



Cambridge IGCSE™

COMBINED SCIENCE

0653/21

Paper 2 Multiple Choice (Extended)

October/November 2025

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.
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- 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.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m/s^2).

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. Any blank pages are indicated.



- 1 One of the characteristics of living organisms is the ability to detect and respond to changes in the environment.

What is this characteristic?

- A excretion
- B growth
- C movement
- D sensitivity

- 2 Which structure is present in palisade mesophyll cells and is needed for photosynthesis?

- A cell wall
- B chloroplast
- C nucleus
- D vacuole

- 3 Osmosis is the net movement of water molecules through a partially permeable membrane.

In which direction does this net movement of water molecules take place?

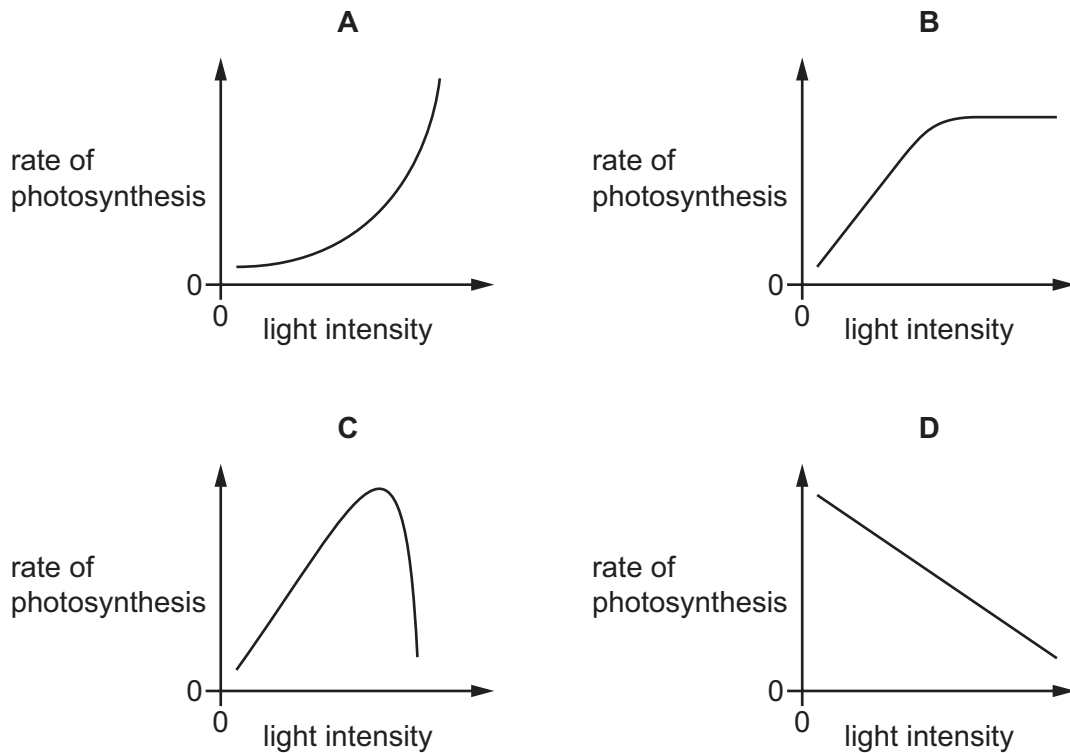
- A from a concentrated solution to a dilute solution
- B from a dilute solution to pure water
- C from a region of lower water potential to a region of higher water potential
- D from a region of higher water potential to a region of lower water potential

- 4 The temperature of an enzyme-controlled reaction increases towards its optimum temperature.

Which row shows the effects of this increase in temperature on the reaction?

	kinetic energy of substrate	frequency of effective collisions	amount of product formed
A	decreases	decreases	decreases
B	increases	decreases	increases
C	decreases	increases	decreases
D	increases	increases	increases

5 Which graph shows the effect of light intensity on the rate of photosynthesis?



6 A person eats some bread which contains starch.

Which row shows where the chemical digestion of the starch starts and finishes?

	starts	finishes
A	mouth	small intestine
B	mouth	large intestine
C	stomach	small intestine
D	stomach	large intestine

7 Which row describes the structure and function of an artery?

	structure	function
A	thicker wall and smaller lumen than a vein	carries blood at high pressure away from heart
B	thicker wall and smaller lumen than a vein	carries blood at low pressure towards heart
C	thinner wall and larger lumen than a vein	carries deoxygenated blood at low pressure
D	thinner wall and larger lumen than a vein	carries oxygenated blood at high pressure

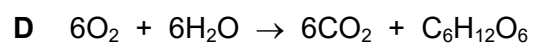
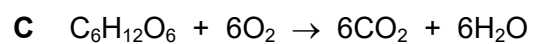
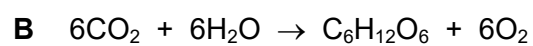
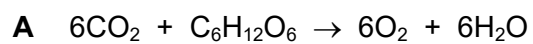
8 Which row shows possible causes of coronary heart disease?

	lack of exercise	smoking	stress
A	✓	✓	✓
B	✓	x	✓
C	x	✓	✓
D	x	x	x

9 Which row describes gas exchange surfaces in humans?

	thickness of surface	surface area
A	thick	large
B	thick	small
C	thin	large
D	thin	small

10 What is the balanced symbol equation for aerobic respiration?



11 Which food chain shows the correct feeding levels?

- A** grass → grasshopper → bluebird → snake
 producer tertiary secondary primary
 consumer consumer consumer
- B** grass → grasshopper → bluebird → snake
 producer primary secondary tertiary
 consumer consumer consumer
- C** grass → grasshopper → bluebird → snake
 tertiary secondary primary producer
 consumer consumer consumer
- D** grass → grasshopper → bluebird → snake
 primary secondary tertiary producer
 consumer consumer consumer

12 What is an example of an ecosystem?

- A** all the animals in an ocean
- B** all the organisms and their environment in a desert
- C** all the plants and their environment in a lake
- D** all the trees in a forest

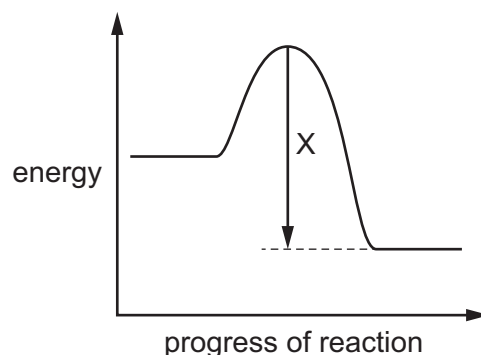
13 Which changes to the composition of the atmosphere are caused by cutting down forests?

	concentration of carbon dioxide gas	concentration of oxygen gas
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

14 Which statement describes the changes that occur when water freezes?

- A** The water molecules gain energy and move faster.
- B** The water molecules lose energy and move slower.
- C** The water molecules gain energy as liquid water forms a solid.
- D** The water molecules lose energy as solid water forms a liquid.

15 A reaction pathway diagram for a reaction is shown.



Which statement describes and explains energy change X?

- A Thermal energy is given out as bonds break.
- B Thermal energy is given out as bonds form.
- C Thermal energy is taken in as bonds break.
- D Thermal energy is taken in as bonds form.

16 Zinc reacts with dilute sulfuric acid.

Which statement explains why the rate of this reaction increases when the temperature of the acid is increased?

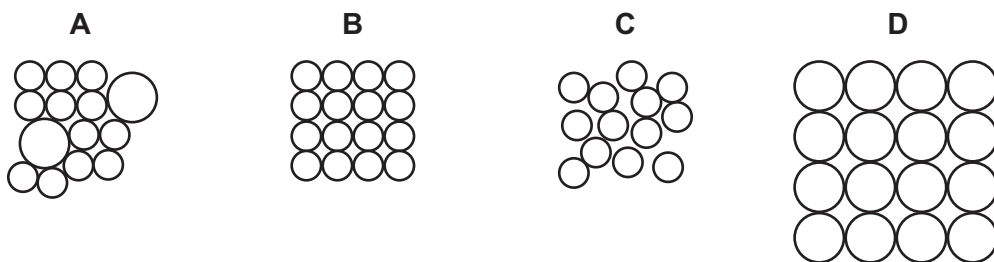
- A The particles are closer together and the particles collide more frequently.
- B The particles move faster and fewer particles have the minimum energy to react.
- C The particles collide more frequently and more particles have the minimum energy to react.
- D The particles collide more frequently and the activation energy of the reaction is reduced.

17 An element is in Period 3 of the Periodic Table.

Which information is given by the period number of this element?

- A its proton number
- B its metallic character
- C the number of electrons in the outer shell of an atom of the element
- D the number of electron shells in an atom of the element

18 Which diagram represents the atoms in an alloy?



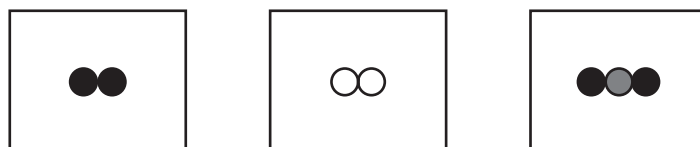
19 Which metal reacts most quickly with cold water?

- A** calcium
- B** magnesium
- C** potassium
- D** sodium

20 What is the reason for the treatment of the domestic water supply with chlorine?

- A** to improve the taste
- B** to kill microbes
- C** to remove odours
- D** to remove insoluble impurities

21 The diagrams show molecules of three of the main gases in clean, dry air. The different circles represent atoms of different elements.



Which elements are shown as ● and ○?

	●	○
A	hydrogen	nitrogen
B	hydrogen	oxygen
C	oxygen	hydrogen
D	oxygen	nitrogen

22 Petroleum is a mixture of hydrocarbons.

Which method is used to separate these hydrocarbons?

- A** crystallisation
- B** filtration
- C** fractional distillation
- D** simple distillation

23 Which equation represents cracking?

- A** $\text{C}_{10}\text{H}_{22} \rightarrow 2\text{C}_2\text{H}_4 + \text{C}_6\text{H}_{12} + \text{H}_2$
- B** $\text{C}_{10}\text{H}_{20} + \text{H}_2 \rightarrow \text{C}_{10}\text{H}_{22}$
- C** $2\text{C}_{10}\text{H}_{22} + 21\text{O}_2 \rightarrow 20\text{CO} + 22\text{H}_2\text{O}$
- D** $2\text{C}_{10}\text{H}_{22} + 31\text{O}_2 \rightarrow 20\text{CO}_2 + 22\text{H}_2\text{O}$

24 Aqueous chlorine is added to aqueous potassium bromide.

What is observed?

- A** no visible change
- B** a white precipitate forms
- C** reaction mixture becomes lighter in colour
- D** reaction mixture becomes darker in colour

25 Four equations are listed.

- 1 $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
- 2 $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- 3 $2\text{CO} \rightarrow \text{C} + \text{CO}_2$
- 4 $\text{CO}_2 + \text{Fe} \rightarrow \text{FeO} + \text{CO}$

Which equations represent reactions that take place in the blast furnace?

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

26 Which statement describes how greenhouse gases in the Earth's atmosphere cause global warming?

- A** They absorb all the thermal energy that reaches the Earth from the Sun.
- B** They absorb all the thermal energy that is reflected from the Earth's surface.
- C** They absorb some of the thermal energy that is reflected from the Earth's surface.
- D** They increase thermal energy loss to space.

27 An electric current is passed through molten calcium chloride using graphite electrodes.

Which row shows the electrode products?

	anode product	cathode product
A	calcium	chlorine
B	chlorine	calcium
C	chlorine	hydrogen
D	hydrogen	chlorine

28 The length of a slope is 1200 m.

A cyclist rides up the slope in a time of 200 s. The cyclist then immediately rides back down the slope in a time of 100 s.

What is the average speed of the cyclist for the whole journey?

- A** 4.0 m/s **B** 8.0 m/s **C** 9.0 m/s **D** 18 m/s

29 A block of mass 20 kg is lifted up through vertical distance h .

The gravitational potential energy of the block increases by 4.9 kJ.

What is the value of h ?

- A** 4.1 m **B** 25 m **C** 98 m **D** 245 m

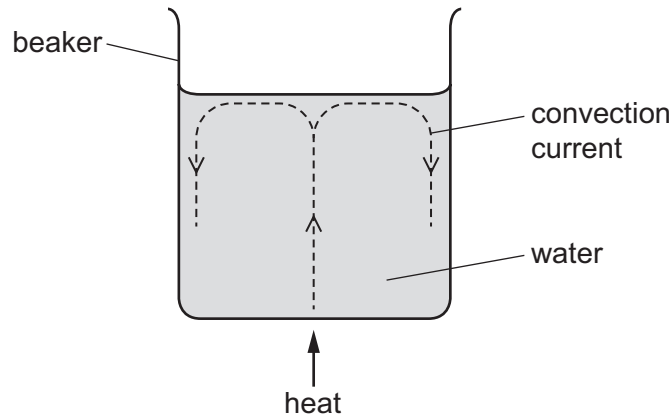
30 What is used to generate electrical power in a geothermal power station?

- A** fossil fuels
- B** hot rocks
- C** light from the Sun
- D** the wind

31 Which statement explains why iron is a better thermal conductor than plastic?

- A** Atoms in iron vibrate more.
- B** Electrons in iron vibrate more.
- C** There are delocalised atoms in iron.
- D** There are delocalised electrons in iron.

32 The diagram shows a convection current in water in a beaker.



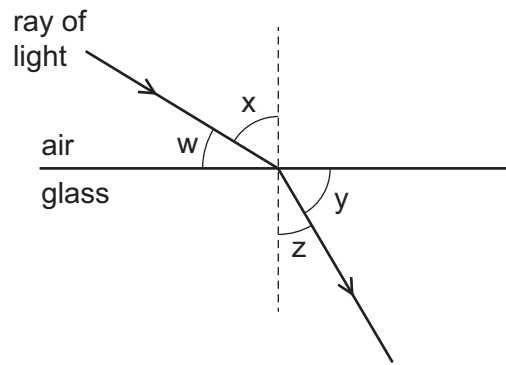
Which statement explains why the hot water at the bottom of the beaker rises?

- A** It expands and becomes less dense.
- B** It expands and becomes more dense.
- C** It contracts and becomes less dense.
- D** It contracts and becomes more dense.

33 Which surface is the best reflector of thermal radiation?

- A** dull black
- B** dull white
- C** shiny black
- D** shiny white

- 34 The diagram shows a ray of light passing from air into glass.



Which row identifies the angle of incidence and the angle of refraction?

	angle of incidence	angle of refraction
A	w	y
B	w	z
C	x	y
D	x	z

- 35 Visible light is electromagnetic radiation. The wavelength range for visible light is $4.0 \times 10^{-7} \text{ m}$ to $7.0 \times 10^{-7} \text{ m}$.

What is the frequency range for visible light?

- A** $1.3 \times 10^{-15} \text{ Hz}$ to $2.3 \times 10^{-15} \text{ Hz}$
- B** $1.3 \times 10^{-14} \text{ Hz}$ to $2.3 \times 10^{-14} \text{ Hz}$
- C** $4.3 \times 10^{14} \text{ Hz}$ to $7.5 \times 10^{14} \text{ Hz}$
- D** $4.3 \times 10^{15} \text{ Hz}$ to $7.5 \times 10^{15} \text{ Hz}$

- 36** The table shows the speed of sound in three different substances, X, Y and Z. One substance is a solid, one is a liquid and one is a gas.

substance	<u>speed of sound</u> m/s
X	3600
Y	1500
Z	267

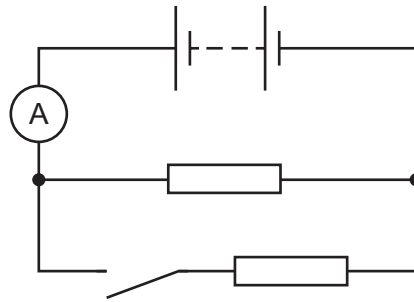
Which row identifies the states of the three substances?

	solid	liquid	gas
A	X	Y	Z
B	X	Z	Y
C	Z	X	Y
D	Z	Y	X

- 37** Which name is given to the rate at which charge flows along a metal wire?

- A** current
- B** electromotive force (e.m.f.)
- C** potential difference (p.d.)
- D** resistance

38 In the circuit shown, the switch is open.

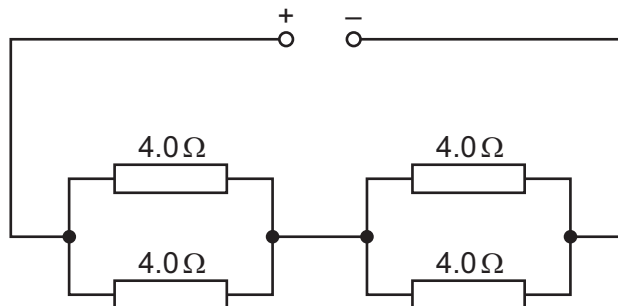


A student closes the switch.

Which row shows what happens to the ammeter reading and what happens to the total resistance of the circuit?

	ammeter reading	total resistance
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

39 The circuit shows four $4.0\ \Omega$ resistors connected to a power supply.



What is the total resistance of the circuit?

- A** $1.0\ \Omega$ **B** $2.0\ \Omega$ **C** $4.0\ \Omega$ **D** $16\ \Omega$

40 What is the main source of the energy released from the Sun?

- A** fission of helium nuclei to form hydrogen nuclei
B fusion of hydrogen nuclei to form helium nuclei
C hydrogen atoms combining to form hydrogen molecules
D hydrogen atoms reacting with oxygen atoms to form water molecules

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The Periodic Table of Elements

Group																				
I	II											III	IV	V	VI	VII	VIII			
		1 H hydrogen 1																		
		Key atomic number atomic symbol name relative atomic mass																		
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		
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	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 —	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 oganeson —			

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.).



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1 Four biological processes are listed.

- 1 egestion
- 2 excretion
- 3 nutrition
- 4 respiration

Which processes are characteristics of all living organisms?

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

2 What are features of a palisade mesophyll cell?

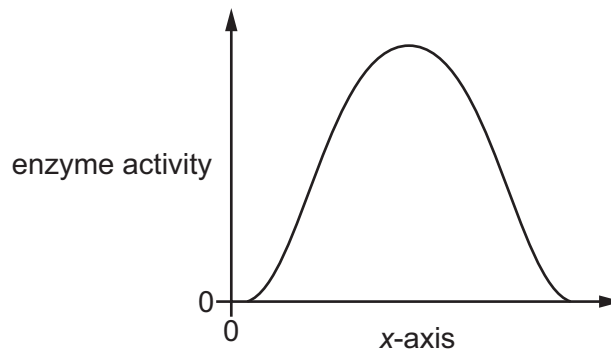
- 1 a nucleus
- 2 a cell wall
- 3 chloroplasts

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

3 Which process is described as the net movement of water molecules from a dilute solution to a concentrated solution through a partially permeable membrane?

- A** absorption
- B** evaporation
- C** osmosis
- D** transpiration

- 4 The graph shows how the activity of an enzyme varies.



What is the x-axis label for this graph?

- A enzyme activity
 - B pH
 - C temperature
 - D time
- 5 Which statement about photosynthesis is correct?
- A Chlorophyll transfers energy from light into energy in chemicals for the synthesis of carbohydrates.
 - B Chlorophyll transfers energy from light into energy in chemicals for the synthesis of carbon dioxide.
 - C Mitochondria transfer energy from light into energy in chemicals for the synthesis of carbohydrates.
 - D Mitochondria transfer energy from light into energy in chemicals for the synthesis of carbon dioxide.
- 6 Some nutrients that a football player eats before a match are listed.
- 1 carbohydrates
 - 2 calcium
 - 3 fats
 - 4 proteins

Which nutrients provide the football player with the most energy per 100 g during the match?

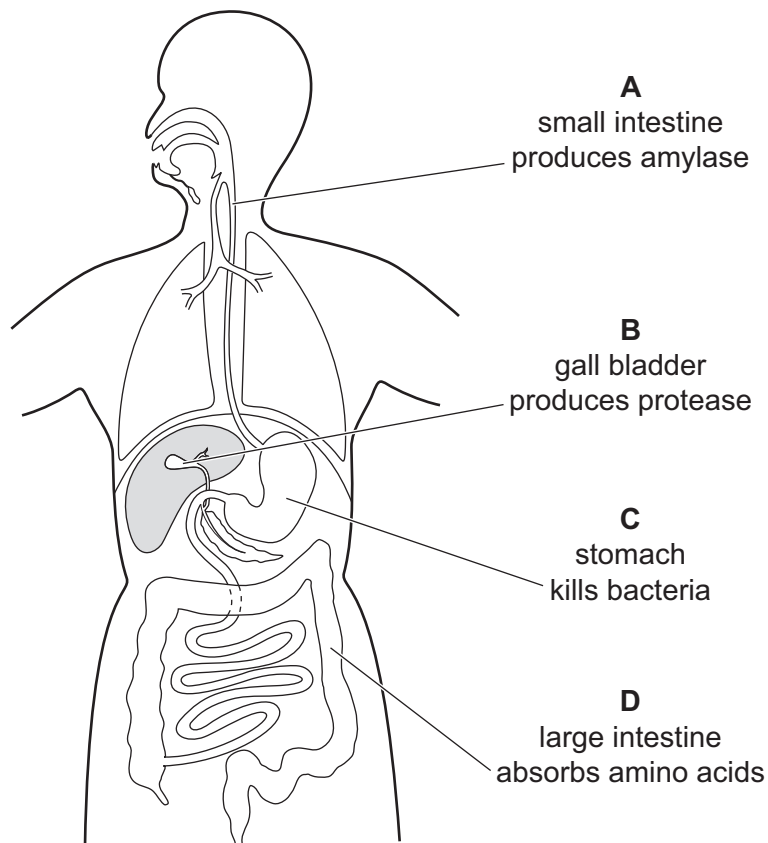
- A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4

7 Which description of physical digestion is correct?

- A the breakdown of food into smaller pieces with a chemical change to the food molecules
- B the breakdown of food into smaller pieces without a chemical change to the food molecules
- C the breakdown of large insoluble food molecules into small soluble food molecules
- D the breakdown of large soluble food molecules into small soluble food molecules

8 The diagram shows the alimentary canal and associated organs.

Which structure has the correct name and function?



9 Which type of plant cell has a large surface area to increase the uptake of water?

- A mesophyll
- B root cortex
- C root hair
- D xylem

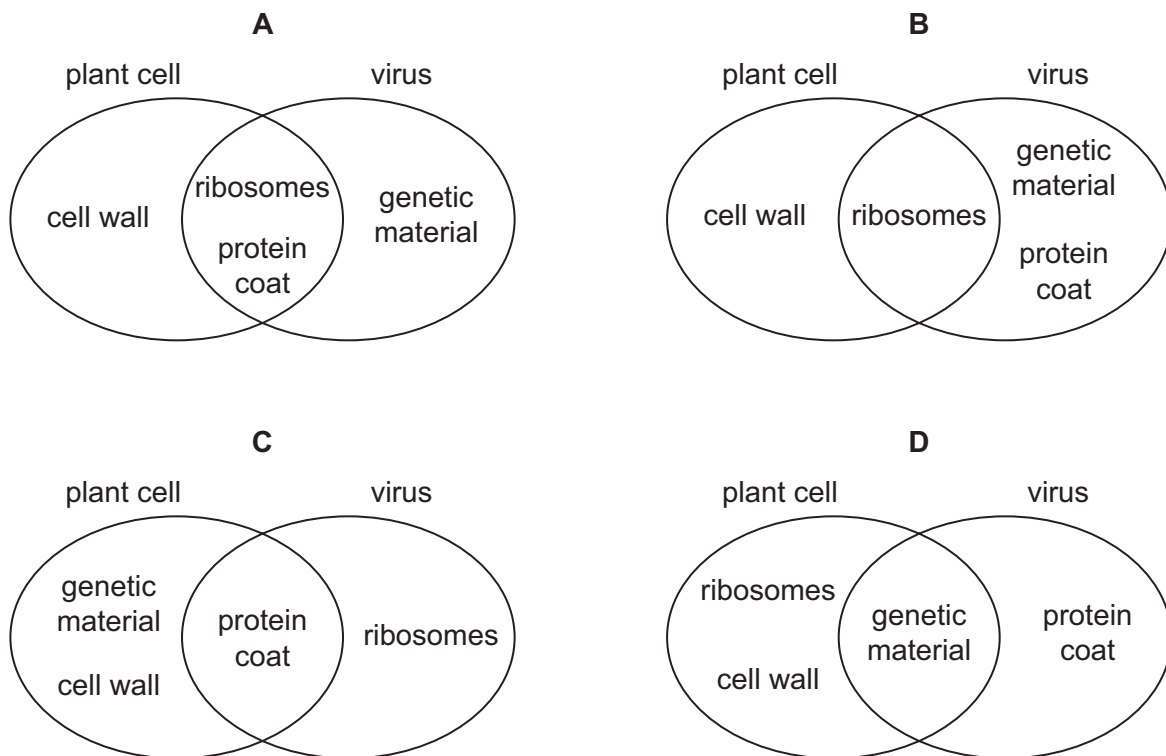
10 Which factors are possible risk factors for coronary heart disease?

- 1 age
- 2 genetic predisposition
- 3 sex

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

11 The diagrams show features of plant cells and viruses that are different and features that are common to both.

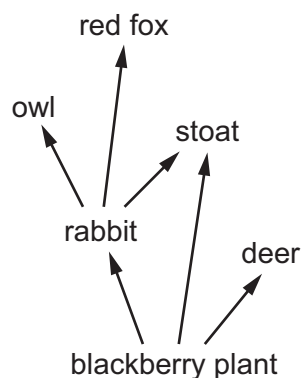
Which diagram is correct?



12 What happens to breathing in humans during exercise?

	depth of breathing	rate of breathing
A	increases	increases
B	increases	no change
C	no change	increases
D	no change	no change

13 The diagram shows a food web.



Which statement about this food web is correct?

- A** There is one producer and two secondary consumers.
- B** There are two producers and three secondary consumers.
- C** There are two secondary consumers and two tertiary consumers.
- D** There are three primary consumers and three secondary consumers.

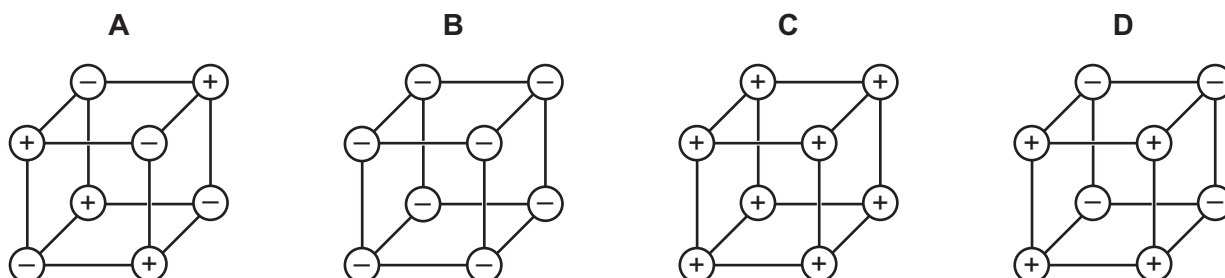
14 The melting point of argon is -189°C and its boiling point is -185°C .

The temperature of a sample of argon is changed from -180°C to -187°C .

Which row describes the arrangement of the particles at -180°C and at -187°C ?

	particles at -180°C	particles at -187°C
A	far apart and randomly arranged	close together and randomly arranged
B	far apart and randomly arranged	close together and ordered
C	close together and ordered	close together and randomly arranged
D	close together and ordered	far apart and randomly arranged

15 Which diagram represents the lattice structure of sodium chloride?



16 In which molecule are 10 electrons used to form covalent bonds?

- A** C_2H_4
- B** CH_3OH
- C** CO_2
- D** N_2

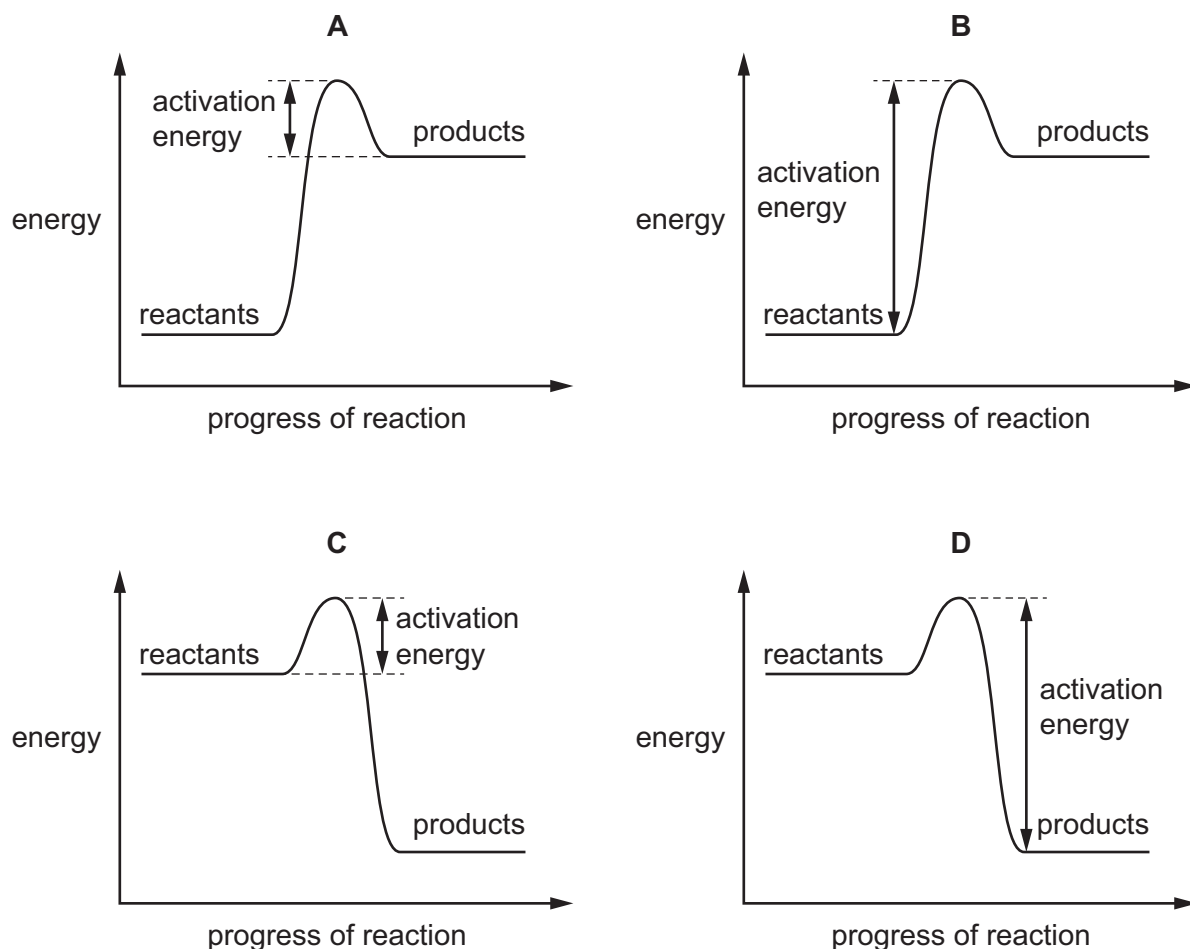
17 The formula of an iron(III) ion is Fe^{3+} .

The formula of a sulfate ion is SO_4^{2-} .

What is the formula of iron(III) sulfate?

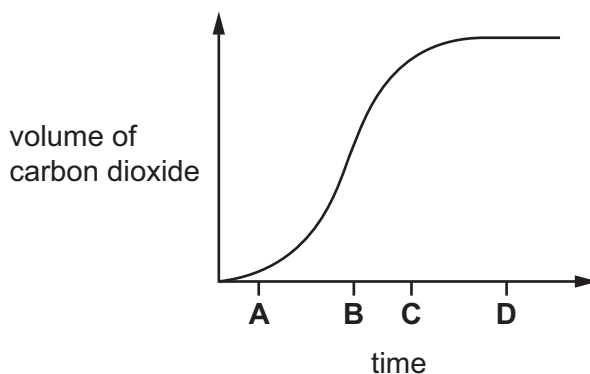
- A** FeSO_4 **B** Fe_3SO_4 **C** $\text{Fe}_2(\text{SO}_4)_3$ **D** $\text{Fe}_3(\text{SO}_4)_2$

18 Which reaction pathway diagram shows the activation energy for an exothermic reaction?



19 The graph shows the volume of carbon dioxide produced in a reaction.

At which time is the rate of reaction greatest?



20 Ammonia dissolves in water.

Which test shows that the solution has a pH of 9?

- A Blue litmus paper stays blue.
- B Red litmus paper turns blue.
- C Universal indicator turns green.
- D Universal indicator turns blue.

21 What is the method by which elements are arranged in the Periodic Table?

- A by nucleon number
- B by number of electrons
- C by number of neutrons
- D by number of protons

22 Which statement about Group I elements is correct?

- A Lithium and potassium are poor electrical conductors.
- B Potassium has a higher density than lithium.
- C Sodium and potassium are relatively hard metals.
- D Sodium reacts with water to produce a lilac flame.

23 Which mixture results in the displacement of a halogen?

- A $\text{Br}_2(\text{aq})$ and $\text{NaCl}(\text{aq})$
- B $\text{Cl}_2(\text{g})$ and $\text{KI}(\text{aq})$
- C $\text{I}_2(\text{aq})$ and $\text{KBr}(\text{aq})$
- D $\text{NaBr}(\text{aq})$ and $\text{KCl}(\text{aq})$

24 What is **not** a property of transition elements?

- A form coloured compounds
- B good electrical conductivity
- C high melting point
- D low density

25 How is an R_f value calculated in chromatography?

- A** $\frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$
- B** $\frac{\text{distance travelled by solvent}}{\text{distance travelled by substance}}$
- C** $\frac{\text{distance from the baseline to the top of the paper}}{\text{distance travelled by substance}}$
- D** $\frac{\text{distance travelled by substance}}{\text{distance from the baseline to the top of the paper}}$

26 Which method describes how pure crystals of magnesium sulfate are obtained from pure aqueous magnesium sulfate?

- A** Filter the crystals from the solution and dry them between pieces of filter paper.
- B** Filter the crystals from the solution and heat them to dryness.
- C** Heat to dryness and leave to cool.
- D** Heat to remove some of the water and leave to cool and evaporate slowly.

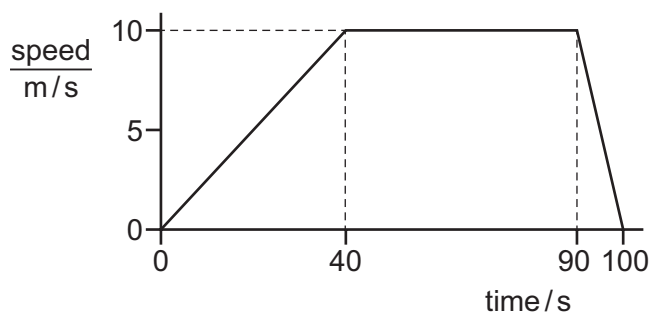
27 Four statements about alkenes are listed.

- 1 They turn aqueous bromine from colourless to orange.
- 2 They are reactants in addition reactions.
- 3 They react with steam in the presence of an acid catalyst.
- 4 They react with hydrogen without a catalyst.

Which statements are correct?

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

28 The speed–time graph for the motion of a car is shown.



What is the distance the car travels while it is decelerating?

- A** 50 m **B** 100 m **C** 200 m **D** 500 m

- 29 A force of 2.0 N moves an object a distance of 40 cm in the direction of the force.

What is the work done by the force?

- A 0.20 J B 0.80 J C 5.0 J D 80 J

- 30 A chair has a weight of 80 N.

The chair has four legs, and each leg has a base area of 20 cm^2 .

What is the pressure exerted by the chair on the floor?

- A 1.0 Pa B 4.0 Pa C 10 000 Pa D 40 000 Pa

- 31 Which statement is a reason why metals are better thermal conductors than plastics?

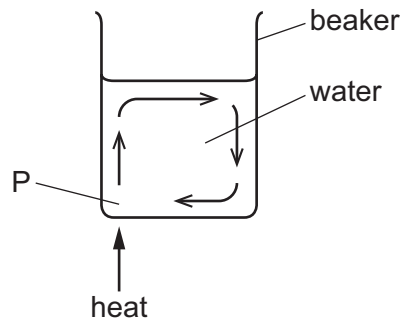
- A Metals contain delocalised electrons.
B Metals have high melting points.
C The forces between particles in metals are strong.
D The particles in metals are far apart.

- 32 A beaker of water is placed in front of an electric fan.

Which changes to the temperature of the water and the position of the beaker **both** result in a greater rate of evaporation of water from the beaker?

	temperature of water	position of beaker
A	decrease	further away from fan
B	decrease	nearer to fan
C	increase	further away from fan
D	increase	nearer to fan

- 33** A beaker of water is heated, and a convection current is formed in the water as shown in the diagram.



What happens to the water at point P?

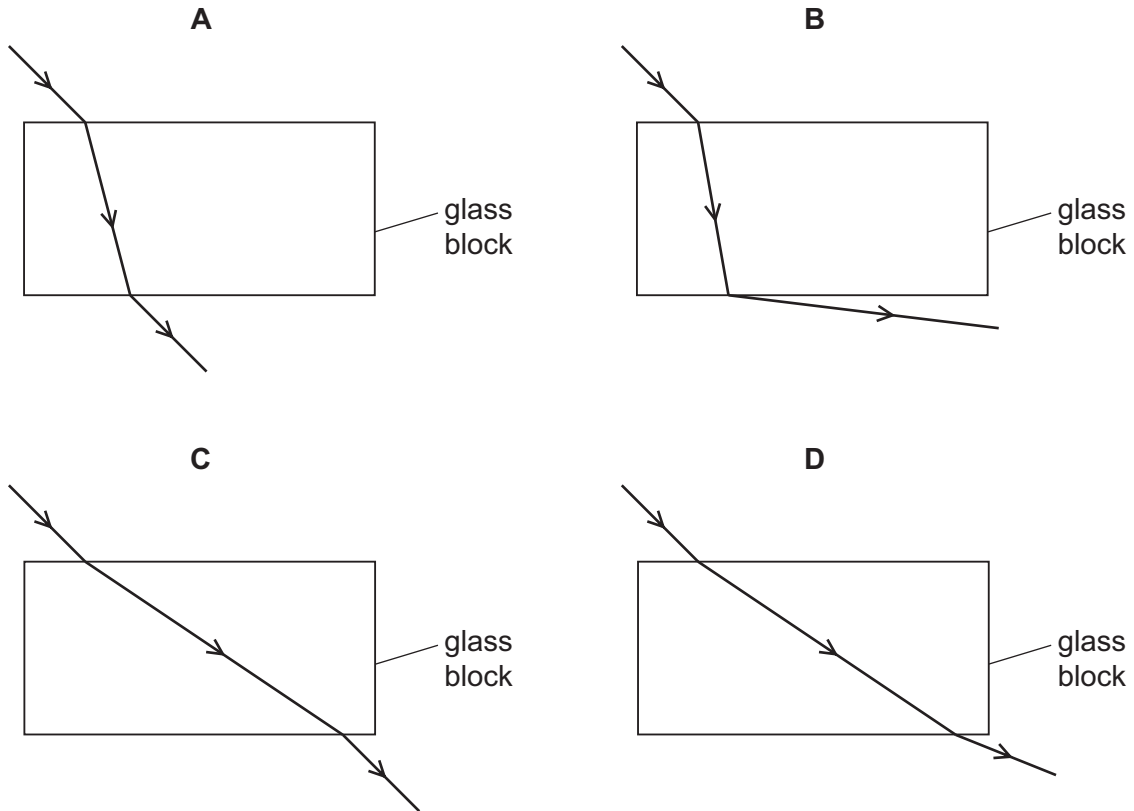
- A** Its volume increases and its density decreases.
 - B** Its volume increases and its density increases.
 - C** Its volume remains the same and its density decreases.
 - D** Its volume remains the same and its density increases.
- 34** An image of an object is formed by a plane mirror.

Which row describes the characteristics of the image?

	type of image	size of image
A	real	same as object
B	real	smaller than object
C	virtual	same as object
D	virtual	smaller than object

35 Light passes through a glass block.

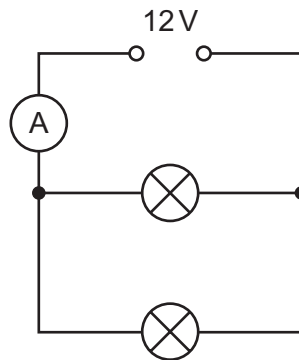
Which diagram shows the path taken by the light?



36 What is the speed of ultraviolet radiation in a vacuum?

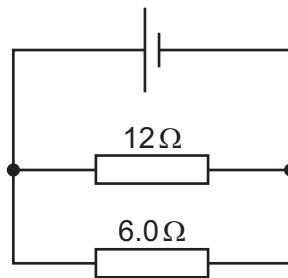
- A** $3.0 \times 10^4 \text{ m/s}$
- B** $3.0 \times 10^6 \text{ m/s}$
- C** $3.0 \times 10^8 \text{ m/s}$
- D** $3.0 \times 10^{10} \text{ m/s}$

- 37 The circuit shows two identical lamps connected in parallel to a 12V power supply. The reading on the ammeter is 3.0 A.



What is the power transferred by **each** lamp?

- A** 4.0 W **B** 8.0 W **C** 18 W **D** 36 W
- 38 The circuit shown contains a $12\ \Omega$ resistor and a $6.0\ \Omega$ resistor connected in parallel.



What is the combined resistance of the two resistors?

- A** $0.25\ \Omega$ **B** $4.0\ \Omega$ **C** $9.0\ \Omega$ **D** $18\ \Omega$
- 39 What is the purpose of a fuse in an electric circuit?
- A** It acts as an extra resistor in the circuit.
B It keeps the current at a steady value.
C It keeps the voltage at a steady value.
D It protects the circuit from a current that is too large.

- 40 Which object is a dwarf planet?

- A** Mars
B Mercury
C Jupiter
D Pluto

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Group																					
I	II											III	IV	V	VI	VII	VIII				
												1 H hydrogen 1									
												Key atomic number atomic symbol name relative atomic mass									
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 —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —

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	europlum	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	femium	—	101	Md	mendelevium	—	102	No	nobelium	—	103	Lr	lawrencium	—



Cambridge IGCSE™

COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/23

October/November 2025

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.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m/s^2).

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. Any blank pages are indicated.



- 1 Nutrition is the taking in of materials.

What are these materials needed for?

	development	energy	growth
A	x	✓	✓
B	✓	x	✓
C	✓	✓	x
D	✓	✓	✓

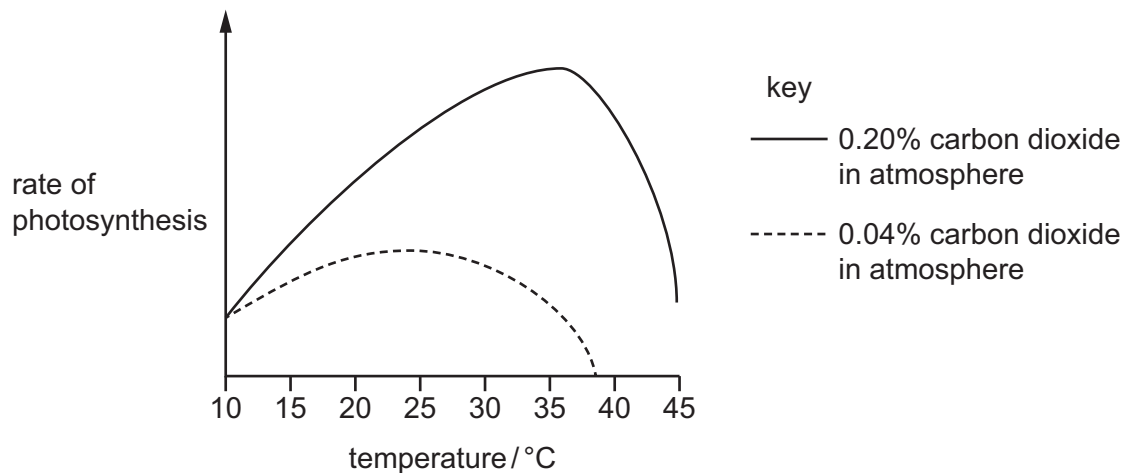
- 2 Which statement describes osmosis?

- A** net movement of water molecules from a lower to a higher water potential through the cell membrane
- B** net movement of water molecules from a lower to a higher water potential through the cell wall
- C** net movement of water molecules from a higher to a lower water potential through the cell membrane
- D** net movement of water molecules from a higher to a lower water potential through the cell wall

- 3 Which statement about enzymes is correct for temperatures up to the optimum temperature?

- A** As temperature increases, substrates react with the active sites more slowly.
- B** As temperature increases, enzymes have more kinetic energy.
- C** As temperature decreases, enzymes denature.
- D** As temperature decreases, the number of effective collisions increases.

- 4 The graph shows the effect of temperature and carbon dioxide concentration on the rate of photosynthesis in a plant.



What is a correct conclusion from the graph?

- A** The higher the temperature, the faster the rate of photosynthesis.
- B** The optimum temperature for photosynthesis for both carbon dioxide concentrations is 37.5 °C.
- C** The rate of photosynthesis depends on both carbon dioxide concentration and temperature.
- D** Increasing carbon dioxide concentration doubles the rate of photosynthesis at all temperatures.
- 5 What is an example of a mineral ion?
- A** calcium
- B** fibre
- C** protein
- D** vitamin C
- 6 Which statement about lipase is correct?
- A** It is secreted into the colon and breaks down fats and oils.
- B** It is secreted into the small intestine and breaks down fats and oils.
- C** It is secreted into the small intestine and breaks down fatty acids into glycerol.
- D** It is secreted into the stomach and breaks down glycerol into fatty acids.

- 7 A student investigates transpiration in four small plants of the same species.

The student places each plant at a different distance away from an electric fan. All other conditions are kept the same.

The table shows the mass of each plant at the beginning of the investigation and after 48 hours.

Which plant is placed the furthest distance away from the electric fan?

	mass of plant / g	
	at beginning	after 48 hours
A	295	255
B	312	262
C	300	247
D	280	235

- 8 Which row explains the effect of physical activity on heart rate?

	heart rate	explanation
A	decreases	increases blood flow to the muscles
B	decreases	decreases blood flow to the muscles
C	increases	increases blood flow to the muscles
D	increases	decreases blood flow to the muscles

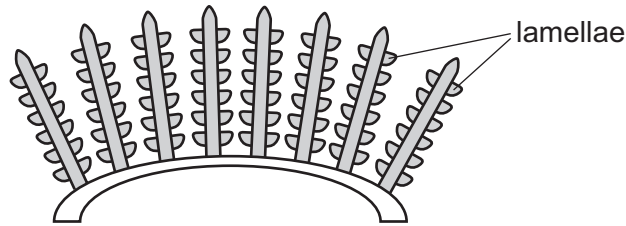
- 9 What are features of an artery?

- 1 a narrow lumen
- 2 a thick wall
- 3 a valve

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

- 10 The diagram shows structures called lamellae.

Lamellae are found in the gills of fish.



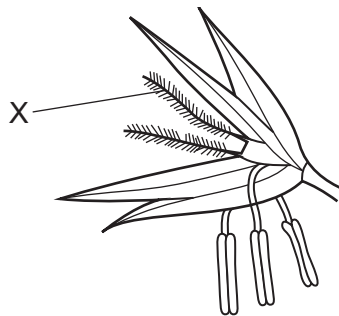
Lamellae give the gills a large surface area.

The gills are the site of gas exchange in fish.

What is the effect of this large surface area?

- A low rate of carbon dioxide diffusion into the blood
- B low rate of oxygen diffusion into the blood
- C high rate of carbon dioxide diffusion into the blood
- D high rate of oxygen diffusion into the blood

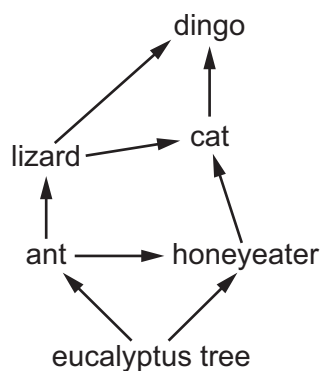
- 11 The diagram shows a flower.



What is structure X?

- A anther of an insect-pollinated flower
- B anther of a wind-pollinated flower
- C stigma of an insect-pollinated flower
- D stigma of a wind-pollinated flower

12 The diagram shows a food web.



Which row describes the honeyeater and the cat?

	honeyeater	cat
A	primary and secondary consumer	secondary and tertiary consumer
B	primary and secondary consumer	secondary consumer only
C	primary consumer only	tertiary consumer only
D	primary consumer only	secondary and tertiary consumer

13 What is described as a community of organisms and their environment interacting together?

- A** ecosystem
- B** food chain
- C** food web
- D** habitat

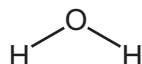
14 Bromine is a liquid at room temperature.

When bromine is cooled to -7.2°C , it turns into a solid.

Which process takes place when the solid forms?

- A** boiling
- B** condensing
- C** freezing
- D** melting

- 15 In water, hydrogen atoms and oxygen atoms are bonded together with covalent bonds.



Which row shows information about the electrons in a molecule of water?

	number of electrons in the outer shell of each hydrogen atom	number of electrons in the outer shell of the oxygen atom	total number of electrons in one molecule of water
A	2	6	8
B	2	8	10
C	8	6	14
D	8	8	16

- 16 Which process is a physical change?

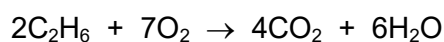
- A** addition of carbon dioxide to limewater
- B** addition of sodium to water
- C** electrolysis of molten lead(II) bromide
- D** separation of petroleum by fractional distillation

- 17 Solid lumps of zinc react with dilute hydrochloric acid.

Which change decreases the rate of this reaction?

- A** adding a catalyst to the reaction mixture
- B** increasing the concentration of the hydrochloric acid
- C** increasing the size of the zinc lumps
- D** increasing the temperature of the hydrochloric acid

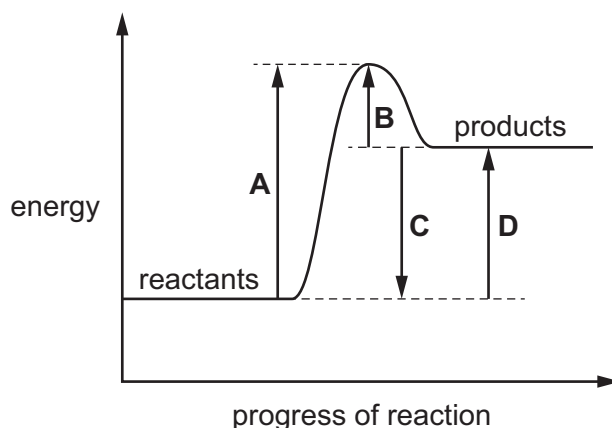
- 18 The equation for the complete combustion of ethane is shown.



Which statement about this reaction is correct?

- A** Ethane is oxidised because it gains oxygen.
- B** Ethane is reduced because carbon–hydrogen bonds are broken.
- C** It is endothermic because thermal energy is transferred to the surroundings.
- D** It is exothermic because thermal energy is taken in from the surroundings.

- 19 Which arrow on the reaction pathway diagram represents the overall energy change for the reaction?



- 20 Which word equation describes a reaction of dilute sulfuric acid?

- A sulfuric acid + zinc $\rightarrow$ zinc sulfate + water
- B sulfuric acid + zinc carbonate $\rightarrow$ zinc sulfate + carbon dioxide
- C sulfuric acid + zinc hydroxide $\rightarrow$ zinc sulfate + water
- D sulfuric acid + zinc oxide $\rightarrow$ zinc sulfate + hydrogen

- 21 Which statement describes a trend in the elements going down Group VII?

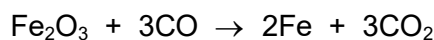
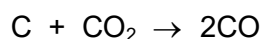
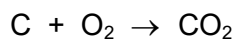
- A They are darker in colour.
- B They are displaced from solutions of their halide ions by elements lower down the group.
- C They are more reactive.
- D They have lower boiling points.

- 22 Which statements about an alloy are correct?

- 1 It contains atoms of different sizes.
- 2 It contains one type of atom.
- 3 It only conducts electricity when it is molten.
- 4 It is a mixture of a metal with another element.

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

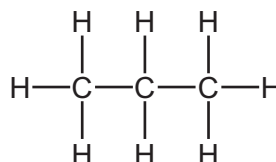
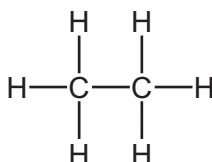
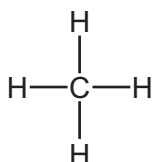
23 The equations describe the reactions that happen when iron is extracted in the blast furnace.



What is a description of one of these reactions?

- A** Carbon dioxide is oxidised to form carbon monoxide.
- B** Iron(III) oxide is reduced by carbon dioxide.
- C** Carbon reacts with carbon monoxide to form carbon dioxide.
- D** Carbon monoxide removes oxygen from iron(III) oxide.

24 The structures of some compounds are shown.



Which statement about these compounds is correct?

- A** They have the same boiling point.
- B** They are in the same homologous series.
- C** They are unsaturated.
- D** They have different chemical properties.

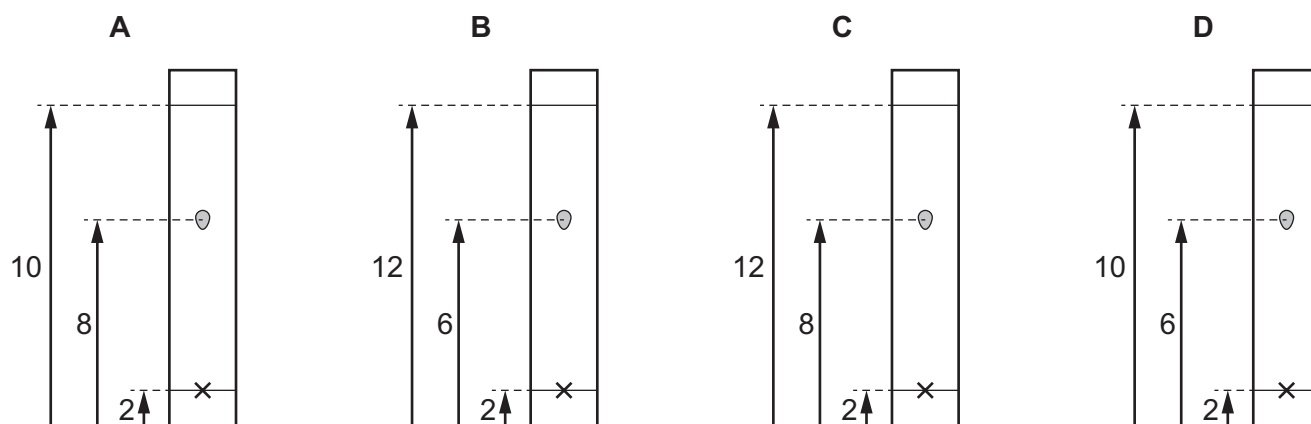
25 Which statement about methane is correct?

- A** Its increase in the atmosphere contributes to climate change.
- B** It reacts with steam in the presence of an acid catalyst.
- C** It has the molecular formula CH_3OH .
- D** It reacts with bromine in an addition reaction.

26 A chromatography experiment is carried out on a compound.

The R_f value of the compound is 0.60.

Which diagram shows the chromatogram of the compound?



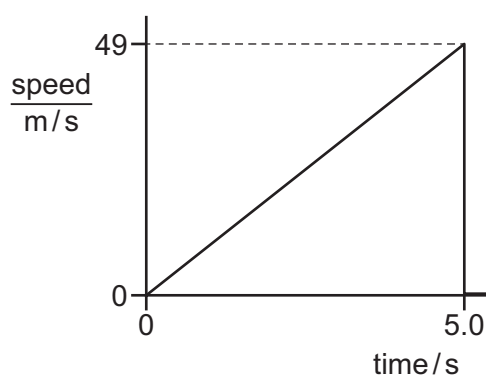
27 Crystals of pure sodium chloride are formed by crystallisation.

Which row describes the structure of a sodium chloride crystal and the arrangement of the ions in the crystal?

	structure	arrangement of ions
A	simple molecular	random
B	simple molecular	regular
C	giant lattice	random
D	giant lattice	regular

28 A stone falls from the top of a cliff to the ground.

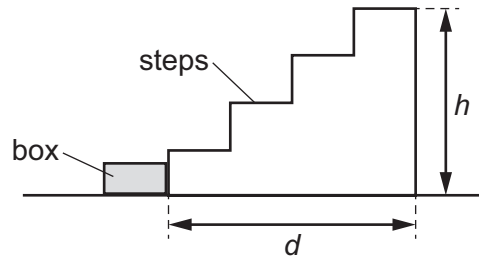
The graph shows how the speed of the stone varies with time until it hits the ground.



What is the height of the top of the cliff above the ground?

- A** 9.8 m **B** 54 m **C** 123 m **D** 245 m

- 29 The diagram shows a box of mass m and weight W at the bottom of a set of steps.



The box is moved from the bottom of the steps to the top of the steps.

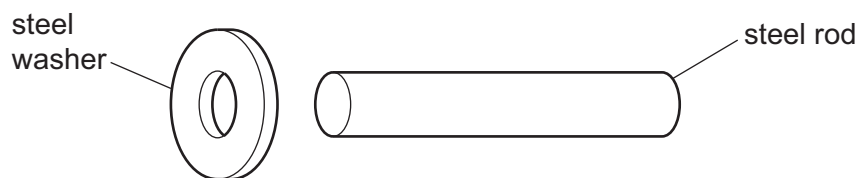
Which two quantities on their own are used to determine the change in gravitational potential energy of the box?

- A** h and d **B** h and m **C** W and d **D** W and h
- 30 Energy is released by a nuclear process in a power station, and energy is released by a nuclear process in the Sun.

Which row shows the process in a power station and the process in the Sun?

	a power station	the Sun
A	nuclear fission	nuclear fission
B	nuclear fission	nuclear fusion
C	nuclear fusion	nuclear fission
D	nuclear fusion	nuclear fusion

- 31 An engineer wants to fit a steel washer onto a steel rod. The rod is slightly too big to fit into the hole in the washer.



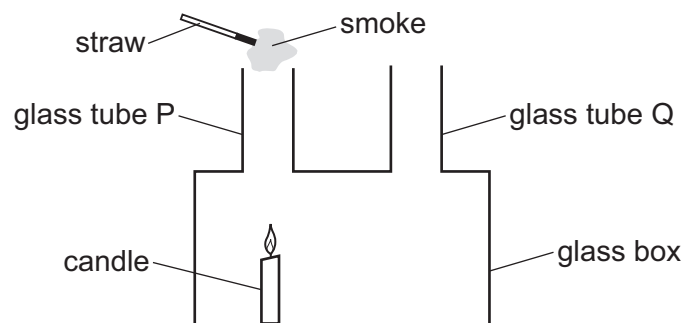
Which statement describes how the engineer fits the washer onto the rod?

- A** Cool the washer and push it over the rod.
B Cool the washer and the rod to the same temperature and then push them together.
C Heat the rod and then push it in the hole.
D Heat the washer and push it over the rod.

32 Which row correctly lists two good thermal conductors and two bad thermal conductors?

	good thermal conductors	bad thermal conductors
A	copper, air	gold, wood
B	copper, gold	glass, air
C	glass, gold	copper, wood
D	glass, wood	copper, gold

33 The diagram shows apparatus used to show convection in air.



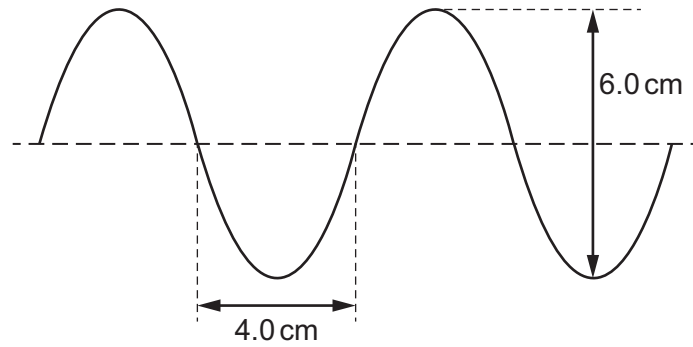
The glass box has two glass tubes, P and Q, at the top. There is a burning candle below P.

A burning straw that produces smoke is held first above P and then above Q.

Which row shows the direction the smoke moves when the straw is placed above each tube?

	straw above P	straw above Q
A	the smoke falls	the smoke falls
B	the smoke falls	the smoke rises
C	the smoke rises	the smoke falls
D	the smoke rises	the smoke rises

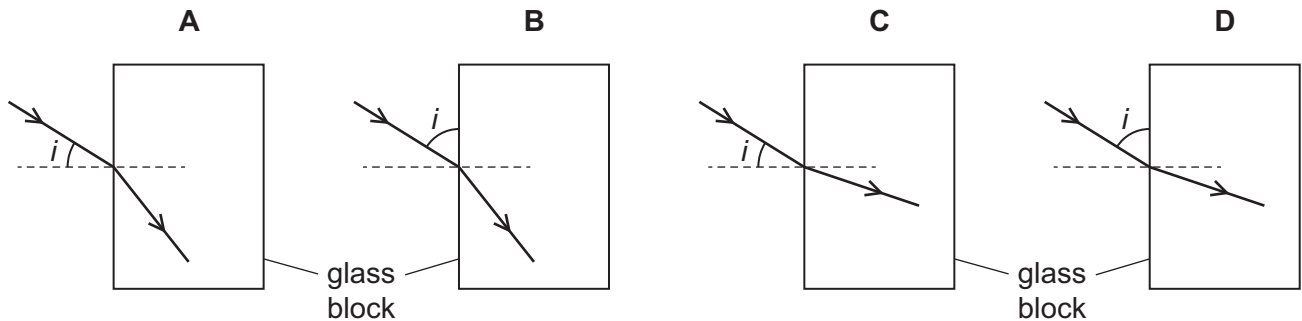
- 34 The diagram represents a wave on the surface of water.



Which row gives the amplitude and the wavelength of the wave?

	amplitude /cm	wavelength /cm
A	3.0	4.0
B	3.0	8.0
C	6.0	4.0
D	6.0	8.0

- 35 Which diagram shows how a ray of light passes from air into a glass block and shows the angle of incidence labelled i ?

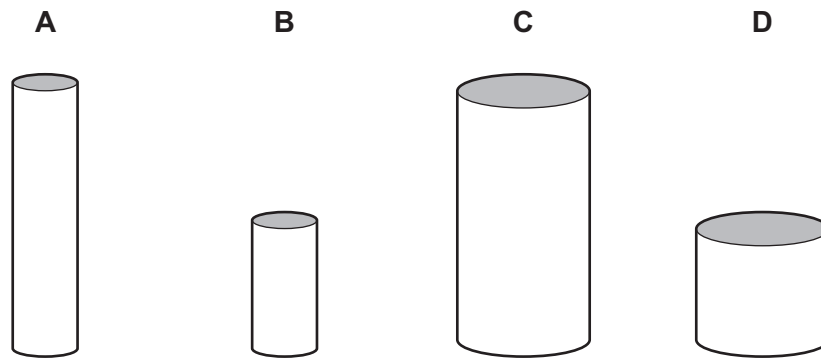


- 36 Which row describes what happens to sound waves as they travel from air into water and from water into rock?

	sound travelling from air into water	sound travelling from water into rock
A	slows down	slows down
B	slows down	speeds up
C	speeds up	slows down
D	speeds up	speeds up

- 37 The diagrams show four solid cylinders, all made of the same metal. The diagrams are all drawn to the same scale.

Which cylinder has the greatest electrical resistance between its circular faces?



- 38 A resistor of resistance $6.0\ \Omega$ is connected in parallel with a resistor of resistance $3.0\ \Omega$.

What is the resistance of the parallel combination?

- A** $0.50\ \Omega$ **B** $2.0\ \Omega$ **C** $3.0\ \Omega$ **D** $9.0\ \Omega$

- 39 Electrical component Z is designed to break the circuit and stop the current when the current in an electrical circuit becomes too large.

What is component Z?

- A** fuse
B motor
C resistor
D voltmeter

- 40 The orbital speed of Mars is v . The strength of the gravitational field of the Sun acting on Mars is f .

Which row gives expressions for the orbital speed of Mercury and the strength of the gravitational field of the Sun acting on Mercury?

	orbital speed of Mercury	strength of gravitational field of the Sun acting on Mercury
A	greater than v	greater than f
B	greater than v	smaller than f
C	smaller than v	greater than f
D	smaller than v	smaller than f

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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	Key atomic number atomic symbol name relative atomic mass										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											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 oganeson —	

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 —

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