Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/02**

Paper 2 Multiple Choice (Extended) **For Examination from 2019**

SPECIMEN PAPER

45 minutes

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

READ THESE INSTRUCTIONS FIRST

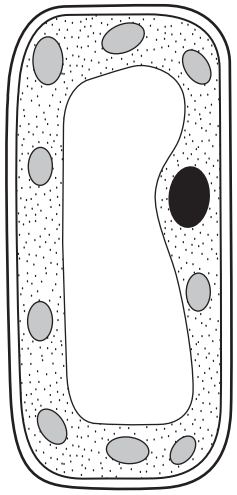
Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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 18.
Electronic calculators may be used.

1 The width of the plant cell in the diagram is 30 mm when it is magnified by a microscope (magnification shown in brackets).



(×1000)

What is the actual width of the cell?

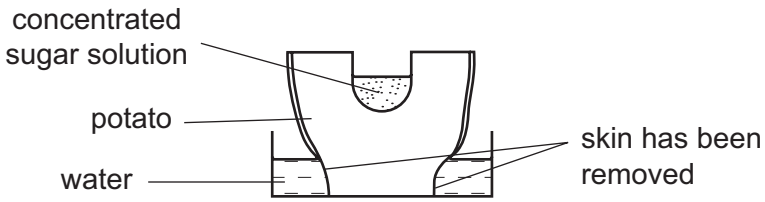
A 0.003 mm

B 0.03 mm

C 0.3 mm

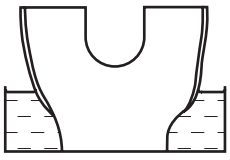
D 30 mm

2 The diagram shows an experiment using an uncooked potato. The skin of the potato was removed as shown.

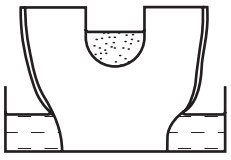


Which diagram shows the result of the experiment after 24 hours?

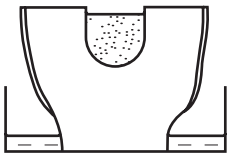
A



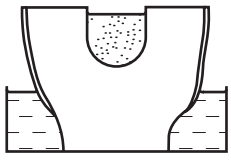
B



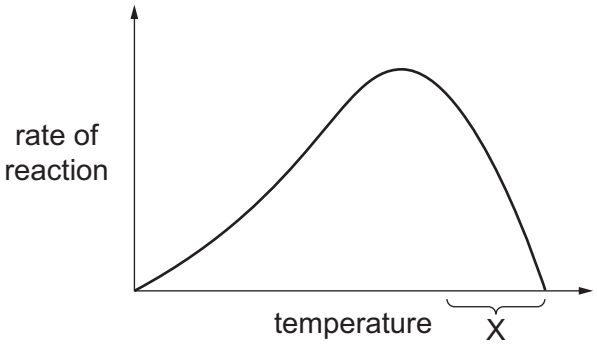
C



D



3 The graph shows how the rate of an enzyme-controlled reaction between starch and amylase changes with temperature. What explains the shape of the graph within the temperature range marked X?



A The higher temperature breaks down the enzyme's substrate.

B The higher temperature decreases the kinetic energy of the enzyme.

C The higher temperature denatures the enzyme.

D The higher temperature helps the enzyme to function as a biological catalyst.

4 A healthy plant has been in the light. A leaf is taken from the plant, decolourised and then tested with iodine solution.

What colour does the iodine solution change to?

A black

B brick red

C pale blue

D yellow

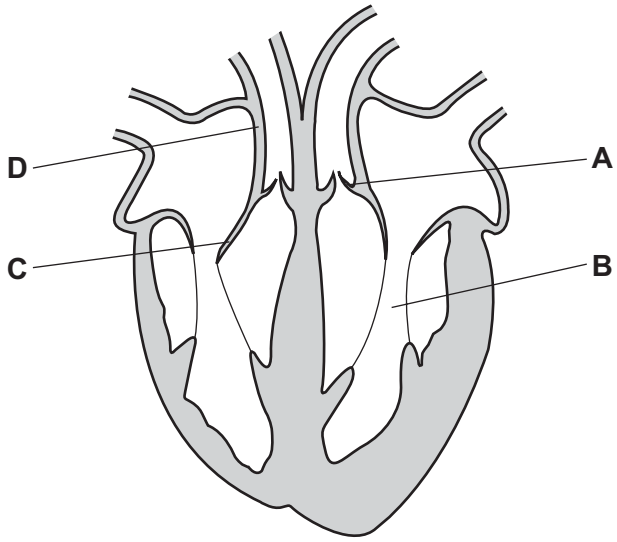
5 A man reduces the amount of salt, saturated fat and fibre in his diet.

How could these changes affect the risk of developing the following conditions?

	constipation	coronary heart disease
A	increased risk	increased risk
B	increased risk	reduced risk
C	reduced risk	increased risk
D	reduced risk	reduced risk

6 The diagram shows a section through the human heart.

Which structure is the ventricle?



7 One of the effects of tobacco smoke on the gas exchange system is that haemoglobin carries oxygen around the body less efficiently.

Which component of tobacco smoke is responsible for this effect?

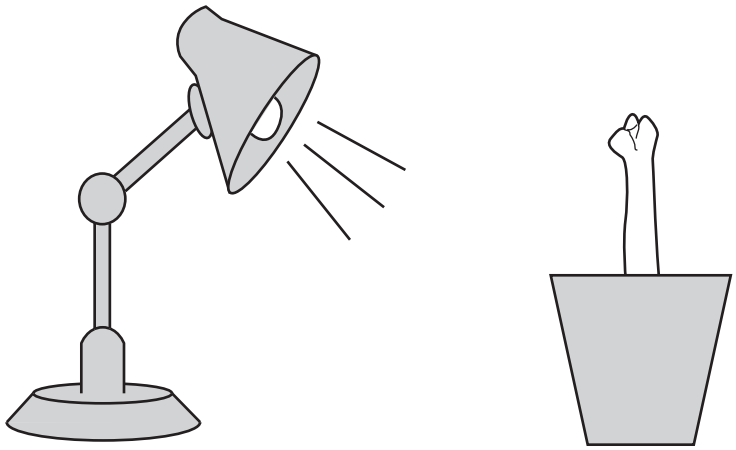
A carbon monoxide

B nicotine

C smoke particles

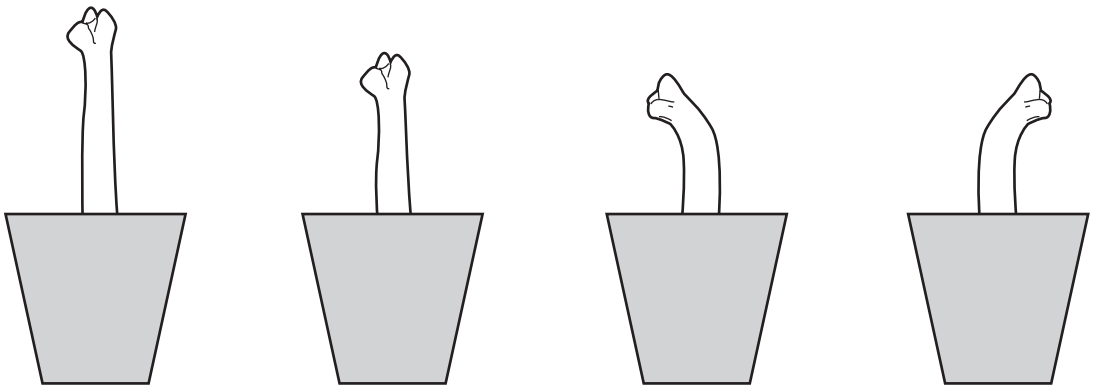
D tar

8 The diagram shows a light from a lamp shining from one direction only onto a shoot.



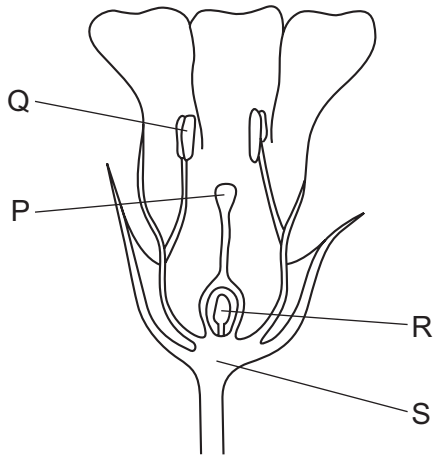
The shoot was left in the light for 48 hours.

Which diagram shows how the shoot would look after 48 hours under the influence of auxin?



A **B** **C** **D**

9 The diagram shows a section through a flower.



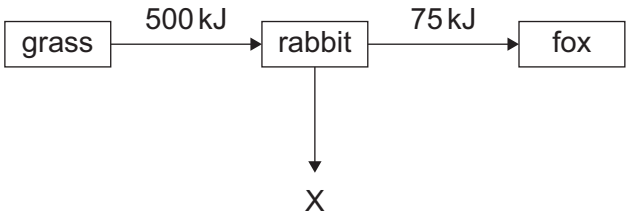
In which parts of the flower are pollen grains produced and received?

	pollen grains produced	pollen grains received
A	Q	P
B	Q	S
C	S	P
D	S	Q

10 Which row in the table describes female gametes compared to male gametes?

	size	number produced	mobility
A	larger	fewer	less mobile
B	larger	greater	more mobile
C	smaller	fewer	more mobile
D	smaller	greater	less mobile

11 A food chain is shown below. The numbers show the amount of energy, measured in kJ, that passes from one organism to another.



Calculate how much energy is lost from this food chain at X.

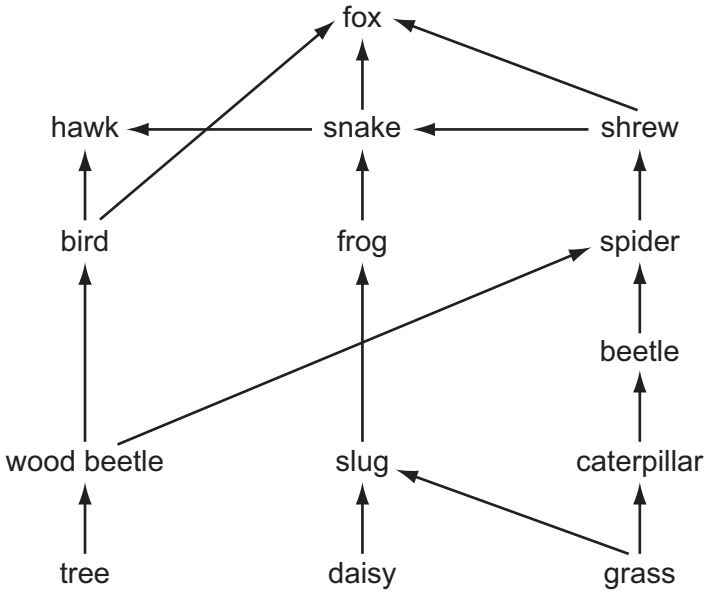
A 25 kJ

B 75 kJ

C 425 kJ

D 575 kJ

12 The diagram shows a food web.



How many producers and how many consumers are shown in this food web?

	number of producers	number of consumers
A	3	3
B	3	11
C	11	3
D	13	1

13 Eutrophication is one of the consequences of water pollution.

Some of the stages of eutrophication are listed in the wrong order.

1 Increased aerobic respiration by decomposers.

2 Death of organisms requiring dissolved oxygen in water.

3 Increased availability of nitrate.

4 Increased growth of producers.

What is the correct order of these stages of eutrophication?

A $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$

B $1 \rightarrow 3 \rightarrow 2 \rightarrow 4$

C $3 \rightarrow 4 \rightarrow 1 \rightarrow 2$

D $3 \rightarrow 1 \rightarrow 4 \rightarrow 2$

14 Which row in the table correctly describes the three substances?

	air	brass	iron
A	compound	compound	element
B	element	mixture	compound
C	mixture	element	compound
D	mixture	mixture	element

15 Sodium chloride is an ionic crystalline substance with a high melting point.

Which statement describes the oppositely charged ions in sodium chloride crystals?

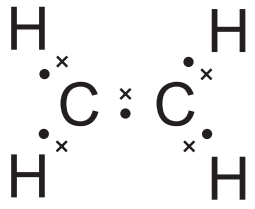
A There is strong attraction between them and a random arrangement.

B There is strong attraction between them and a regular arrangement.

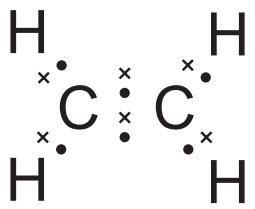
C There is weak attraction between them and a random arrangement.

D There is weak attraction between them and a regular arrangement.

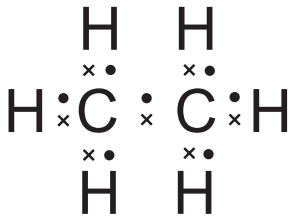
16 What is the dot-and-cross diagram for a molecule of ethene?



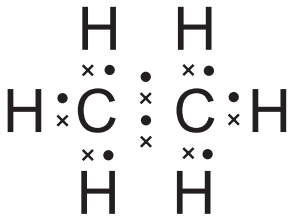
A



B



C



D

17 Hexane, C_6H_{14}, burns in an excess of oxygen, forming carbon dioxide and water.

What is the equation for this reaction?

A $C_6H_{14} + 9O_2 \rightarrow 6CO_2 + 7H_2O$

B $C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

C $2C_6H_{14} + 19O_2 \rightarrow 6CO_2 + 7H_2O$

D $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

18 Molten copper bromide is electrolysed. The products are collected and cooled to room temperature.

Which row describes the cooled products?

	anode product	cathode product
A	brown liquid	reddish-brown solid
B	reddish-brown solid	brown liquid
C	colourless gas	reddish-brown solid
D	silvery solid	colourless gas

[Turn over

19 Which statement describes bond breaking?

A It is an endothermic process which results in a temperature decrease.

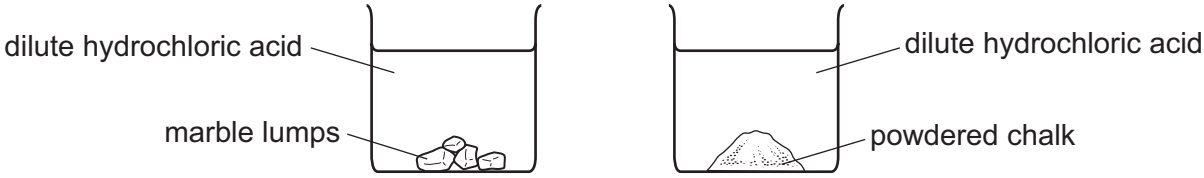
B It is an endothermic process which results in a temperature increase.

C It is an exothermic process which results in a temperature decrease.

D It is an exothermic process which results in a temperature increase.

20 Marble and chalk are two forms of calcium carbonate.

Equal masses of marble lumps and powdered chalk are added to dilute hydrochloric acid.



The marble takes longer than the chalk to fully react.

Why is this?

A Marble is more reactive than chalk.

B Marble is more soluble than chalk.

C The marble has a smaller surface area than chalk.

D The marble is more basic than chalk.

21 Which row in the table describes an alkali?

	solubility in water	reaction with an acid
A	insoluble	does not react
B	insoluble	reacts
C	soluble	does not react
D	soluble	reacts

22 The table shows the results of tests on an aqueous solution of compound X.

test	result
blue litmus paper	turns red
aqueous silver nitrate	white precipitate formed

What is X?

A HCl

B HNO_3

C $NaCl$

D NaOH

23 Metal X reacts rapidly with cold water.

Metal Y does not react with dilute hydrochloric acid.

Which row describes the reactivities of X and Y?

	reactivity of metal	reactivity compared to hydrogen
A	X is more reactive than Y	X is less reactive than hydrogen
B	X is more reactive than Y	X is more reactive than hydrogen
C	Y is more reactive than X	Y is less reactive than hydrogen
D	Y is more reactive than X	Y is more reactive than hydrogen

24 Carbon is used to extract copper from copper oxide.

Which statement about the process is correct?

A Carbon is more reactive than copper.

B Carbon oxidises copper oxide.

C Copper is more reactive than carbon.

D Copper oxide reduces carbon.

25 Which statement describes the reactivity of potassium?

A It forms negative ions very easily.

B It forms positive ions more readily than lithium does.

C It is displaced from its salts by copper.

D It is displaced from its salts by sodium.

26 Which row in the table describes the method of extraction of aluminium, and the reason for using this method?

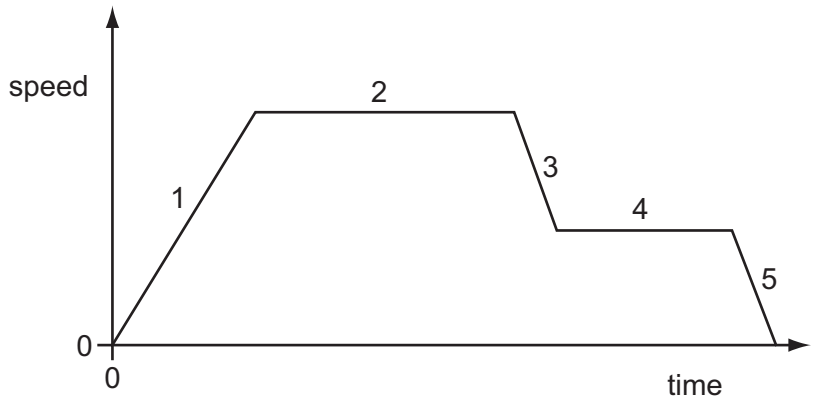
	method of extraction	reason
A	heat with carbon	aluminium is less reactive than carbon
B	heat with carbon	aluminium is more reactive than carbon
C	electrolysis	aluminium is more reactive than carbon
D	electrolysis	aluminium is resistant to corrosion

27 Petroleum is separated into useful fractions by fractional distillation.

Which row in the table describes the properties of the compounds in the fraction obtained from the top of the fractionating column?

	boiling point	molecular size	intermolecular attractive forces
A	high	large	weak
B	high	small	strong
C	low	large	strong
D	low	small	weak

28 The speed-time graph for a car journey is shown.



During which two parts of the journey is the car moving at constant speed?

A 1 and 3

B 1 and 5

C 2 and 4

D 3 and 5

29 The strength of the gravitational field on the Moon is less than the strength of the gravitational field on Earth.

An object has mass *M* and weight *W* on the Moon.

What is the mass and what is the weight of the object on Earth?

	mass	weight
A	*M*	more than *W*
B	*M*	*W*
C	more than *M*	more than *W*
D	more than *M*	*W*

30 The equation for Hooke's Law relates the extension of a spring to the load applied to it.

In an experiment, loads are applied to a spring and the spring extends. The table shows the results.

load / N	0	12	24	36	48	60	72
length of spring / cm	15	18	21	24	27	30	33

What is the value of the spring constant *k* for this spring, and has the spring been loaded past its limit of proportionality?

	$\frac{\text{spring constant } k}{\text{N/cm}}$	loaded past limit of proportionality?
A	4.0	no
B	4.0	yes
C	12	no
D	12	yes

31 A ball rolls along a frictionless, horizontal track at an initial speed of 8.0 m / s. It reaches a sloping section of the track and continues to roll up the slope.

What is the maximum vertical height that the ball reaches up the slope?

The acceleration of free fall *g* is 10 m / s^2. Ignore air resistance.

A 0.80 m

B 3.2 m

C 32 m

D 80 m

32 In which pair of energy resources is the Sun **not** the original source of energy?

A coal and oil

B geothermal and nuclear

C hydroelectricity and natural gas

D wind and waves

33 A gas is trapped in a sealed container of constant volume. The gas is heated.

What effect does this have on the gas molecules?

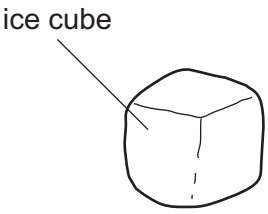
A The average distance between the molecules increases.

B The average mass of the molecules increases.

C The molecules expand.

D The molecules move more quickly.

34 The diagram shows an ice cube surrounded by air. The ice cube cools the air around it. This cooling changes the density of the air and causes the air to move.



Which row in the table shows the change in density of the air and the direction in which the air moves?

	density change	direction of movement
A	decreases	downwards
B	decreases	upwards
C	increases	downwards
D	increases	upwards

35 A water wave with a wavelength of 2.0 cm moves a distance of 900 cm in 1.0 minute.

What is its frequency?

A 7.5 Hz

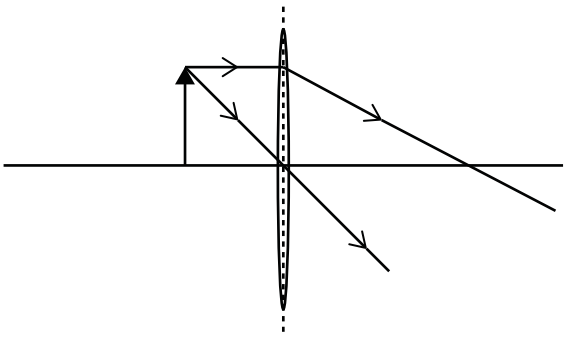
B 30 Hz

C 450 Hz

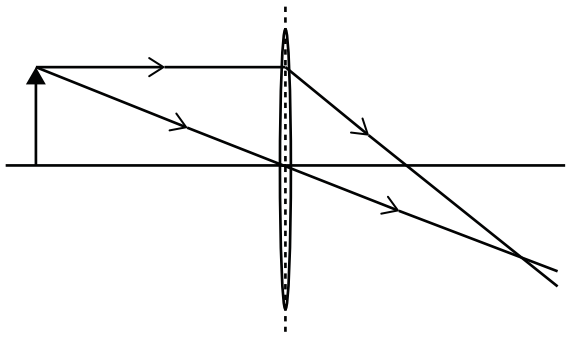
D 1800 Hz

36 Which ray diagram shows how an image is formed by a magnifying glass?

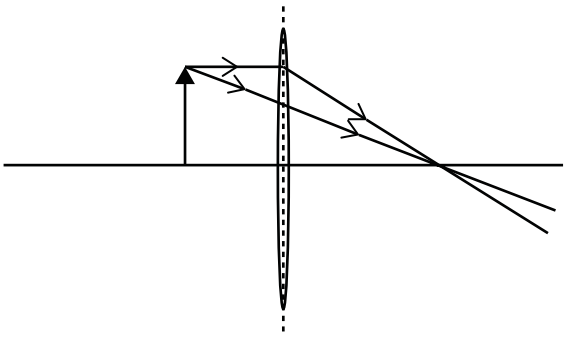
A



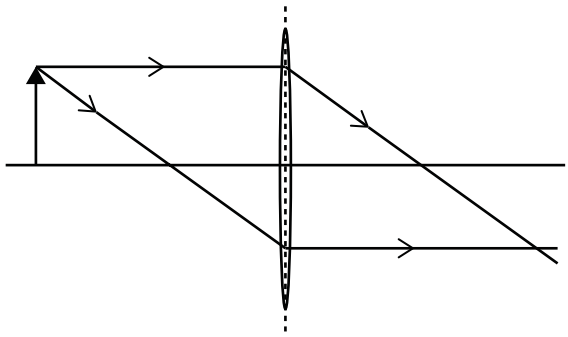
B



C



D



37 Which electromagnetic waves are found immediately either side of the visible region of the electromagnetic spectrum?

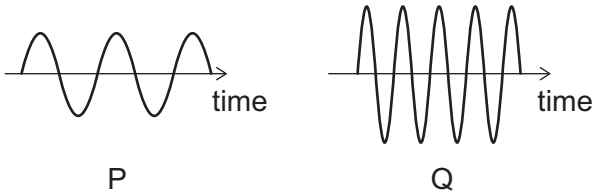
A infra-red and ultraviolet

B microwaves and infra-red

C microwaves and X-rays

D ultraviolet and X-rays

38 The diagrams represent two sound waves. The diagrams are drawn to the same scale.



Which statement correctly compares the pitch and the loudness of the two sounds?

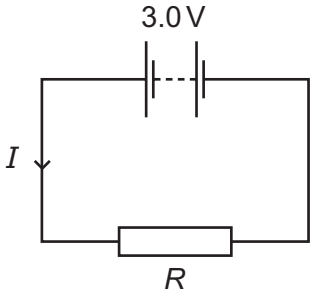
A P has a higher pitch and is louder than Q.

B P has a higher pitch and is quieter than Q.

C P has a lower pitch and is louder than Q.

D P has a lower pitch and is quieter than Q.

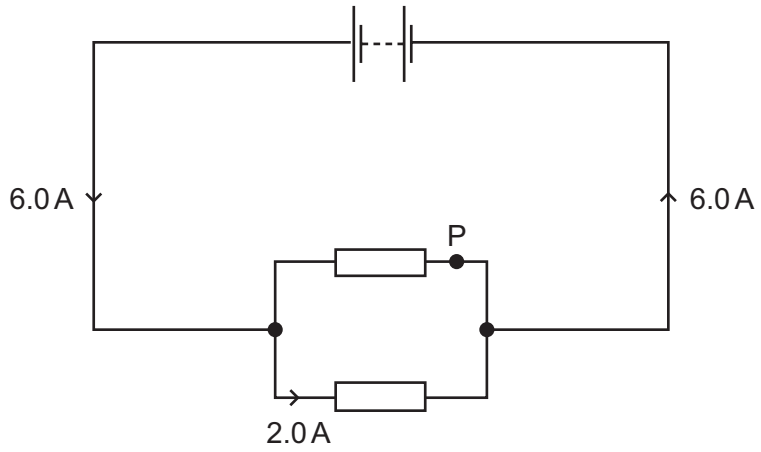
39 The circuit shows a 3.0 V battery connected to a resistor of resistance *R*. There is a current *I* in the resistor.



Which row in the table shows a possible pair of values of *I* and *R*?

	I/A	*R*/Ω
A	1.5	1.5
B	1.5	2.0
C	4.0	12
D	6.0	2.0

40 The diagram shows two resistors connected to a battery. The currents in different parts of the circuit are indicated.



What is the current at point P?

A 2.0A

B 4.0A

C 8.0A

D 14A

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											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
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 –		

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 dm^3 at room temperature and pressure (r.t.p.).