



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/23

Paper 2 Multiple Choice (Extended)

October/November 2019

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.

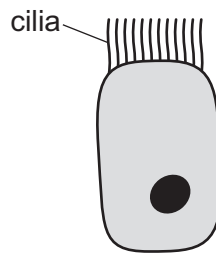
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 20.
Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.

- 1 A biologist keeps a potted plant in a laboratory.

Which feature of the potted plant shows that it is a living organism?

- A** It grows larger over time.
B It has green leaves.
C The compost in the pot dries after he waters it.
D The stems contain xylem.
- 2 The diagram shows a ciliated cell.



Which row shows where ciliated cells are found in the human gas exchange system and their correct function?

	location of ciliated cells		function of ciliated cells	
	bronchi	trachea	move mucus away from lungs	move mucus towards lungs
A	✓	✓	✓	✗
B	✓	✓	✗	✓
C	✓	✗	✓	✗
D	✗	✓	✗	✓

- 3 What is the word equation for photosynthesis?

- A** carbon dioxide + oxygen → glucose + water
B carbon dioxide + water → glucose + oxygen
C glucose + oxygen → carbon dioxide + water
D glucose + water → carbon dioxide + oxygen

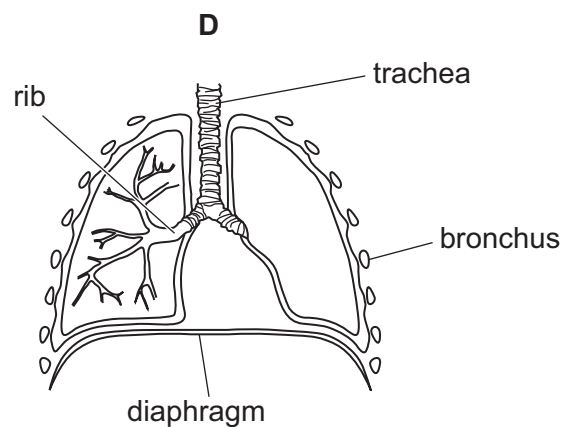
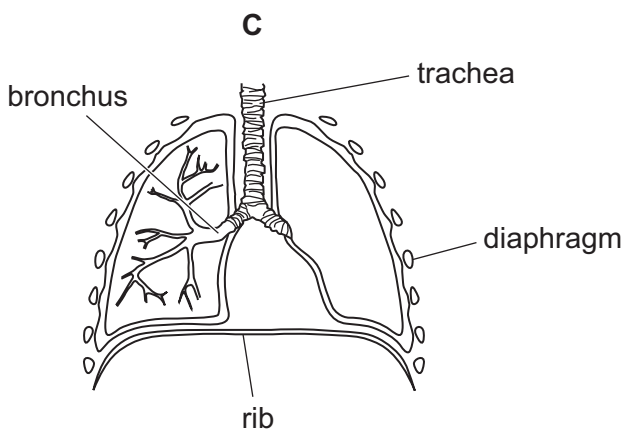
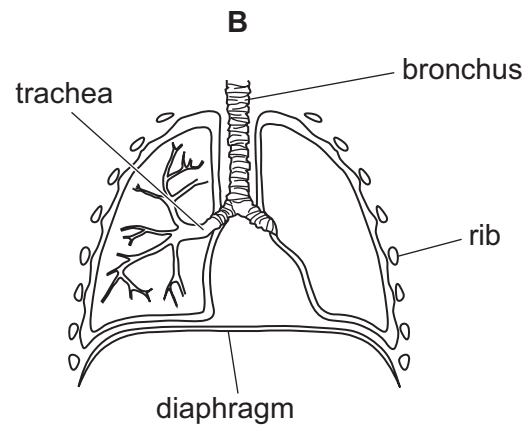
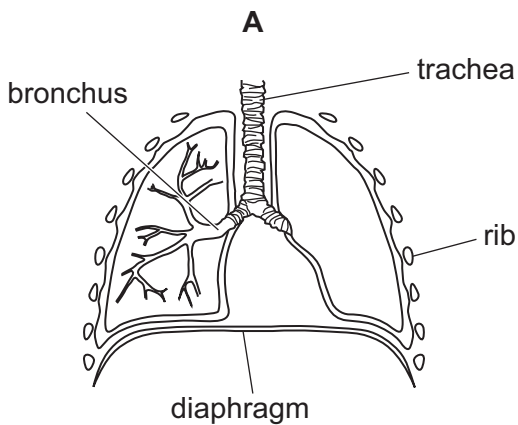
- 4 1 cm³ of substance **X** is added to 10 cm³ starch suspension and mixed. Food tests are carried out immediately after mixing and again after an hour.

The results of the tests are shown in the table.

test reagent	colour of solution after mixing	colour of solution after one hour
Benedict's solution	blue	orange
iodine solution	blue / black	brown

What is substance **X**?

- A** amylase
B protease
C lipase
D sugar
- 5 Which diagram is correctly labelled?



6 Which statement about aerobic respiration is correct?

- A It exchanges gases through the walls of the alveoli.
- B It expels carbon dioxide from the lungs.
- C It only produces carbon dioxide and energy.
- D It uses oxygen to release energy from glucose.

7 Which are absorbed from the alimentary canal into the blood?

- 1 fibre
- 2 glucose
- 3 vitamin C

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

8 Shoots were grown in different light conditions.

Some shoots had their tips covered with foil.

	shoot tip	direction of light
1	covered	from all around
2	covered	from one direction
3	uncovered	from all around
4	uncovered	from one direction

Which shoots would grow straight upwards?

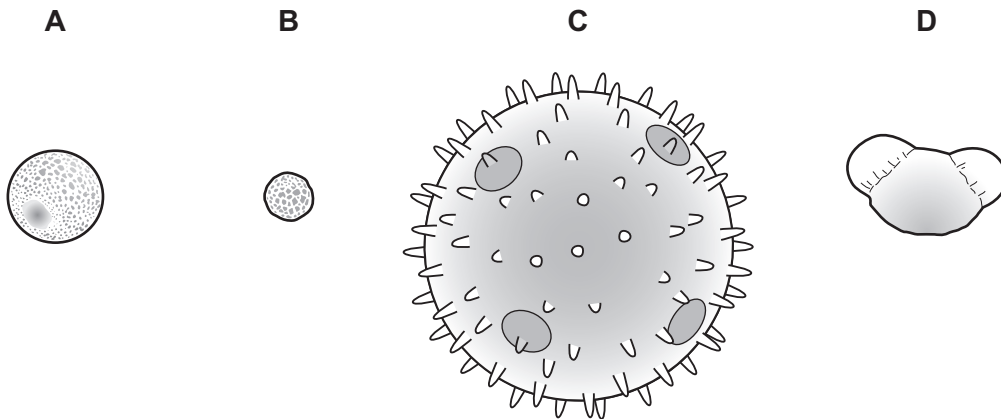
- A 1, 2 and 3 B 1 and 3 only C 3 and 4 only D 3 only

9 Which statement about sexual reproduction is **always** correct?

- A It involves only one parent.
- B It involves the fusion of nuclei.
- C It produces genetically identical offspring.
- D It takes place only in animals.

10 The diagram shows four pollen grains.

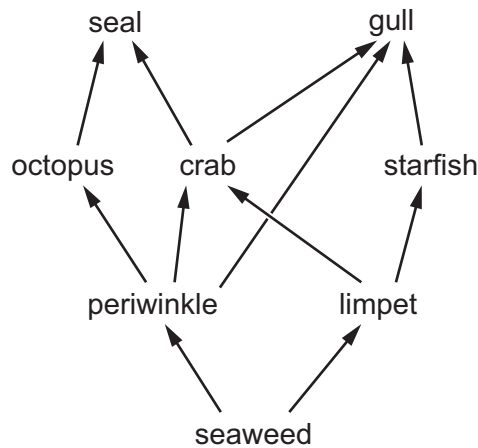
Which pollen grain is most likely to be distributed by an animal?



11 Which statement about human gametes is correct?

- A Sperm cells are much larger than egg cells.
- B Sperm cells are produced in smaller numbers than egg cells.
- C Sperm cells have a jelly coating that changes after fertilisation.
- D The flagellum is an adaptive feature of a sperm cell.

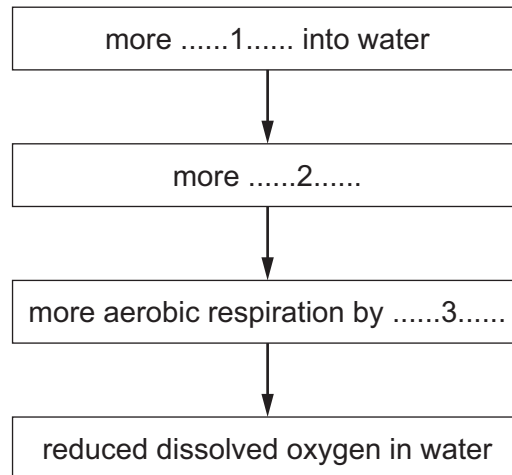
12 The diagram shows a food web.



Which organism is found in more than one trophic level?

- A crab
- B gull
- C octopus
- D starfish

13 The flow diagram shows some stages in the eutrophication of a pond.

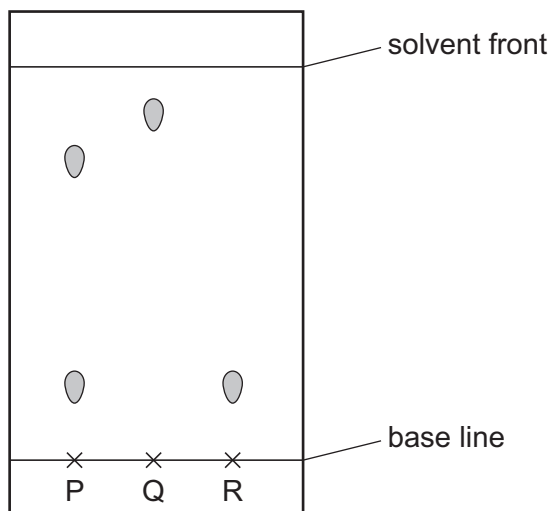


Which words complete gaps 1, 2 and 3?

	1	2	3
A	decomposers	nitrites	producers
B	decomposers	producers	nitrites
C	nitrites	producers	decomposers
D	nitrites	decomposers	producers

14 Chromatography is carried out on three solutions P, Q and R.

The chromatogram obtained is shown.



Which statement is **not** correct?

- A P contains at least two substances.
- B Q contains the substance with the highest R_f value.
- C R is insoluble in the solvent.
- D P, Q and R together may contain only three substances.

15 Which substance is a single compound?

- A air
- B oxygen
- C petroleum
- D water

16 The fertiliser ammonium sulfate has the formula $(\text{NH}_4)_2\text{SO}_4$.

How many atoms of each element are present in the formula?

	number of hydrogen atoms	number of nitrogen atoms	number of oxygen atoms	number of sulfur atoms
A	4	1	1	1
B	4	2	4	1
C	8	1	4	1
D	8	2	4	1

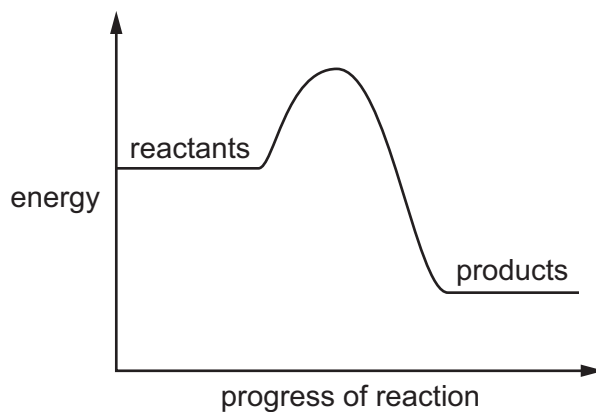
17 Element X is a non-metal used in the treatment of the water supply.

It is made during the electrolysis of a metal salt.

What is the colour of X and at which electrode is it made?

	colour	electrode
A	red	anode
B	red	cathode
C	yellow-green	anode
D	yellow-green	cathode

18 An energy level diagram for a reaction is shown.



Which row describes the energy transfer and the type of energy change for this reaction?

	energy transfer	energy change
A	energy is absorbed by reactants	endothermic
B	energy is absorbed by reactants	exothermic
C	energy is released to surroundings	endothermic
D	energy is released to surroundings	exothermic

- 19 Calcium carbonate reacts with 50 cm³ hydrochloric acid.

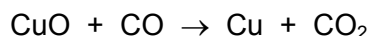
The carbon dioxide produced is collected in a gas syringe.

The experiment is done four times using concentrated or dilute hydrochloric acid and using 5 g calcium carbonate in powder or lump form.

Which experiment takes the longest time to collect 10 cm³ of gas?

	calcium carbonate	hydrochloric acid
A	lumps	concentrated
B	lumps	dilute
C	powder	concentrated
D	powder	dilute

- 20 The equation for a reaction is shown.



Which statement about this reaction is correct?

- A** CO acts as a reducing agent.
 - B** CO₂ is reduced.
 - C** Cu is oxidised.
 - D** CuO acts as a reducing agent.
- 21 Copper sulfate is a soluble salt which is prepared by reacting insoluble copper oxide with dilute sulfuric acid.

Which statement about the preparation of copper sulfate crystals is **not** correct?

- A** After the reaction, the mixture is filtered and copper sulfate solution is collected.
 - B** Excess copper oxide is used to ensure that all the acid is used up.
 - C** The final solution is heated so that all the water boils off.
 - D** The mixture of copper oxide and dilute sulfuric acid is heated to speed up the reaction.
- 22 Which statement about alloys is correct?
- A** They are made from metals because metals are poor electrical conductors.
 - B** They are mixtures of compounds that contain metals.
 - C** They have all the same properties as the metals from which they are made.
 - D** They have different properties to the metals from which they are made.

23 Which equation does **not** represent a reaction that takes place in the blast furnace?

- A $C + O_2 \rightarrow CO_2$
- B $C + CO_2 \rightarrow 2CO$
- C $2Fe + CO_2 \rightarrow 2FeO + C$
- D $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

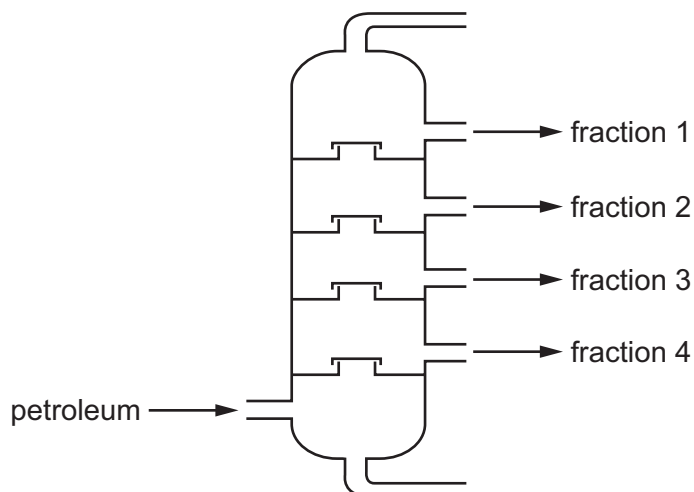
24 Which row describes the percentage composition of clean air?

	carbon dioxide	nitrogen	noble gases	oxygen
A	less than 1	78	less than 1	21
B	less than 1	78	21	less than 1
C	21	less than 1	less than 1	78
D	78	less than 1	less than 1	21

25 Which two gases cause an enhanced greenhouse effect when their concentrations in the atmosphere increase?

- A carbon monoxide and carbon dioxide
- B carbon dioxide and methane
- C methane and sulfur dioxide
- D sulfur dioxide and carbon monoxide

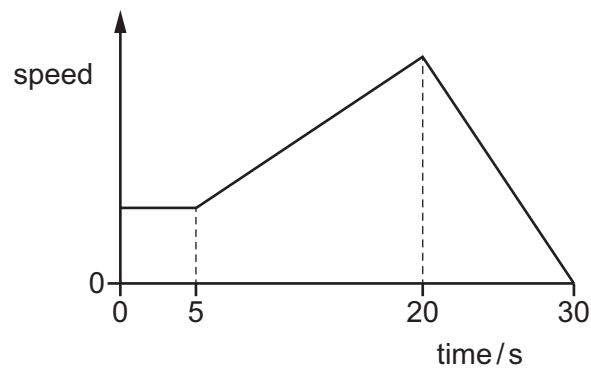
26 A simple fractionating column is shown.



Which statement about the fractions is correct?

- A Fraction 1 contains compounds with the highest boiling points.
 - B Fraction 2 contains larger hydrocarbon molecules than fraction 3.
 - C Fraction 3 is more viscous than fraction 4.
 - D Fraction 4 is the least flammable.
- 27 What is a typical property of alkanes?
- A They are catalysts.
 - B They burn in air.
 - C They can be neutralised.
 - D They react endothermically.

- 28 The graph shows how the speed of a car changes with time. The car travels at constant speed, then accelerates, and finally brakes to a stop.



The car travels 60 m while it brakes to a stop.

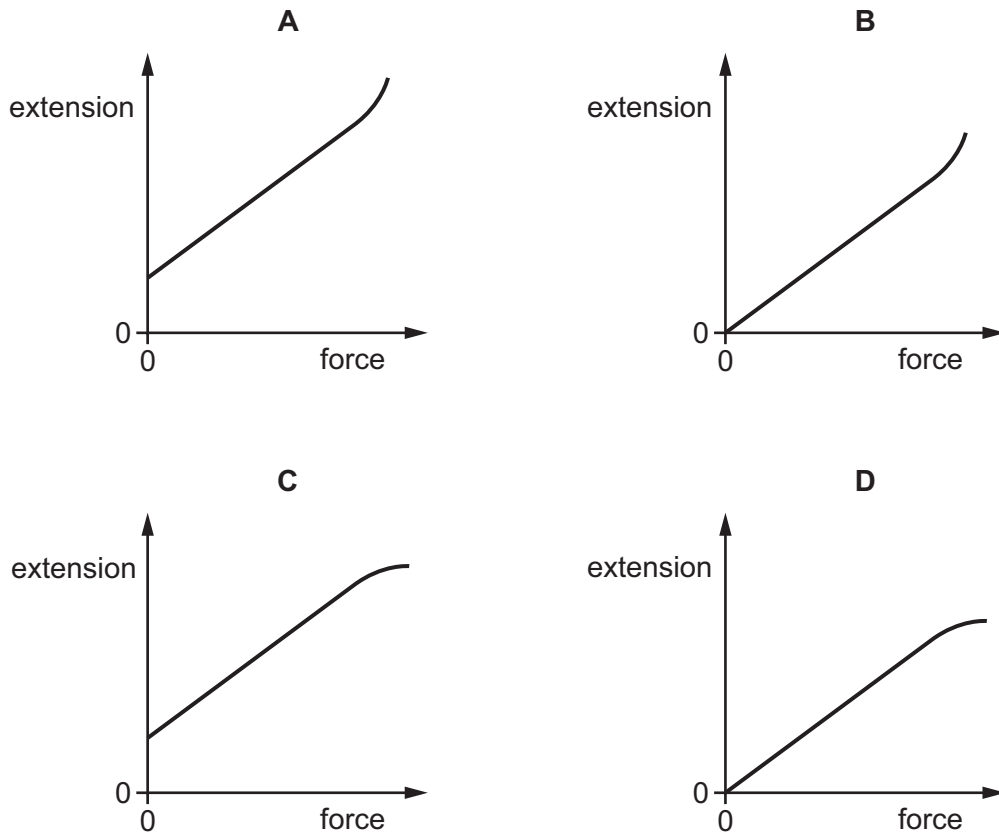
What is the average speed of the car while it is braking?

- A** 3.0 m/s **B** 4.0 m/s **C** 6.0 m/s **D** 12 m/s
- 29 Which of these bodies has a resultant force acting on it?
- A** a book at rest on a table
 - B** a car travelling up a hill in a straight line at constant speed
 - C** a football moving upwards freely after being kicked
 - D** a parachutist descending vertically at constant speed

30 The force acting on a spring is gradually increased from 0 N.

The spring eventually passes its limit of proportionality.

Which graph shows how the extension of the spring changes as the force increases?



31 Some energy resources are less reliable than others.

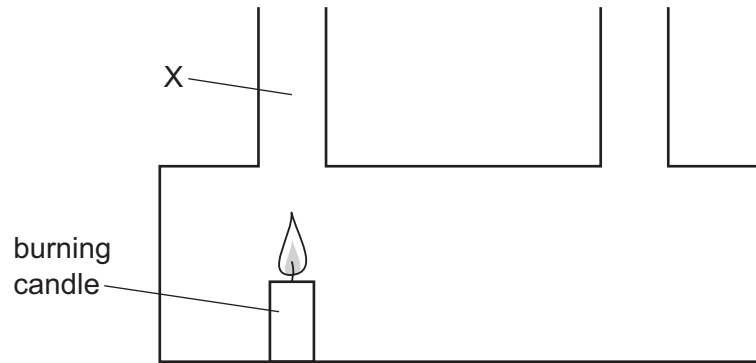
Which type of power station **cannot** produce electricity at all times?

- A coal-fired power station
- B geothermal power station
- C hydroelectric power station
- D solar power station

32 Which statement about the molecules in a gas is correct?

- A They are closer together than those in solids.
- B They are further apart than those in liquids.
- C They are **not** free to move around.
- D They are packed together in a regular pattern.

- 33 The equipment shown is used to demonstrate convection in air. Point X is labelled.



Which row describes and explains the movement of the air at X?

	movement of air at X	explanation
A	downwards	air becomes less dense when heated
B	downwards	air becomes more dense when heated
C	upwards	air becomes less dense when heated
D	upwards	air becomes more dense when heated

- 34 What type of wave is a sound wave and in which direction do air particles vibrate as the wave passes through the air?

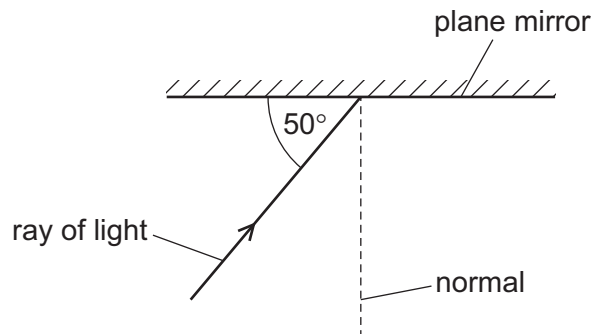
	type of wave	direction of vibration
A	longitudinal	parallel to wave direction
B	longitudinal	perpendicular to wave direction
C	transverse	parallel to wave direction
D	transverse	perpendicular to wave direction

- 35 A boy plays a series of musical notes of increasing frequency on a violin. As the frequency of the note increases, he plays the notes more loudly.

How do the amplitude and the wavelength of the sound waves change?

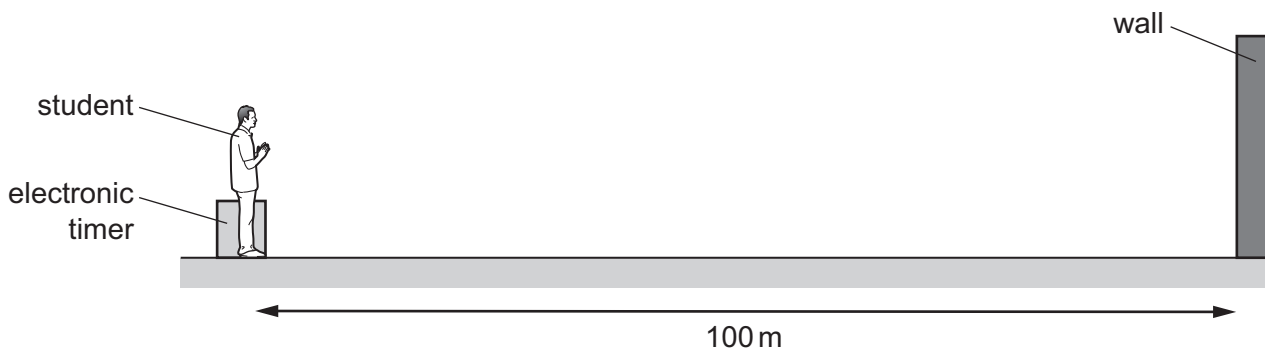
	amplitude	wavelength
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 36 The diagram shows light striking a plane mirror.



What is the angle of reflection of the ray when it is reflected from the mirror?

- A** 40° **B** 50° **C** 80° **D** 100°
- 37 A student measures the speed of sound. He claps his hands and the sound reflects from a wall that is 100 m away from him.

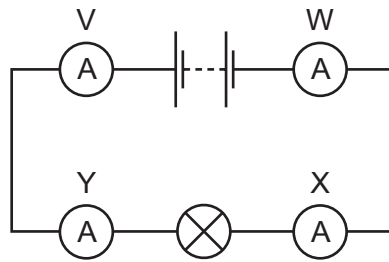


An electronic timer next to the student detects the echo of the sound 0.60 s after it is made.

Which calculation gives the speed of sound?

- A** $\frac{200}{0.30}$ m/s **B** $\frac{200}{0.60}$ m/s **C** $\frac{100}{0.60}$ m/s **D** $\frac{100}{1.2}$ m/s
- 38 A piece of wire has a resistance of 8.0 Ω.
- The length of the wire is doubled and the diameter of the wire is halved.
- What is the new resistance of the wire?
- A** 2.0 Ω **B** 4.0 Ω **C** 8.0 Ω **D** 64 Ω

39 Four ammeters V, W, X and Y are connected in the circuit shown.



Which ammeters have the same reading as each other?

- A V and W only
 - B V and Y only
 - C X and Y only
 - D V, W, X and Y
- 40 There is a current I in a resistor and a potential difference V across it.

Which equation gives the energy E transferred by the resistor in a time t ?

- A $E = \frac{I}{Vt}$
- B $E = \frac{V}{It}$
- C $E = \frac{t}{VI}$
- D $E = IVt$

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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			
57 La lanthanum 139	89 Ac actinium —	72 Hf hafnium 178	74 W tungsten 184	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	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 —
58 Ce cerium 140	90 Th thorium 232	73 Ta tantalum 181	75 Re rhenium 186	79 Au gold 197	80 Hg mercury 201	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —
59 Pr praseodymium 141	91 Pa protactinium 231	74 Zr zirconium 91	76 Ru ruthenium 101	79 Au gold 197	80 Hg mercury 201	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —
60 Nd neodymium 144	92 U uranium 238	75 Nb niobium 93	77 Rh rhodium 103	79 Au gold 197	80 Hg mercury 201	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —
61 Pm promethium —	93 Np neptunium —	76 Mo molybdenum 96	78 Pd palladium 106	80 Hg mercury 201	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232
62 Sm samarium 150	94 Pu plutonium —	77 Co cobalt 59	79 Cu copper 64	80 Hg mercury 201	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	91 Pa protactinium 231
63 Eu europium 152	95 Am americium —	78 Ni nickel 59	80 Zn zinc 65	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	92 U uranium 238
64 Gd gadolinium 157	96 Cm curium —	79 Cu copper 64	81 Ga gallium 70	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	93 Np neptunium —
65 Tb terbium 159	97 Bk berkelium —	80 Zn zinc 65	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	94 Pu plutonium —
66 Dy dysprosium 163	98 Cf californium —	81 Tl thallium 204	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	95 Am americium —
67 Ho holmium 165	99 Es einsteinium —	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	96 Cm curium —
68 Er erbium 167	100 Fm fermium —	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	97 Bk berkelium —
69 Tm thulium 169	101 Md mendelevium —	84 Po polonium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	98 Cf californium —
70 Yb ytterbium 173	102 No nobelium —	85 At astatine —	86 Rn radon —	87 Fr francium —	88 Ra radium —	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	99 Es einsteinium —
71 Lu lutetium 175	103 Lr lawrencium —	86 Rn radon —	87 Fr francium —	88 Ra radium —	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 —	100 Fm fermium —

Key
atomic number
atomic symbol
name
relative atomic mass

lanthanoids

actinoids

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