



Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/12

Paper 1 Multiple Choice (Core)

February/March 2023

45 minutes

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.

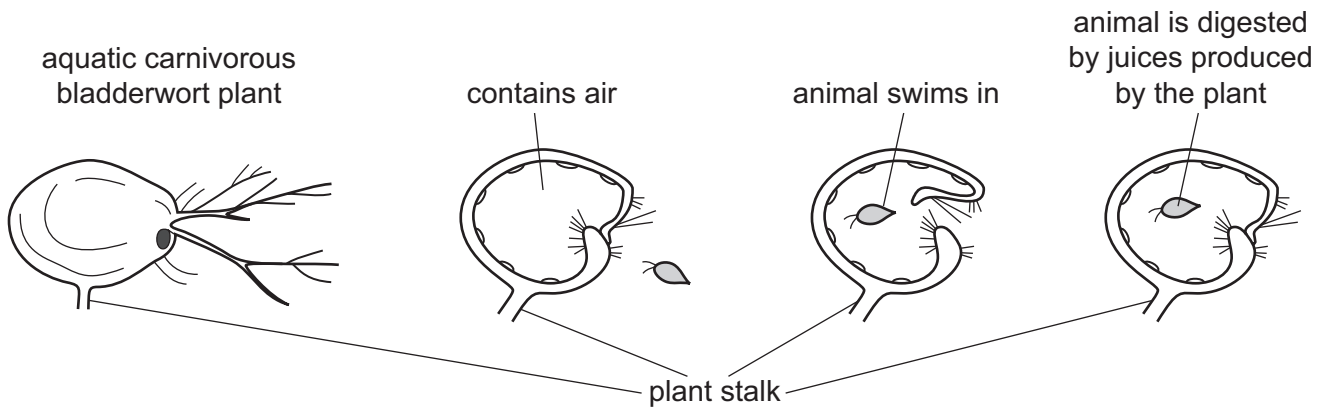
INFORMATION

- 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 **20** pages. Any blank pages are indicated.



- 1 The diagram shows how an aquatic carnivorous bladderwort plant reacts to tiny aquatic organisms that swim by.



Which characteristics of living organisms are shown by this plant?

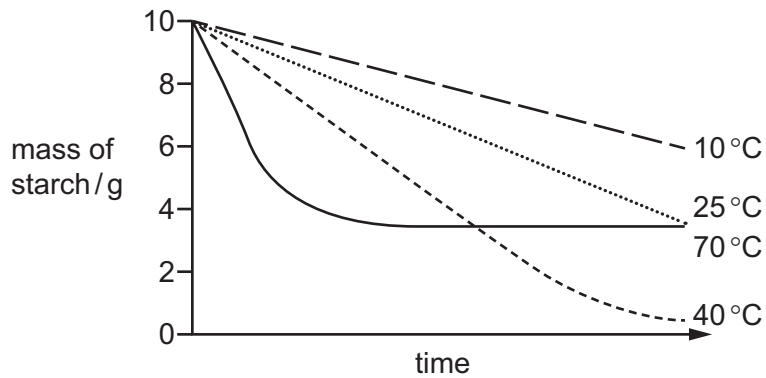
- A** excretion and growth
B growth and sensitivity
C nutrition and excretion
D nutrition and sensitivity
- 2 Which structure is found inside some living plant cells but **not** in animal cells?
- A** cell membrane
B chloroplast
C nucleus
D stomata
- 3 Tests are carried out on a colourless liquid. The results are shown.

test	resultant colour
biuret	purple
ethanol emulsion	white
iodine	brown

Which food groups does the liquid contain?

- A** protein and fat
B protein and starch
C reducing sugar and fat
D starch and fat

- 4 The graph shows the rate at which 10g of starch is broken down by amylase at four different temperatures.

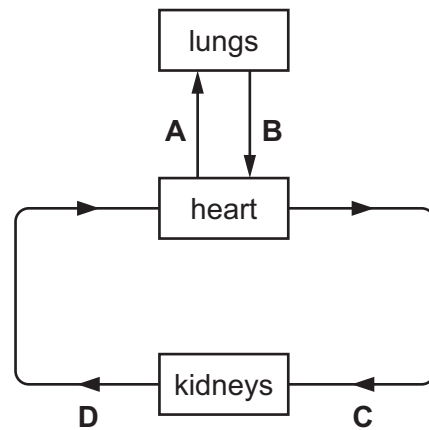


At which temperature does amylase work best to break down starch?

- A** 10°C **B** 25°C **C** 40°C **D** 70°C
- 5 Why are nitrate ions necessary for plant growth?
- A** They are essential for producing starch.
B They are found in the chloroplasts.
C They are part of the cell sap.
D They are used in making amino acids.
- 6 Which statements about chemical digestion are correct?
- 1 It breaks food into smaller pieces.
 - 2 It converts small molecules into larger ones.
 - 3 It produces molecules that can be absorbed.
 - 4 It produces small molecules.
- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

7 The arrows in the diagram represent blood vessels.

Which vessel is the pulmonary vein?

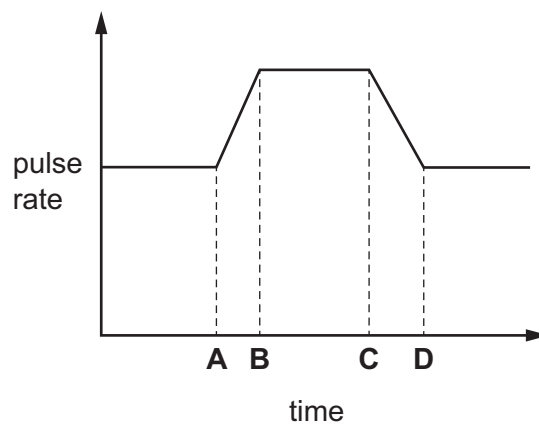


8 Which process provides the energy for the maintenance of a constant body temperature?

- A homeostasis
- B photosynthesis
- C respiration
- D sweating

9 The graph shows the pulse rate over a period of time.

At which point is adrenaline released into the blood?



10 Which row correctly matches a structure with its function in the human reproductive system?

	structure	function
A	cervix	where the fetus develops
B	oviduct	releases the female gamete
C	sperm duct	secretes fluids that make semen
D	testes	produces the male gametes

11 In terms of the alleles present, which word describes the genetic make-up of an organism?

- A** dominant
- B** genotype
- C** phenotype
- D** recessive

12 The diagram shows a food chain.

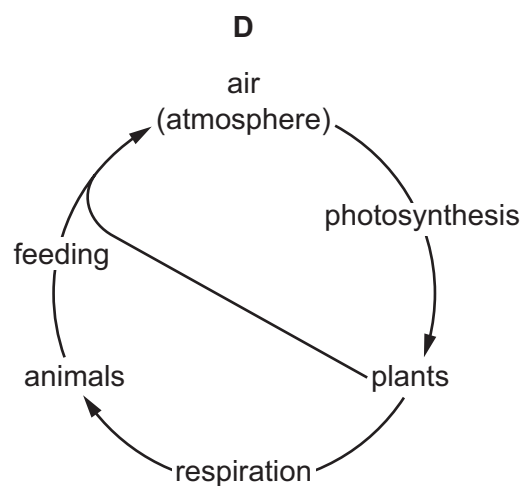
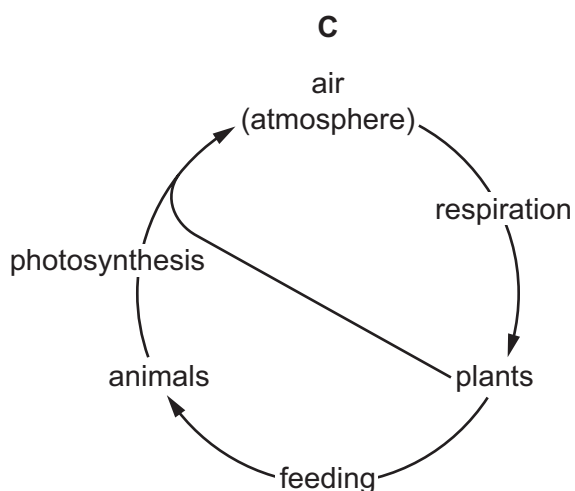
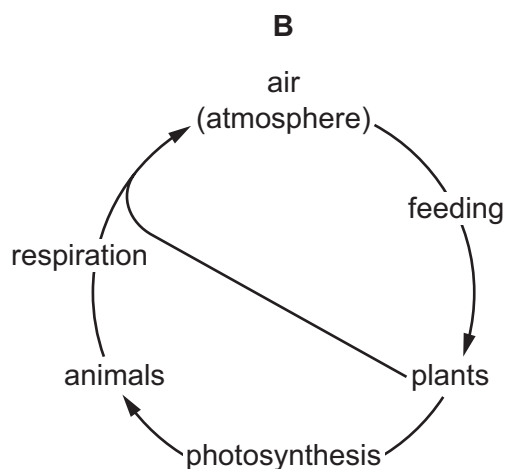
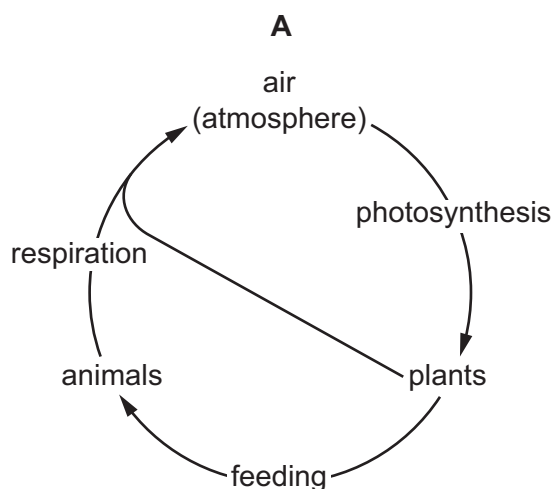
grass → rabbit → fox → flea

Which statement is correct?

- A** The grass is a primary consumer.
- B** The rabbit is a secondary consumer.
- C** The fox is a tertiary consumer.
- D** The flea is a tertiary consumer.

13 A student draws four different attempts at part of the carbon cycle.

Which diagram is correct?



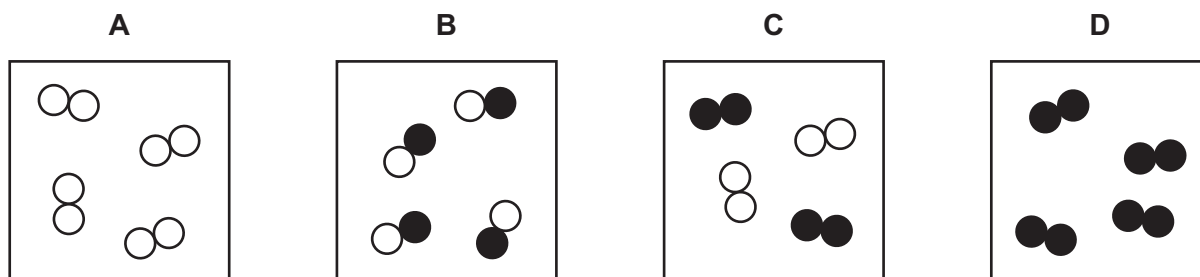
14 A student adds excess copper oxide powder to warm dilute sulfuric acid.

Aqueous copper sulfate is formed.

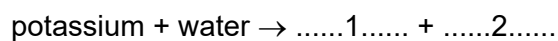
Which method is used to remove the unreacted copper oxide?

- A** chromatography
- B** crystallisation
- C** distillation
- D** filtration

15 Which diagram represents molecules of a compound?



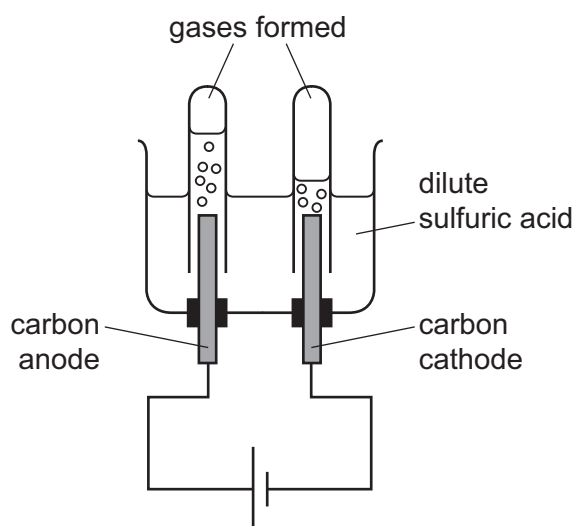
16 Potassium reacts with water.



Which words complete the equation?

	1	2
A	potassium hydroxide	hydrogen
B	potassium hydroxide	oxygen
C	potassium oxide	hydrogen
D	potassium oxide	oxygen

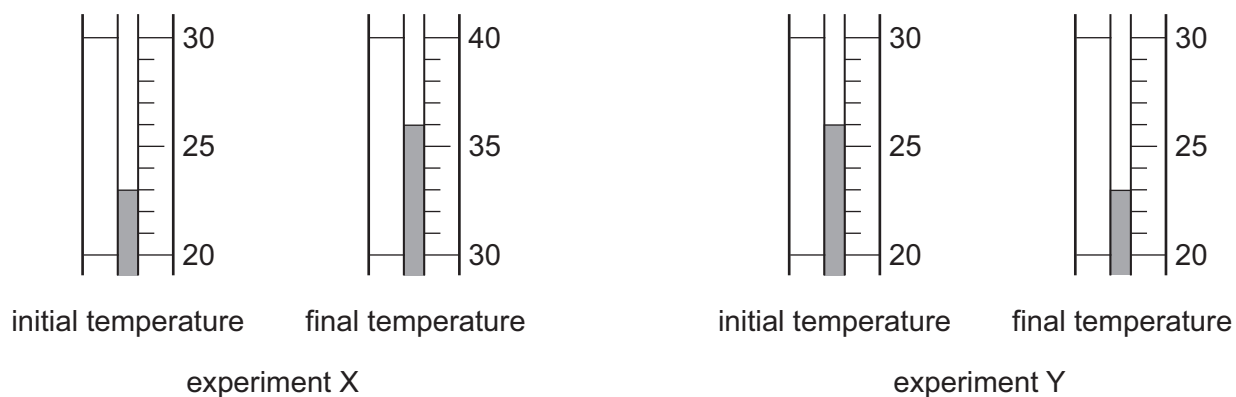
17 Dilute sulfuric acid is electrolysed using the apparatus shown.



Which product forms at the cathode?

- A** hydrogen
- B** oxygen
- C** sulfur dioxide
- D** water vapour

18 The initial and final temperatures in two experiments, X and Y, are shown.



Which row shows the types of change that take place in these two experiments?

	experiment X	experiment Y
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

19 Which statement about rates of reaction is correct?

- A** Catalysts never affect the rate of reaction.
- B** Decreasing the temperature of a reaction increases the rate of reaction.
- C** Increasing the concentration of a reacting solution decreases the rate of reaction.
- D** Using smaller sized pieces of a solid increases the rate of reaction.

20 Which word equation represents a redox reaction?

- A** calcium carbonate \rightarrow calcium oxide + carbon dioxide
- B** calcium oxide + hydrochloric acid \rightarrow calcium chloride + water
- C** copper oxide + carbon \rightarrow copper + carbon dioxide
- D** sodium oxide + water \rightarrow sodium hydroxide

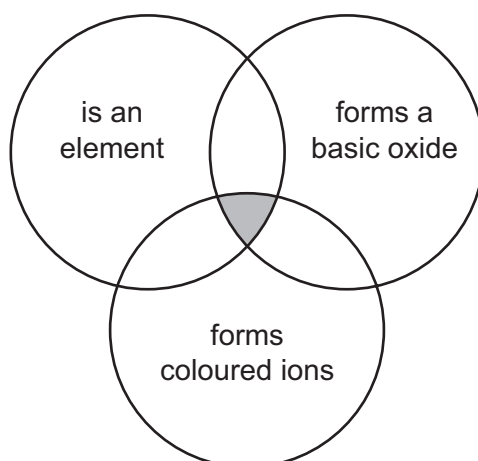
21 A student makes lists of acidic oxides and basic oxides.

<u>acidic oxides</u>	<u>basic oxides</u>
carbon dioxide	calcium oxide
potassium oxide	magnesium oxide
nitrogen dioxide	sodium oxide
phosphorus oxide	sulfur dioxide

Which oxides are **not** in the correct list?

- A carbon dioxide and sodium oxide
- B potassium oxide and sulfur dioxide
- C nitrogen dioxide and sulfur dioxide
- D potassium oxide and calcium oxide

22 The diagram shows overlapping circles into which different chemical formulae can be placed.



Which formula can be placed in the shaded area because it has all three properties?

- A Br_2
- B CO
- C Cu
- D Na

23 Why are the elements in Group VIII of the Periodic Table unreactive?

- A They are gaseous elements.
- B They are monatomic elements.
- C They have full inner shells of electrons.
- D They have full outer shells of electrons.

24 Pieces of four metals are added separately to test-tubes containing dilute hydrochloric acid.

The results are shown.

metal	results
1	bubbles produced slowly
2	no reaction
3	vigorous bubbling
4	steady bubbling

What is the order of reactivity of the metals from most to least reactive?

- A 2 → 1 → 4 → 3
- B 2 → 4 → 1 → 3
- C 3 → 1 → 4 → 2
- D 3 → 4 → 1 → 2

25 Four watch-glasses contain solid salts as shown.



blue
copper(II) sulfate



white
copper(II) sulfate



blue
cobalt(II) chloride



pink
cobalt(II) chloride

Water is added to each salt.

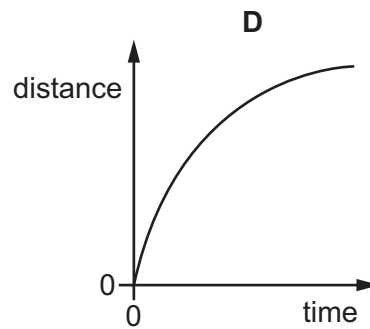
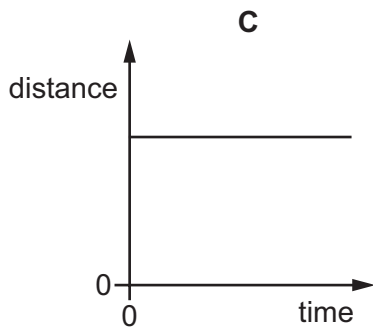
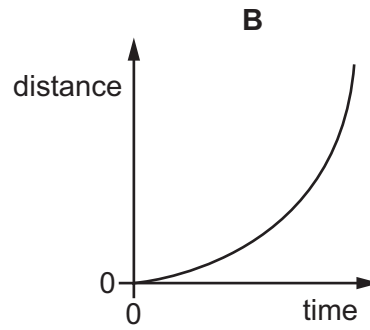
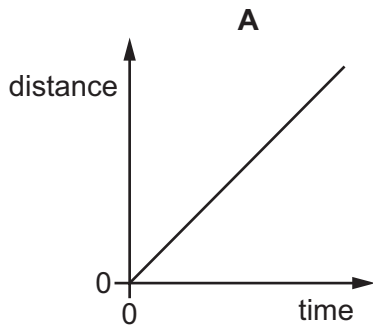
Which statement describes the salt solutions that form?

- A They are blue or pink only.
 - B They are white or blue only.
 - C They are all pink.
 - D They are all blue.
- 26 What is a use of the naphtha fraction obtained by the fractional distillation of petroleum?
- A bottled gas for heating
 - B feedstock for making chemicals
 - C fuel for diesel engines
 - D road surfaces

27 Which substance is an unsaturated compound?

- A ethane
- B ethanol
- C ethene
- D methane

28 Which diagram shows the distance–time graph for an object moving with constant speed?



- 29 A parachutist and his parachute have a combined weight W . The parachutist falls vertically towards the Earth's surface. The force of air resistance R opposes his motion.

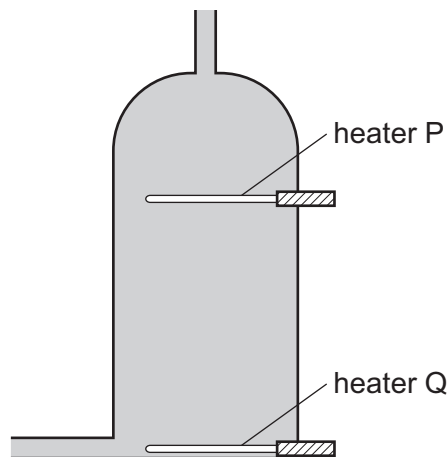
The speed of the parachutist is constant.



Which statement about the forces on the parachutist is correct?

- A W and R are both equal to zero.
 - B W is equal to R and greater than zero.
 - C W is greater than R .
 - D W is less than R .
- 30 What is a suitable unit for the moment of a force?
- A Nkg
 - B N/kg
 - C Nm
 - D N/m
- 31 A machine takes a certain time to do a certain quantity of work.
- Which pair of changes **must** increase the power of the machine?
- A decreasing the work done and decreasing the time taken
 - B decreasing the work done and increasing the time taken
 - C increasing the work done and decreasing the time taken
 - D increasing the work done and increasing the time taken
- 32 Which source of energy is non-renewable?
- A chemical energy in a fossil fuel
 - B energy in tides
 - C geothermal energy
 - D wind energy

- 33 A hot water tank is fitted with two identical heaters P and Q. Heater P is fitted above heater Q, as shown. The tank is full of cold water.



When only heater Q is switched on, it takes a long time to heat the tank of water to 60°C .

What happens to the cold water when only heater P is switched on?

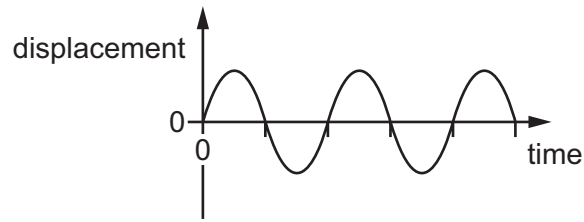
- A All the water reaches 60°C in less time.
 - B All the water reaches 60°C in the same time.
 - C The water below heater P reaches 60°C in less time.
 - D The water above heater P reaches 60°C in less time.
- 34 A water wave passes point Y.

A student counts how many wave crests pass point Y in 30 seconds.

Using **only** this information, what can the student calculate?

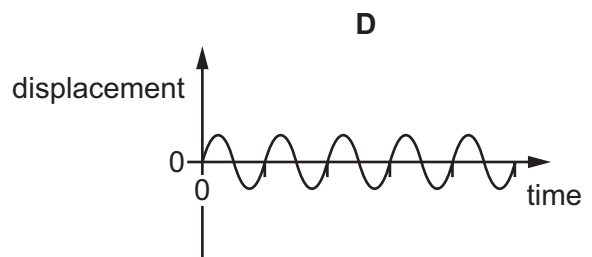
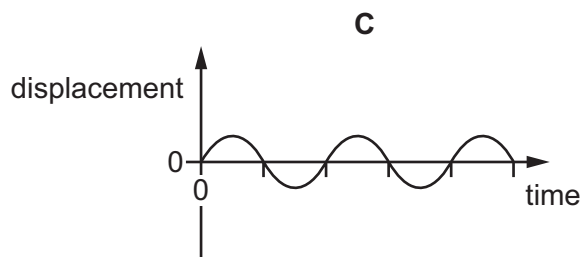
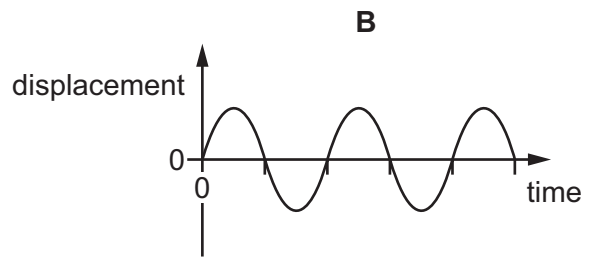
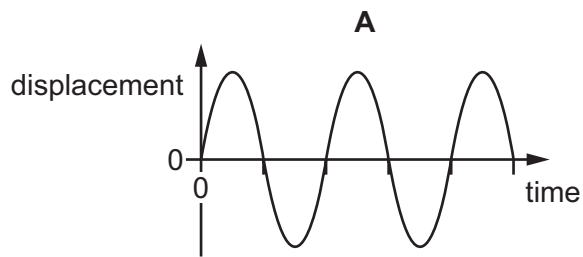
- A the amplitude of the wave
- B the frequency of the wave
- C the speed of the wave
- D the wavelength of the wave

35 The diagram is a displacement–time graph for the molecules in air as a sound wave passes.

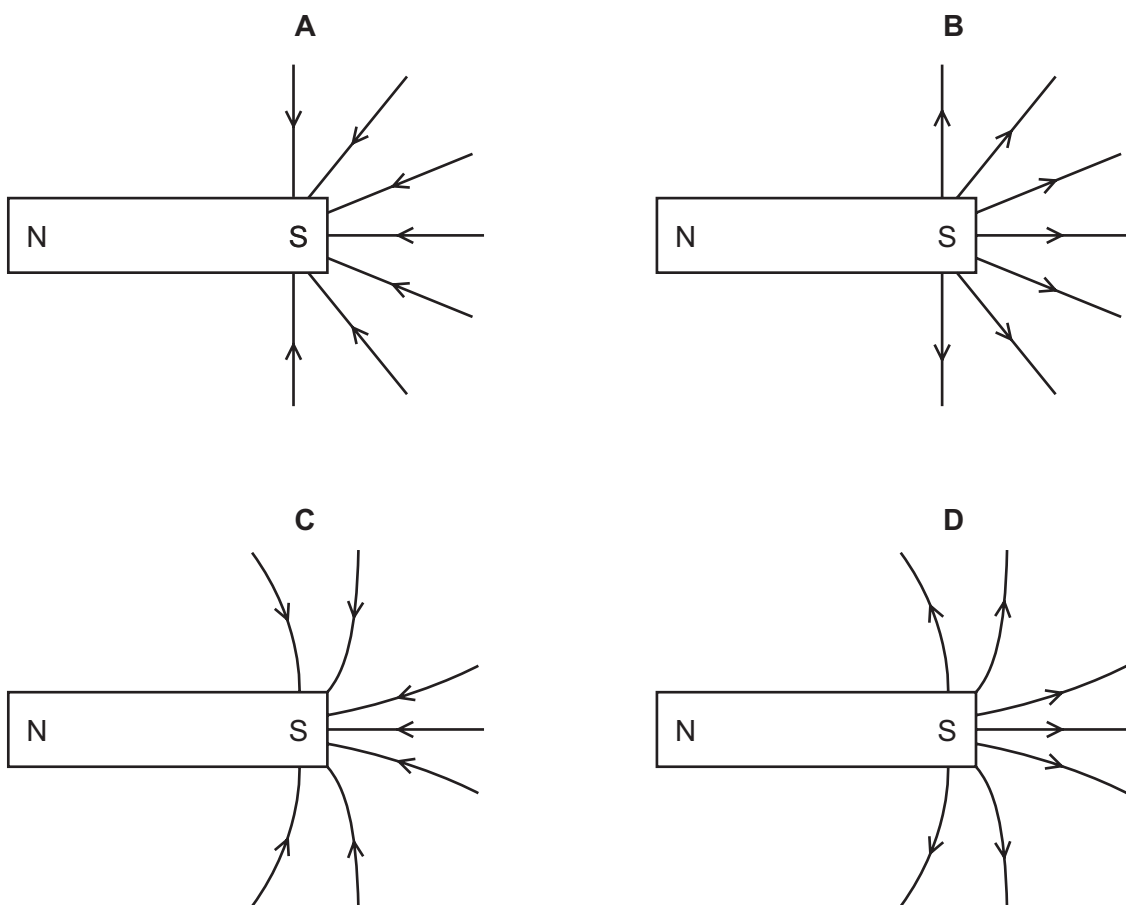


The graphs below are drawn to the same scale.

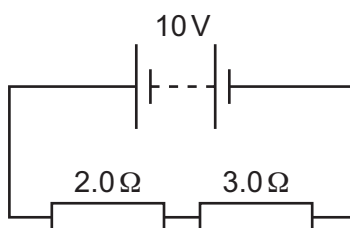
Which graph represents a quieter sound with a higher pitch?



- 36 Which diagram shows the pattern and direction of the magnetic field near the S pole of a bar magnet?



- 37 A $2.0\ \Omega$ resistor and a $3.0\ \Omega$ resistor are connected in series with a 10V battery.



What is the current in the circuit?

- A 0.50A B 2.0A C 5.0A D 50A

- 38 The current in an electric heater is 10 A when in normal use. The heater circuit contains a fuse.

What is the purpose of the fuse and what is a suitable rating for the fuse?

	purpose of fuse	suitable fuse rating / A
A	maintains a constant current	9
B	maintains a constant current	13
C	protects the circuit from the effects of overheating	9
D	protects the circuit from the effects of overheating	13

- 39 The nucleus of an isotope of gold contains 79 protons and 118 neutrons. The symbol for gold is Au.

What is the nuclide symbol for this isotope?

- A** ${}_{118}^{79}\text{Au}$ **B** ${}_{197}^{79}\text{Au}$ **C** ${}_{79}^{118}\text{Au}$ **D** ${}_{79}^{197}\text{Au}$

- 40 The isotope of americium used in a smoke detector has a half-life of 430 years. A sample of this isotope emits 36 000 particles per minute.

At which rate does it emit particles 1290 years later?

- A** 4500 counts per minute
B 9000 counts per minute
C 12 000 counts per minute
D 18 000 counts per minute

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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	1 H hydrogen 1	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	Key atomic number atomic symbol name relative atomic mass		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 —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —

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
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 —

actinoids

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