1000 N **D** 3000 N

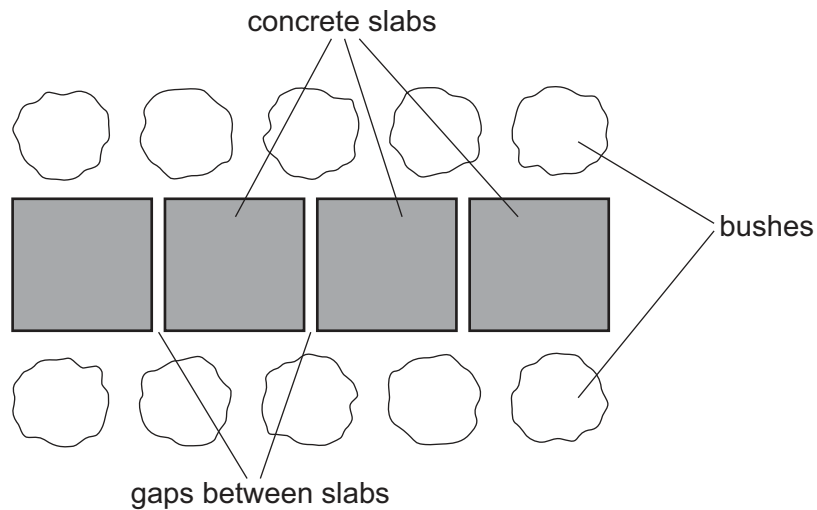
32 A force moves a block of wood up a slope at constant speed.



What happens to its kinetic energy and its gravitational potential energy as it moves up the slope?

	kinetic energy	gravitational potential energy
A	constant	decreases
B	constant	increases
C	increases	decreases
D	increases	increases

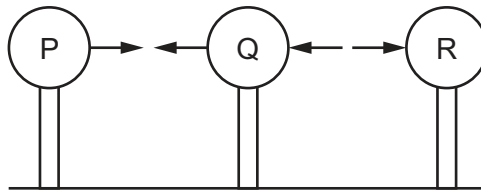
33 A path is made by laying concrete slabs on a cold day. Gaps are left between the slabs.



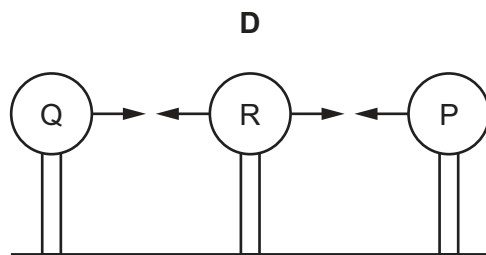
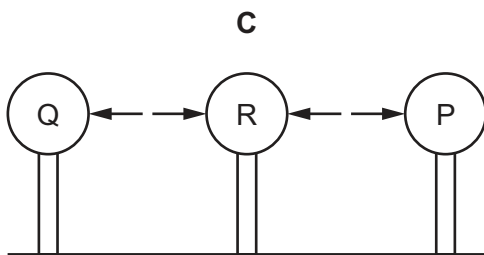
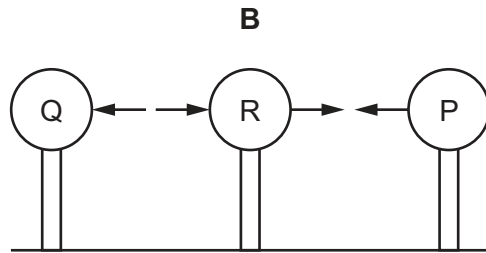
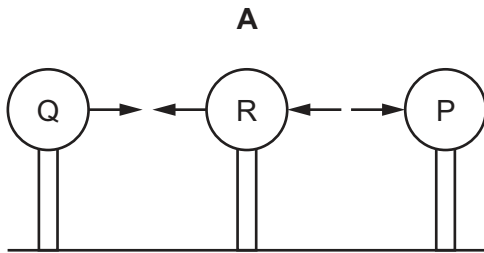
On a hot day how does the size of each slab and the gaps between the slabs change?

- A The slabs and the gaps both become larger.
 - B The slabs and the gaps both become smaller.
 - C The slabs become larger and the gaps become smaller.
 - D The slabs become smaller and the gaps become larger.
- 34 Which statement about waves is correct?
- A All transverse waves travel at the same speed in a vacuum.
 - B Longitudinal waves can travel through a vacuum.
 - C Longitudinal waves cannot transfer energy.
 - D Transverse waves have vibrations at right-angles to the direction of travel.

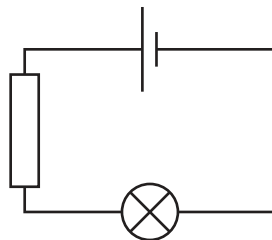
- 35 The diagram shows the direction of the electrostatic forces acting on three charged objects P, Q and R.



Which diagram correctly shows the forces acting on the objects when they are arranged in a different order?



- 36 In the circuit shown, 2.0 C of charge move through the lamp in a time of 6.0 s.



What is the current in the circuit?

- A** 0.33 A **B** 3.0 A **C** 4.0 A **D** 12 A

37 A heating element is connected to a power supply of voltage V .

The current in the element is I and produces thermal energy E in time t .

What is the correct formula for t in terms of I , V and E ?

A $t = \frac{EV}{I}$
 B $t = \frac{EI}{V}$
 C $t = \frac{E}{VI}$
 D $t = \frac{VI}{E}$

38 Which metal is used to make the core of an electromagnet?

- A** aluminium
- B** copper
- C** iron
- D** steel

39 Which table correctly identifies the locations of electrons, neutrons and protons in an atom?

A

	inside nucleus	outside nucleus
electrons	✓	
neutrons	✓	
protons		✓

B

	inside nucleus	outside nucleus
electrons		✓
neutrons		✓
protons	✓	

C

	inside nucleus	outside nucleus
electrons		✓
neutrons	✓	
protons	✓	

D

	inside nucleus	outside nucleus
electrons	✓	
neutrons		✓
protons		✓

40 The nuclide iodine-128 is radioactive with a half-life of 25 minutes.

A sample of this nuclide has an initial activity of 1600 counts/second.

What will be the activity of this sample after 100 minutes?

- A** 50
 B 100
 C 200
 D 400

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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	11 Na sodium 23	12 Mg magnesium 24	19 K potassium 39	20 Ca calcium 40	37 Rb rubidium 85	55 Cs caesium 133	87 Fr francium —	1 H hydrogen 1	2 He helium 4	5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20																																																																																																																																																																																				
11 Na sodium 23	12 Mg magnesium 24	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 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 —	118 Og oganesson —	119 Uue unbinilium —	120 Uub unbinilium —	121 Uut ununilium —	122 Uuq ununilium —	123 Uup ununilium —	124 Uuq ununilium —	125 Uup ununilium —	126 Uuq ununilium —	127 Uup ununilium —	128 Uuq ununilium —	129 Uup ununilium —	130 Uuq ununilium —	131 Uup ununilium —	132 Uuq ununilium —	133 Uup ununilium —	134 Uuq ununilium —	135 Uup ununilium —	136 Uuq ununilium —	137 Uup ununilium —	138 Uuq ununilium —	139 Uup ununilium —	140 Uuq ununilium —	141 Uup ununilium —	142 Uuq ununilium —	143 Uup ununilium —	144 Uuq ununilium —	145 Uup ununilium —	146 Uuq ununilium —	147 Uup ununilium —	148 Uuq ununilium —	149 Uup ununilium —	150 Uuq ununilium —	151 Uup ununilium —	152 Uuq ununilium —	153 Uup ununilium —	154 Uuq ununilium —	155 Uup ununilium —	156 Uuq ununilium —	157 Uup ununilium —	158 Uuq ununilium —	159 Uup ununilium —	160 Uuq ununilium —	161 Uup ununilium —	162 Uuq ununilium —	163 Uup ununilium —	164 Uuq ununilium —	165 Uup ununilium —	166 Uuq ununilium —	167 Uup ununilium —	168 Uuq ununilium —	169 Uup ununilium —	170 Uuq ununilium —	171 Uup ununilium —	172 Uuq ununilium —	173 Uup ununilium —	174 Uuq ununilium —	175 Uup ununilium —	176 Uuq ununilium —	177 Uup ununilium —	178 Uuq ununilium —	179 Uup ununilium —	180 Uuq ununilium —	181 Uup ununilium —	182 Uuq ununilium —	183 Uup ununilium —	184 Uuq ununilium —	185 Uup ununilium —	186 Uuq ununilium —	187 Uup ununilium —	188 Uuq ununilium —	189 Uup ununilium —	190 Uuq ununilium —	191 Uup ununilium —	192 Uuq ununilium —	193 Uup ununilium —	194 Uuq ununilium —	195 Uup ununilium —	196 Uuq ununilium —	197 Uup ununilium —	198 Uuq ununilium —	199 Uup ununilium —	200 Uuq ununilium —	201 Uup ununilium —	202 Uuq ununilium —	203 Uup ununilium —	204 Uuq ununilium —	205 Uup ununilium —	206 Uuq ununilium —	207 Uup ununilium —	208 Uuq ununilium —	209 Uup ununilium —	210 Uuq ununilium —	211 Uup ununilium —	212 Uuq ununilium —	213 Uup ununilium —	214 Uuq ununilium —	215 Uup ununilium —	216 Uuq ununilium —	217 Uup ununilium —	218 Uuq ununilium —	219 Uup ununilium —	220 Uuq ununilium —	221 Uup ununilium —	222 Uuq ununilium —	223 Uup ununilium —	224 Uuq ununilium —	225 Uup ununilium —	226 Uuq ununilium —	227 Uup ununilium —	228 Uuq ununilium —	229 Uup ununilium —	230 Uuq ununilium —	231 Uup ununilium —	232 Uuq ununilium —	233 Uup ununilium —	234 Uuq ununilium —	235 Uup ununilium —	236 Uuq ununilium —	237 Uup ununilium —	238 Uuq ununilium —	239 Uup ununilium —	240 Uuq ununilium —	241 Uup ununilium —	242 Uuq ununilium —	243 Uup ununilium —	244 Uuq ununilium —	245 Uup ununilium —	246 Uuq ununilium —	247 Uup ununilium —	248 Uuq ununilium —	249 Uup ununilium —	250 Uuq ununilium —	251 Uup ununilium —	252 Uuq ununilium —	253 Uup ununilium —	254 Uuq ununilium —	255 Uup ununilium —	256 Uuq ununilium —	257 Uup ununilium —	258 Uuq ununilium —	259 Uup ununilium —	260 Uuq ununilium —	261 Uup ununilium —	262 Uuq ununilium —	263 Uup ununilium —	264 Uuq ununilium —	265 Uup ununilium —	266 Uuq ununilium —	267 Uup ununilium —	268 Uuq ununilium —	269 Uup ununilium —	270 Uuq ununilium —	271 Uup ununilium —	272 Uuq ununilium —	273 Uup ununilium —	274 Uuq ununilium —	275 Uup ununilium —	276 Uuq ununilium —	277 Uup ununilium —	278 Uuq ununilium —	279 Uup ununilium —	280 Uuq ununilium —	281 Uup ununilium —	282 Uuq ununilium —	283 Uup ununilium —	284 Uuq ununilium —	285 Uup ununilium —	286 Uuq ununilium —	287 Uup ununilium —	288 Uuq ununilium —	289 Uup ununilium —	290 Uuq ununilium —	291 Uup ununilium —	292 Uuq ununilium —	293 Uup ununilium —	294 Uuq ununilium —	295 Uup ununilium —	296 Uuq ununilium —	297 Uup ununilium —	298 Uuq ununilium —	299 Uup ununilium —	300 Uuq ununilium —

Key
atomic number
atomic symbol
name
relative atomic mass

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.).