



COMBINED SCIENCE

0653/21

Paper 2 Multiple Choice (Extended)

May/June 2019

45 minutes

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

* 1 5 8 5 3 0 7 5 3 1 *

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.

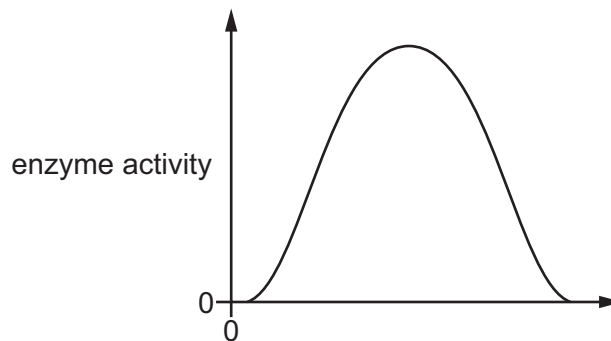
- 1 A student is reading a text book. He finds the following definition about how substances move in and out of cells.

The net movement of water molecules from a region of higher water potential to a region of lower water potential through a partially permeable membrane is called

The corner of the page has been torn.

What is the missing word at the end of the sentence?

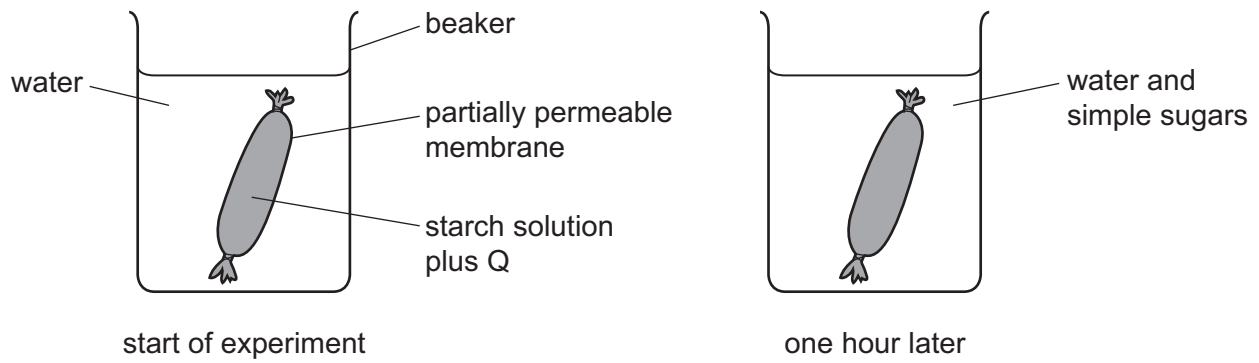
- A diffusion
 - B dissolving
 - C evaporation
 - D osmosis
- 2 The graph shows how the activity of an enzyme varies.



Which label for the x-axis of this graph is correct?

- A enzyme activity
 - B pH
 - C temperature
 - D time
- 3 What is defined as the breakdown of food into smaller pieces, without chemically changing the molecules?
- A absorption
 - B chemical digestion
 - C egestion
 - D mechanical digestion

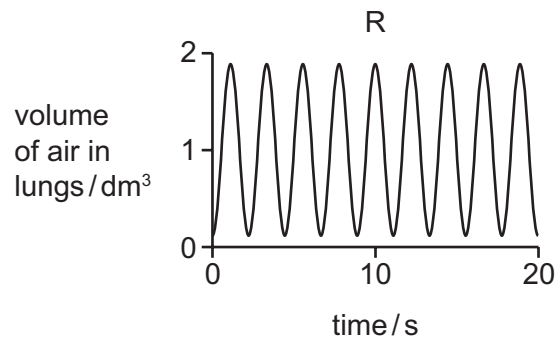
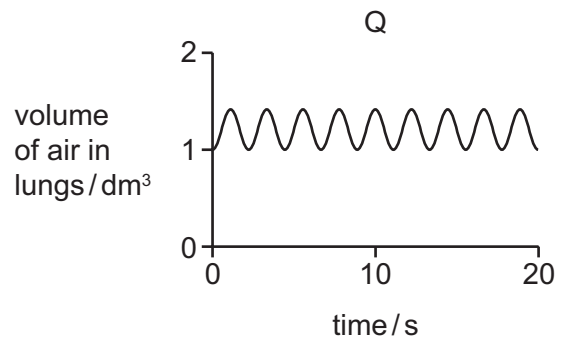
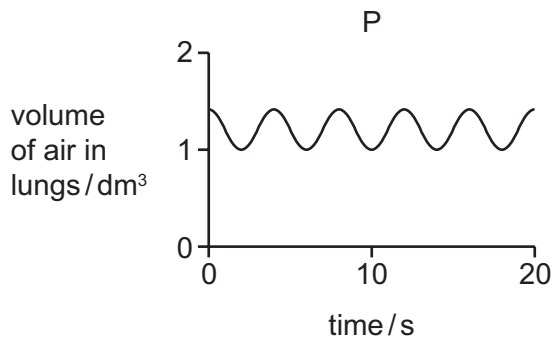
4 The diagram shows an experiment at the start and one hour later.



What is Q?

- A amylase
 - B lipase
 - C protease
 - D water
- 5 The rate of water absorption into a plant is increased by the large surface area of which type of cell?
- A mesophyll
 - B root cortex
 - C root hair
 - D xylem

- 6 The graphs P, Q and R show the changes in the volume of air in the lungs of the same person, measured after different levels of activities.



Which row shows the correct graph for each level of activity?

| | at rest | immediately after 10 minutes of running | immediately after 10 minutes of walking |
|----------|---------|---|---|
| A | P | Q | R |
| B | P | R | Q |
| C | R | Q | P |
| D | R | P | Q |

- 7 Which word equation represents aerobic respiration?

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

8 How does adrenaline affect blood glucose concentration and pulse rate?

| | blood glucose concentration | pulse rate |
|----------|-----------------------------|------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

9 Diagram 1 shows a germinating bean seed placed horizontally.

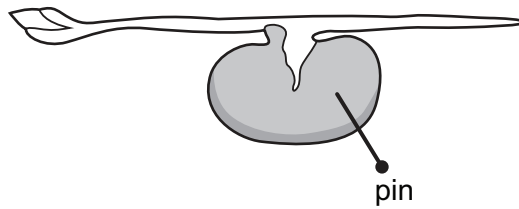


diagram 1

Diagram 2 shows the same seed after three days. The shoot has grown upwards because of the action of an auxin.

Where is the auxin produced?

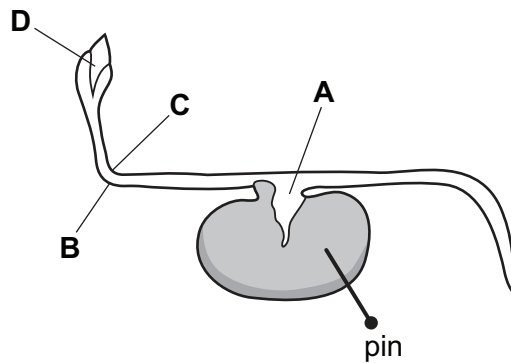
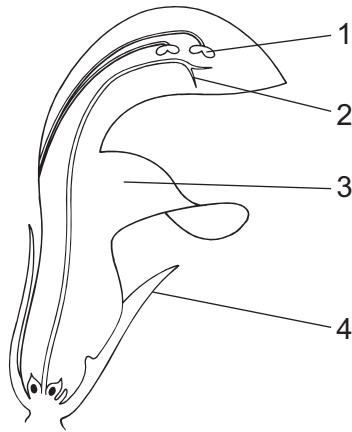


diagram 2

10 What are the features of sexual reproduction?

| | fusion of nuclei | nature of offspring |
|----------|------------------|------------------------|
| A | no | genetically dissimilar |
| B | yes | genetically identical |
| C | no | genetically identical |
| D | yes | genetically dissimilar |

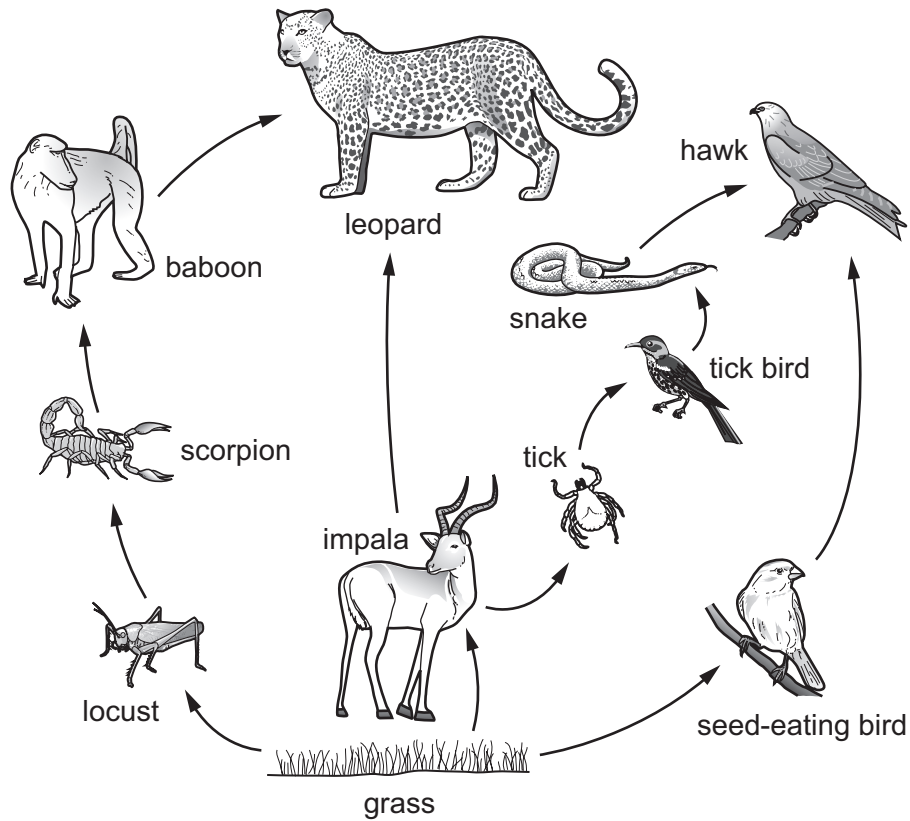
11 The diagram shows a section through an insect-pollinated flower.



Which labels are correct?

| | anther | petal | sepal | stigma |
|----------|--------|-------|-------|--------|
| A | 1 | 3 | 4 | 2 |
| B | 1 | 4 | 3 | 2 |
| C | 2 | 3 | 4 | 1 |
| D | 2 | 4 | 3 | 1 |

12 The diagram shows a food web from the African grasslands.



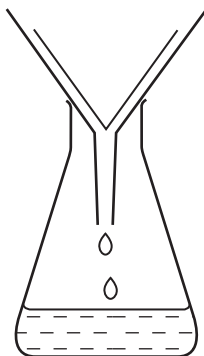
Which row correctly identifies the positions of the organisms in the food web?

| | primary consumer | secondary consumer | tertiary consumer |
|----------|------------------|--------------------|-------------------|
| A | grass | seed-eating bird | locust |
| B | impala | tick | leopard |
| C | locust | scorpion | tick bird |
| D | seed-eating bird | tick bird | baboon |

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

| | carbon dioxide gas | oxygen gas |
|----------|--------------------|------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

14 The diagram shows apparatus used for filtration.



Why can sugar and salt **not** be separated by using this apparatus?

- A They are both compounds.
- B They are both white.
- C They both dissolve in water.
- D They both have the same size particles.

15 Copper sulfate crystals dissolve in water.

Which word describes the role of the water?

- A filtrate
- B solute
- C solution
- D solvent

16 Magnesium chloride is an ionic compound.

Which row describes the formation of magnesium chloride and the strength of the attraction between its ions?

| | formation of magnesium chloride | strength of the attraction between ions |
|---|--|---|
| A | electrons are shared between magnesium and chlorine | strong |
| B | electrons are shared between magnesium and chlorine | weak |
| C | electrons are transferred from magnesium to chlorine | strong |
| D | electrons are transferred from magnesium to chlorine | weak |

17 Which process occurs at the anode during the electrolysis of concentrated aqueous sodium chloride?

- A Chloride ions lose electrons to form chlorine.
- B Hydrogen ions gain electrons to form hydrogen.
- C Oxide ions lose electrons to form oxygen.
- D Sodium ions gain electrons to form sodium.

18 When an excess of zinc is added to dilute hydrochloric acid, a gas is released.

Which pieces of apparatus are needed to investigate the rate of this reaction?

- 1 balance
- 2 gas syringe
- 3 stop watch
- 4 thermometer

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

19 Calcium chloride is a soluble salt.

It is made by adding calcium carbonate to substance X.

Solid calcium chloride is obtained from the reaction mixture by process Y.

What are substance X and process Y?

| | substance X | process Y |
|---|-------------------|-----------------|
| A | hydrochloric acid | crystallisation |
| B | hydrochloric acid | filtration |
| C | sodium chloride | crystallisation |
| D | sodium chloride | filtration |

20 Which aqueous ion gives a white precipitate with aqueous sodium hydroxide and with aqueous ammonia?

- A Cu^{2+} B Fe^{2+} C Fe^{3+} D Zn^{2+}

21 Which pair of substances react together?

- A bromine and potassium chloride
- B bromine and potassium iodide
- C iodine and potassium bromide
- D iodine and potassium chloride

22 Iron obtained from the blast furnace contains small amounts of carbon and silicon.

Which statement describes this iron?

- A It is a covalent compound.
- B It is an alloy.
- C It is an ionic compound.
- D It is slag.

23 P, Q, R and S are four metallic elements.

An atom of S forms an ion by losing only one electron.

When Q is added to a solution of R^{2+} ions, metal R is produced.

P reacts with cold water to form hydrogen.

What are P, Q, R and S?

| | P | Q | R | S |
|---|-----------|-----------|--------|-----------|
| A | calcium | magnesium | copper | sodium |
| B | copper | magnesium | iron | potassium |
| C | potassium | copper | zinc | sodium |
| D | sodium | zinc | iron | magnesium |

24 Which statement about water is **not** correct?

- A A water molecule consists of three atoms covalently bonded together.
- B The water supply is treated with chlorine to kill the bacteria in it.
- C Water changes the colour of cobalt chloride paper from blue to pink.
- D Water has a low melting point because covalent bonds are weak.

25 Which statement shows that petroleum is a mixture?

- A Petroleum can be burned as a fuel.
- B Petroleum can be separated into fractions by distillation.
- C Petroleum is a fossil fuel formed over millions of years.
- D Petroleum is a thick, black liquid.

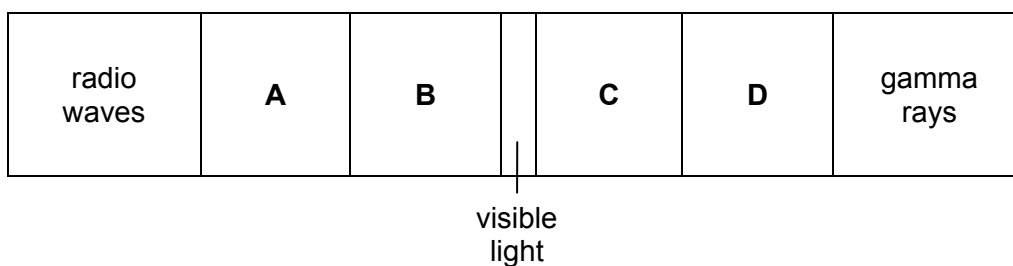
26 Which statement about alkanes is **not** correct?

- A Alkanes are unsaturated hydrocarbons.
- B Alkanes burn to release heat energy.
- C Alkanes form carbon dioxide and water when they burn.
- D Alkane molecules contain only single bonds.

27 Which reaction equation represents cracking?

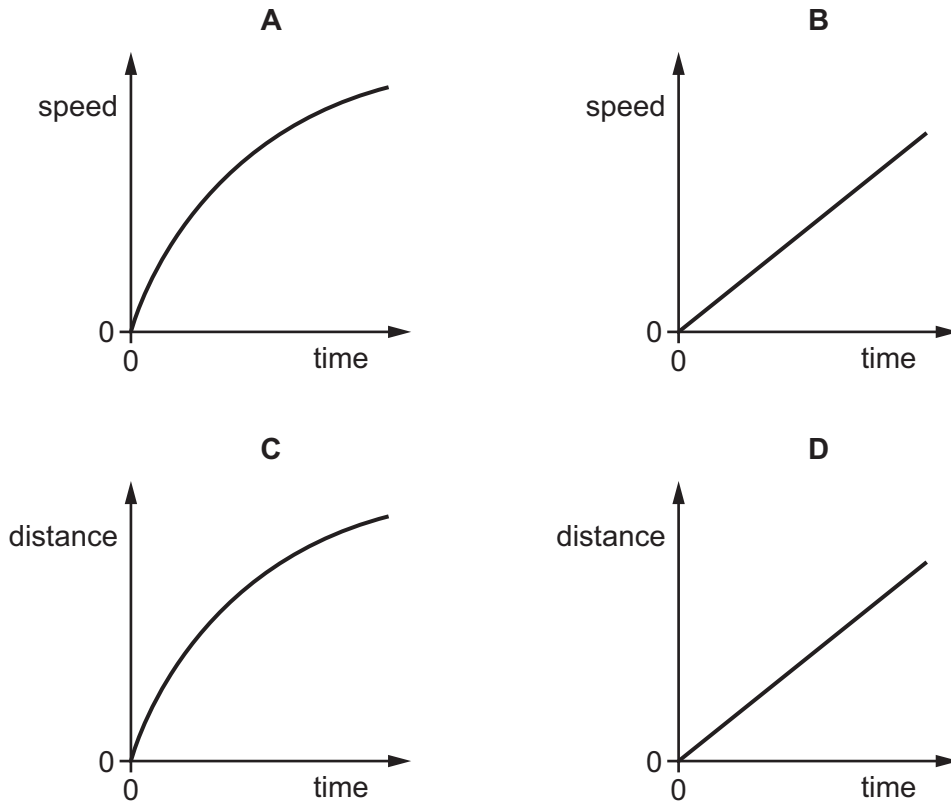
- A $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- B $\text{C}_2\text{H}_4 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_4\text{Br}_2$
- C $n\text{C}_2\text{H}_4 \rightarrow -(\text{C}_2\text{H}_2)_n$
- D $\text{C}_2\text{H}_6 \rightarrow \text{C}_2\text{H}_4 + \text{H}_2$

28 Which labelled part of the electromagnetic spectrum is often involved in thermal energy transfer by radiation?

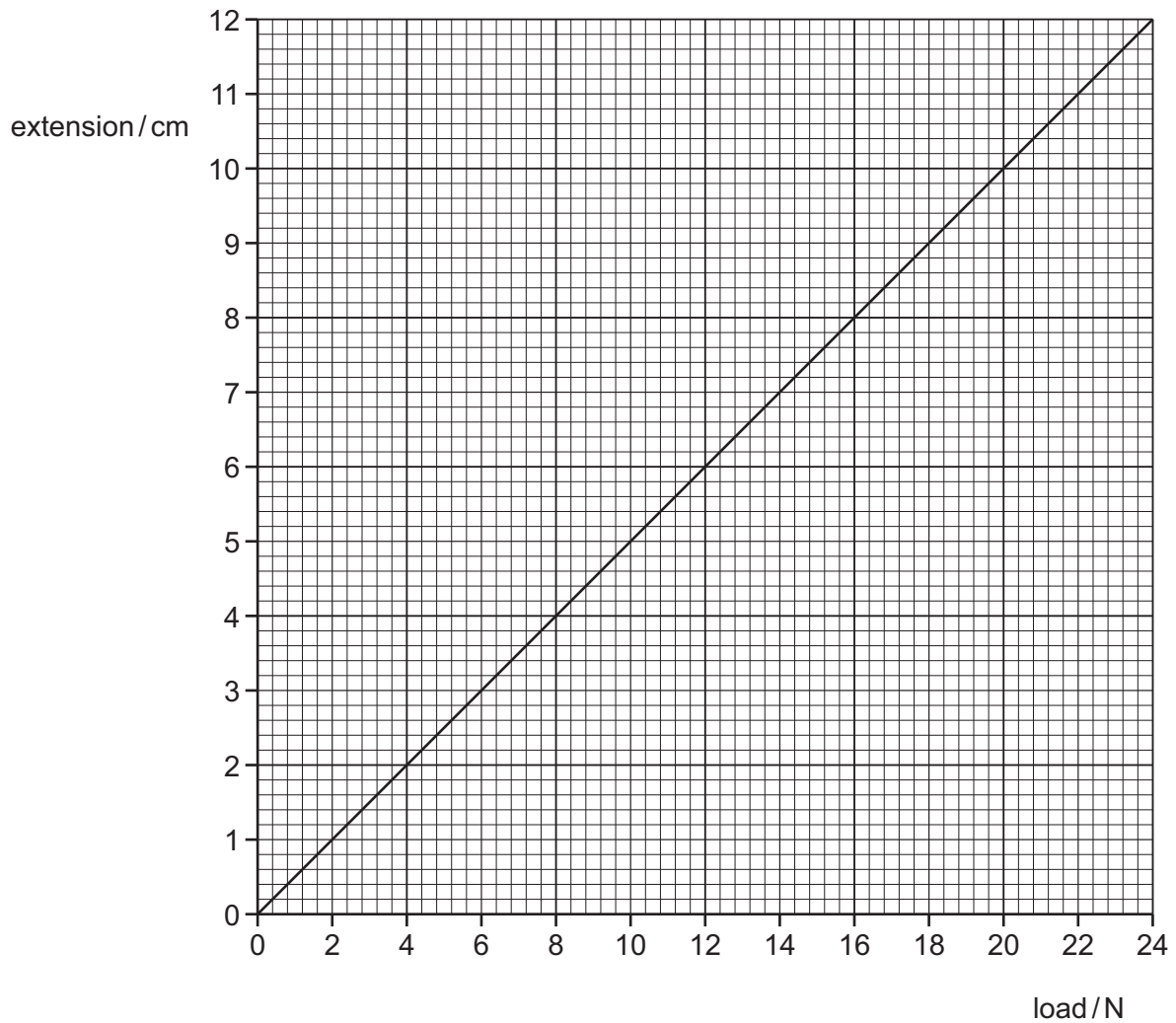


29 The diagrams show two speed–time graphs and two distance–time graphs.

Which graph represents the motion of a train with a positive acceleration that is **not** constant?



30 The diagram shows an extension-load graph for a spring.



The unstretched length of the spring is 10.0 cm.

What is the length of the spring when a load of 8.0 N is suspended from it?

- A** 4.0 cm **B** 14.0 cm **C** 16.0 cm **D** 26.0 cm

31 Which statement describes the process of convection in a liquid?

- A** Heated liquid becomes less dense and falls.
B Heated liquid becomes less dense and rises.
C Heated liquid becomes more dense and falls.
D Heated liquid becomes more dense and rises.

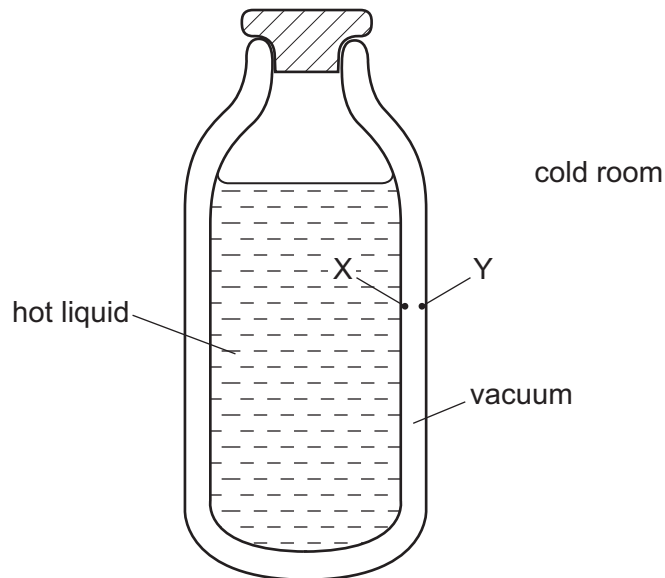
- 32 A balloon contains helium. The balloon is released and rises through the atmosphere. Its volume increases and the temperature of the helium inside it decreases.

What happens to the average distance between the helium molecules and what happens to their average speed?

| | average distance between molecules | average speed of molecules |
|----------|------------------------------------|----------------------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

- 33 The diagram shows a vacuum flask containing a hot liquid in a cold room.

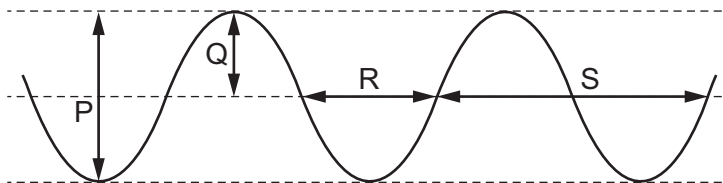
X and Y are points on the inside surfaces of the walls of the flask.



How is thermal energy transferred through the vacuum between X and Y?

- A** by conduction and convection
- B** by conduction only
- C** by radiation and convection
- D** by radiation only

34 The diagram represents a wave at one moment.



Which labelled arrows represent the amplitude and the wavelength of the wave?

| | amplitude | wavelength |
|----------|-----------|------------|
| A | P | R |
| B | P | S |
| C | Q | R |
| D | Q | S |

35 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 |

36 The amplitude of a sound wave decreases and its frequency increases.

What happens to the sound heard?

- A** It becomes louder and its pitch becomes higher.
- B** It becomes louder and its pitch becomes lower.
- C** It becomes quieter and its pitch becomes higher.
- D** It becomes quieter and its pitch becomes lower.

37 What is the unit of electric charge?

- A** ampere
- B** coulomb
- C** volt
- D** watt

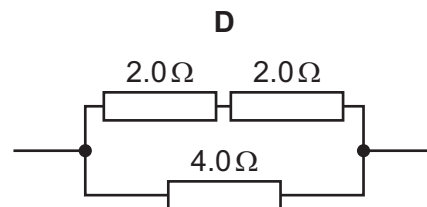
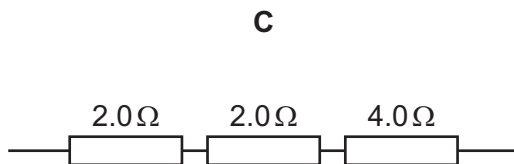
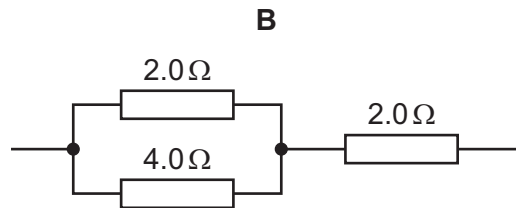
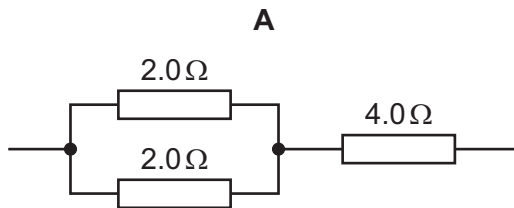
- 38 There is a current of 2.0 A in a resistor. The power produced in the resistor is 8.0 W.

What is the potential difference across the resistor?

- A 0.25 V B 4.0 V C 10 V D 16 V

- 39 Three resistors, one of resistance $4.0\ \Omega$ and two of resistance $2.0\ \Omega$, are connected in different arrangements.

Which arrangement has a total resistance of $5.0\ \Omega$?



- 40 A mains circuit can safely supply a current of up to 40 A.

The current in a hairdryer is 2 A when it is operating normally. The hairdryer is connected to the mains by a lead which can safely carry up to 5 A.

What is the correct fuse to protect the hairdryer?

- A 1 A fuse
 B 3 A fuse
 C 10 A fuse
 D 50 A fuse

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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 | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | | | 2 He helium 4 | | | | | |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 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 — | — | — | — | — |

| | | | | | | | | | | | | | | | |
|-------------|-------------------------------------|-----------------------------------|--|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|----------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| lanthanoids | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium — | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| actinoids | 89 Ac actinium — | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium — | 94 Pu plutonium — | 95 Am americium — | 96 Cm curium — | 97 Bk berkelium — | 98 Cf californium — | 99 Es einsteinium — | 100 Fm fermium — | 101 Md mendelevium — | 102 No nobelium — | 103 Lr lawrencium — |

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