



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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COMBINED SCIENCE

0653/01

Paper 1 Multiple Choice

October/November 2009

45 minutes

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

* 1 5 7 4 9 6 9 5 9 0 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, 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.

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.

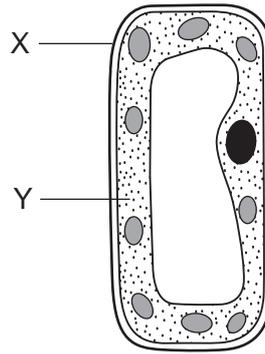
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 20.

This document consists of **19** printed pages and **1** blank page.



1 The diagram shows a plant cell.



Which are represented by X and Y?

| | X | Y |
|----------|---------------|---------------|
| A | cell membrane | cell wall |
| B | cell membrane | cytoplasm |
| C | cell wall | cytoplasm |
| D | cell wall | cell membrane |

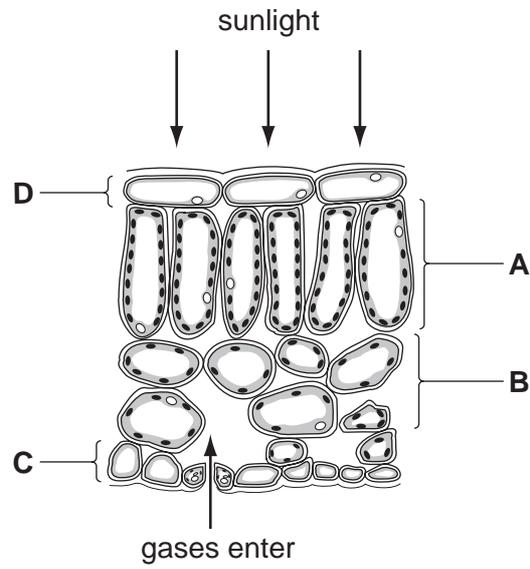
2 Which substance can enter a living cell by diffusion?

- A** carbon dioxide
- B** cellulose
- C** protein
- D** starch

3 Which part of blood contains haemoglobin?

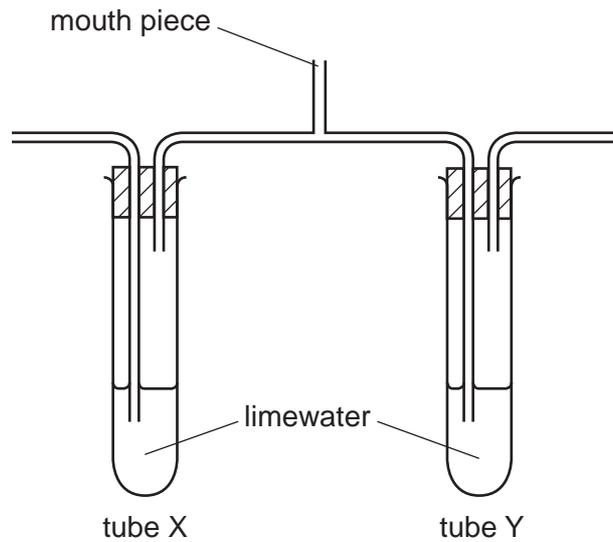
- A** plasma
- B** platelets
- C** red blood cells
- D** white blood cells

- 4 The diagram shows some cells in a leaf of a green plant.
In which layer of cells does most photosynthesis occur?



- 5 What is the **main** function of the front teeth?
- A crushing
 - B cutting
 - C grinding
 - D tearing

- 6 The diagram shows apparatus at the start of a breathing experiment.



A person breathes in and out through the mouth piece for a short time.

Which row in the table shows the results?

| | limewater in tube X | limewater in tube Y |
|----------|---------------------|---------------------|
| A | goes cloudy | goes cloudy |
| B | goes cloudy | stays clear |
| C | stays clear | goes cloudy |
| D | stays clear | stays clear |

- 7 What is the correct sequence when the nervous system responds to a stimulus?

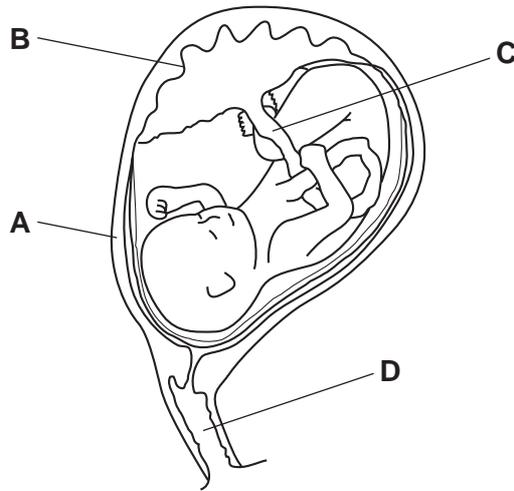
- A** stimulus → central nervous system → receptor → effector → response
B stimulus → effector → central nervous system → receptor → response
C stimulus → effector → receptor → central nervous system → response
D stimulus → receptor → central nervous system → effector → response

- 8 Which cells are produced by fertilisation?

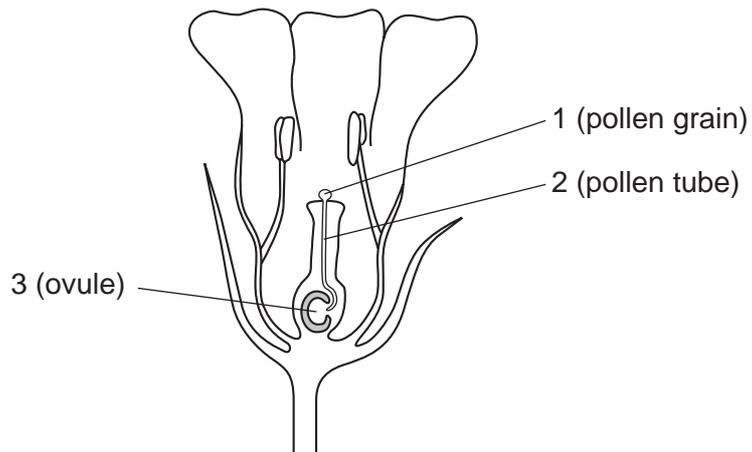
- A** gametes that are genetically different from the parents
B gametes that are genetically identical to the parents
C zygotes that are genetically different from the parents
D zygotes that are genetically identical to the parents

9 The diagram shows a developing fetus.

Where does gaseous exchange between the fetus and its mother occur?



10 The diagram shows a flower just before fertilisation.



Where are the male and female gametes?

| | male gamete | female gamete |
|----------|-------------|---------------|
| A | 1 | 3 |
| B | 2 | 3 |
| C | 3 | 1 |
| D | 3 | 2 |

- 11** In an experiment the tails of two mice were cut off before mating. The tails of their offspring were also removed before they produced offspring. This was repeated for many generations. All the offspring had tails when they were born.

Why were mice always born with tails?

- A** Asexual reproduction does not produce new varieties.
 - B** Genes are not passed on from parents to offspring.
 - C** The results of asexual reproduction are not predictable.
 - D** Variation due to the environment is not inherited.
- 12** What describes a population?
- A** all the animals and plants in a community
 - B** all the animals in a community
 - C** all members of the same species in a community
 - D** all the plants in a community

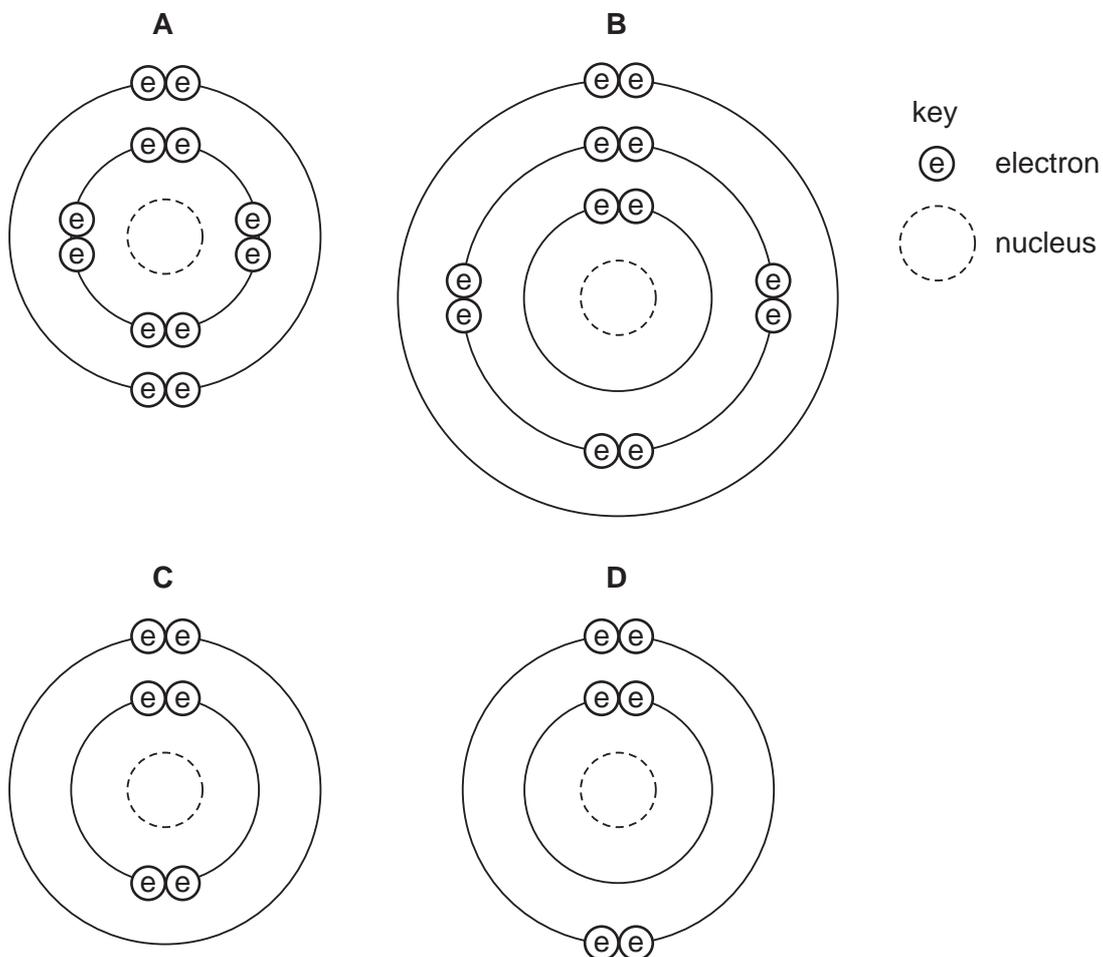
- 13** Tropical rainforests have a high species diversity.

What does this mean?

- A** Each species in the rainforest depends on many other species.
 - B** Each species in the rainforest shows great variation.
 - C** Rainforests contain large numbers of organisms.
 - D** Rainforests contain many different types of organisms.
- 14** Two liquids are separated by fractional distillation.
- This is possible because the liquids differ in their
- A** colour.
 - B** density.
 - C** solubility in water.
 - D** boiling point.

15 An atom has the symbol ${}^{12}_6\text{X}$.

Which diagram shows the arrangement of the electrons in this atom?



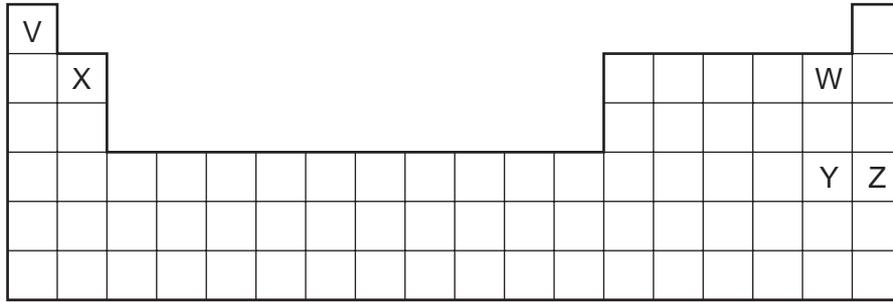
16 The atoms of three elements have the symbols ${}_8\text{X}$, ${}_9\text{Y}$ and ${}_{10}\text{Z}$.

Which types of bond form between these elements?

| | X and Y | Y and Z |
|----------|----------|----------|
| A | covalent | covalent |
| B | covalent | none |
| C | ionic | ionic |
| D | ionic | none |

17 The diagram shows an outline of the Periodic Table.

Which two elements have similar chemical properties?

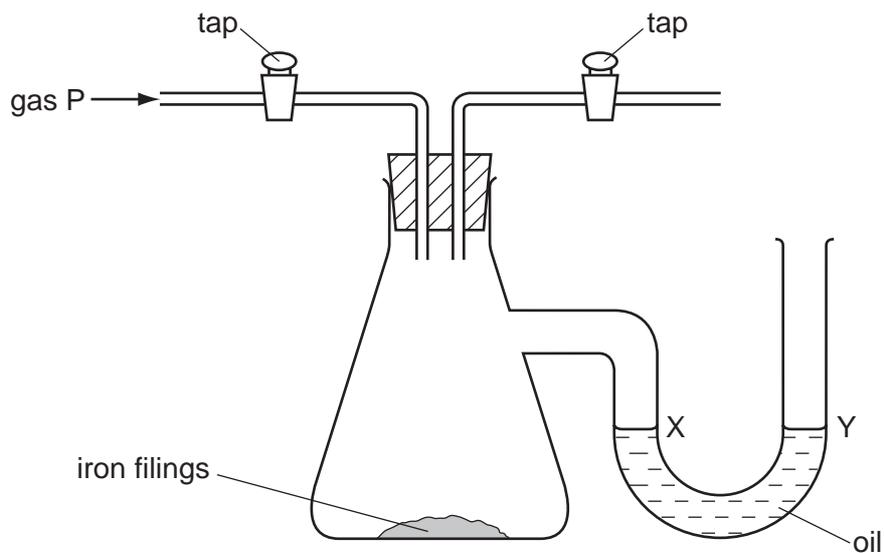


- A** V and W **B** V and X **C** W and Y **D** Y and Z

18 How many atoms of metals and of non-metals are shown in the formula Na_2SO_4 ?

| | atoms of metals | atoms of non-metals |
|----------|-----------------|---------------------|
| A | 1 | 1 |
| B | 1 | 2 |
| C | 2 | 4 |
| D | 2 | 5 |

19 The diagram shows an experiment on the rusting of iron.



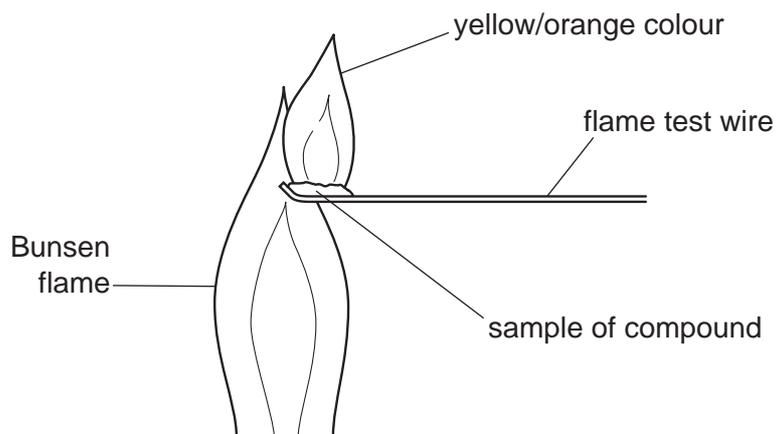
The vessel is filled with gas P, the taps are closed and the apparatus is then left for a week.

The experiment is repeated four times with different gases. Any pressure change is shown by changes in the oil levels X and Y.

Which pressure change occurs?

| | gas P | pressure change |
|----------|---------------|-----------------|
| A | damp nitrogen | increase |
| B | damp oxygen | decrease |
| C | dry nitrogen | decrease |
| D | dry oxygen | increase |

20 The diagram shows the result of a flame test.



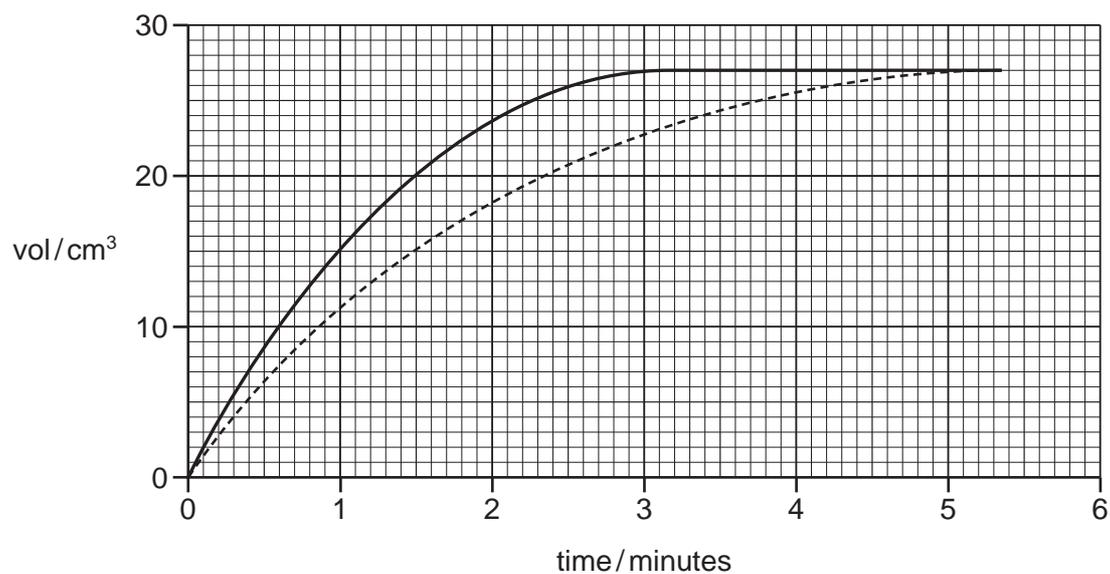
Which element is present in the compound?

- A silicon
 - B silver
 - C sodium
 - D sulfur
- 21 Which gas, present in the exhaust gases from a motor car, is **not** a pollutant?
- A carbon monoxide
 - B nitrogen
 - C nitrogen oxide
 - D sulfur dioxide
- 22 The Group II element strontium, Sr, is above calcium in the reactivity series.

Which of the substances shown in the table react with dilute hydrochloric acid to form a flammable gas?

| | strontium powder | strontium oxide | strontium hydroxide | strontium carbonate |
|---|------------------|-----------------|---------------------|---------------------|
| A | ✓ | ✓ | ✓ | x |
| B | ✓ | x | x | ✓ |
| C | ✓ | x | x | x |
| D | x | x | x | ✓ |

- 23 The solid line on the graph shows the volume of gas given off as calcium carbonate reacts with dilute hydrochloric acid.



Which change to the conditions gives the results shown by the dotted line?

- A Decrease the temperature of the acid.
 - B Decrease the size of the calcium carbonate pieces.
 - C Increase the concentration of the acid.
 - D Increase the mass of the calcium carbonate pieces.
- 24 Which element is purified by using electrolysis?

- A chlorine
- B copper
- C iron
- D zinc

25 A hydrocarbon fuel is burned completely.



What are the products of this reaction?

| | X | Y |
|----------|-----------------|------------------|
| A | CO | H ₂ |
| B | CO | H ₂ O |
| C | CO ₂ | H ₂ |
| D | CO ₂ | H ₂ O |

26 Simple hydrocarbons are used to make plastics.

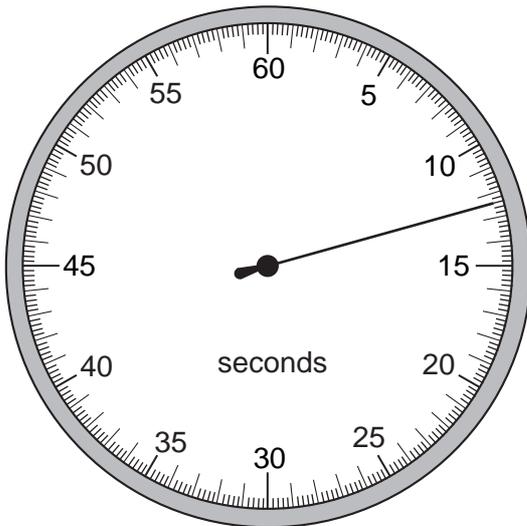
Which terms apply to these simple hydrocarbons?

| | the bonds in their molecules are | they are called |
|----------|----------------------------------|-----------------|
| A | covalent | monomers |
| B | covalent | polymers |
| C | ionic | monomers |
| D | ionic | polymers |

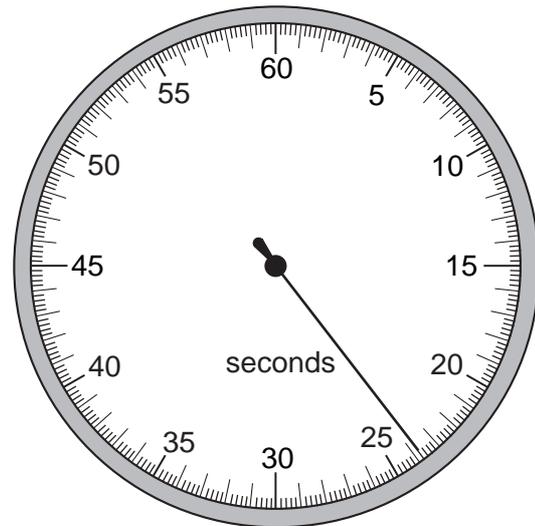
27 Which statement defines a hydrocarbon?

- A** a compound that burns to form carbon dioxide and water
- B** a compound that contains carbon and hydrogen only
- C** a compound that is contained in fossil fuels
- D** a compound that only contains single bonds

- 28 A stopwatch is used to time an athlete running 100 m. The timekeeper forgets to reset to zero before using it to time another athlete running 100 m.



stopwatch at
end of first
athlete's run

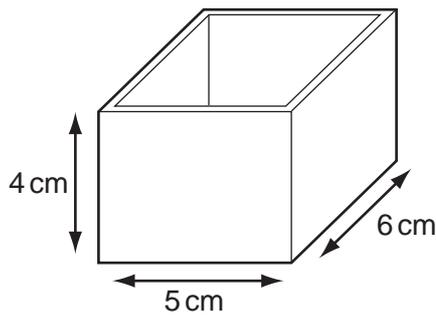


stopwatch at
end of second
athlete's run

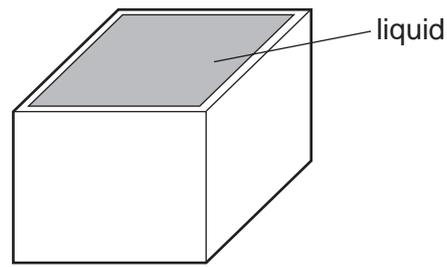
How long does the second athlete take to run 100 m?

- A** 11.2 s **B** 11.4 s **C** 12.4 s **D** 23.8 s
- 29 Which property of a body can be measured in newtons?
- A** density
B mass
C volume
D weight

- 30 The diagrams show a rectangular box with inside measurements of 5 cm × 6 cm × 4 cm.



mass = 40 g



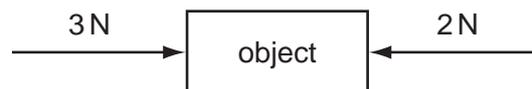
total mass = 220 g

The box has a mass of 40 g when empty. When filled with a liquid it has a total mass of 220 g.

What is the density of the liquid?

- A $\frac{220}{(5 \times 6 \times 4)} \text{ g/cm}^3$
- B $\frac{(220 - 40)}{(5 \times 6 \times 4)} \text{ g/cm}^3$
- C $\frac{(5 \times 6 \times 4)}{220} \text{ g/cm}^3$
- D $\frac{(5 \times 6 \times 4)}{(220 - 40)} \text{ g/cm}^3$

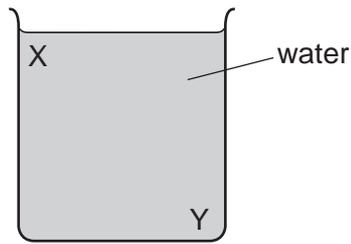
- 31 The object in the diagram is acted upon by the two forces shown.



What is the effect of these forces?

- A The object moves to the left with constant speed.
- B The object moves to the left with constant acceleration.
- C The object moves to the right with constant speed.
- D The object moves to the right with constant acceleration.

32 A beaker contains water at room temperature.

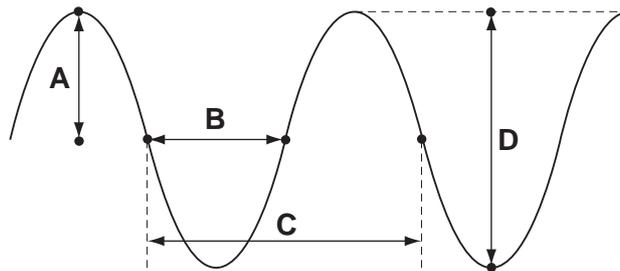


How could a convection current be set up in the water?

- A cool the water at X
- B cool the water at Y
- C stir the water at X
- D stir the water at Y

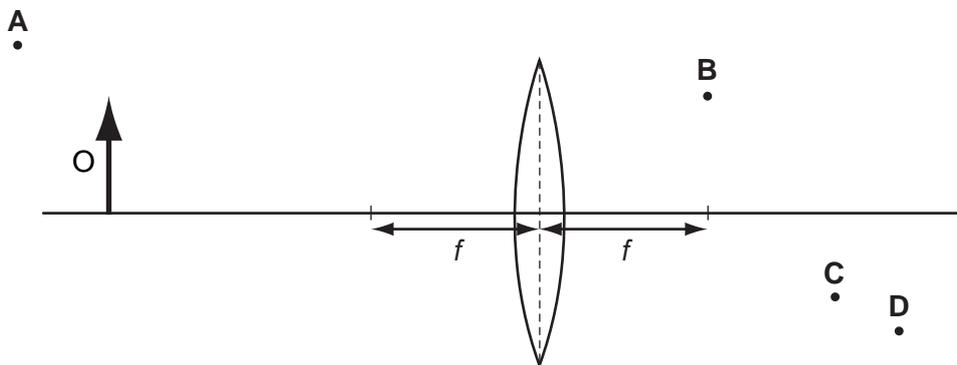
33 The drawing shows a wave.

Which labelled distance is the wavelength?



34 An object O is placed in front of a converging lens of focal length f .

At which point will the top of the image be seen?

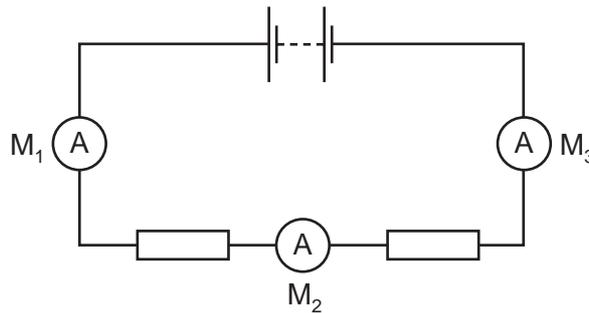


35 A pupil measures the potential difference across a device and the current in it.

Which calculation gives the resistance of the device?

- A current + potential difference
- B current \div potential difference
- C potential difference \div current
- D potential difference \times current

36 The diagram shows a battery connected to two identical resistors. Three ammeters M_1 , M_2 and M_3 are connected in the circuit.

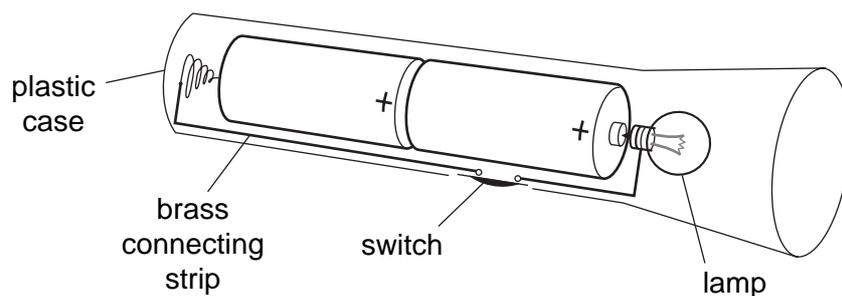


Meter M_1 reads 1.0 A.

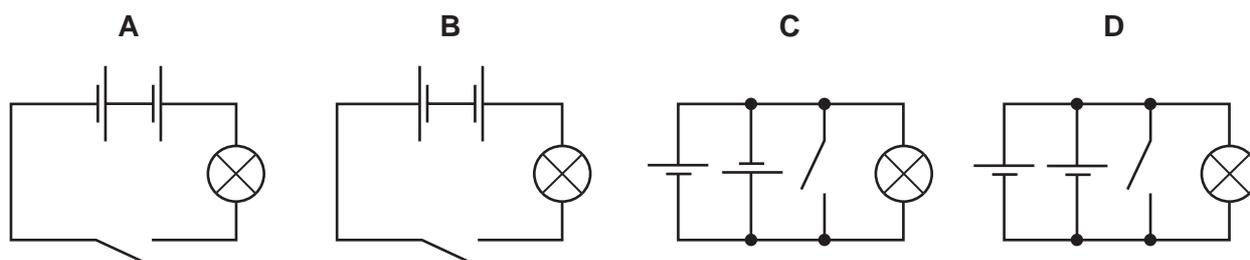
What are the readings on M_2 and M_3 ?

| | reading on M_2 / A | reading on M_3 / A |
|----------|----------------------|----------------------|
| A | 0.5 | 0.0 |
| B | 0.5 | 0.5 |
| C | 0.5 | 1.0 |
| D | 1.0 | 1.0 |

- 37 The diagram shows a torch containing two cells, a switch and a lamp.



What is the circuit diagram for the torch?



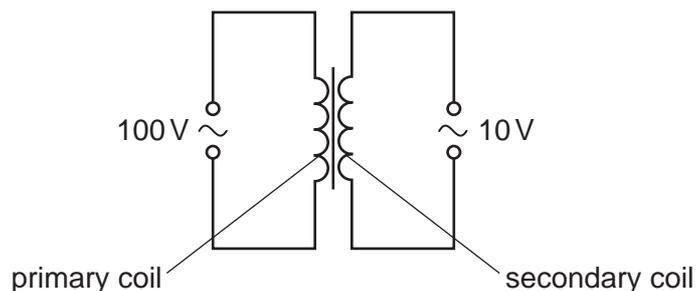
- 38 On a building site, the metal scaffolding is firmly embedded in the damp ground. A builder holds a mains-operated electric drill in one hand, and with his other hand holds on to the scaffolding.

The power cable of the drill is damaged where it enters the metal casing of the drill.

What danger does this present to the builder?

- A A current could flow through the builder and electrocute him.
- B A current in the scaffolding could heat it up and burn him.
- C The large current could blow the fuse and damage the drill.
- D The large current could make the motor spin too quickly.

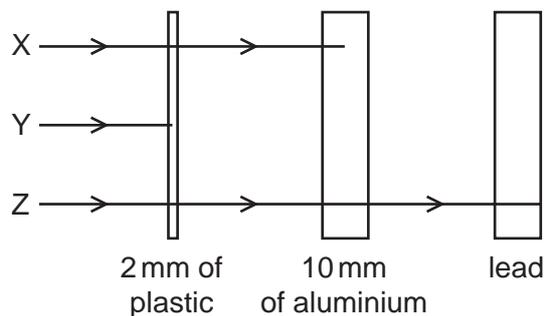
- 39 A transformer is to be used to provide a 10V output from a 100V supply.



What are suitable numbers of turns for the primary coil and for the secondary coil?

| | number of turns on the primary coil | number of turns on the secondary coil |
|----------|-------------------------------------|---------------------------------------|
| A | 100 | 1000 |
| B | 200 | 110 |
| C | 400 | 490 |
| D | 800 | 80 |

- 40 The diagram shows the paths of three different types of radiation, X, Y and Z.



Which row in the table correctly identifies X, Y and Z?

| | X | Y | Z |
|----------|-----------------|-----------------|-----------------|
| A | alpha radiation | beta radiation | gamma radiation |
| B | beta radiation | alpha radiation | gamma radiation |
| C | beta radiation | gamma radiation | alpha radiation |
| D | gamma radiation | alpha radiation | beta radiation |

DATA SHEET
The Periodic Table of the Elements

| | | Group | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|----------------------------------|-----------------------------------|----------------------------------|------------------------------------|------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|----------------------------------|-------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|----------------------------------|------------------------------------|------------------------------------|--------------------------------|-----------------------------------|------------------------------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------------|---------------------------------|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 H Hydrogen 1 | | | | | | | | | | | | 4 He Helium 2 | | | | | | | | | | | | | | | | | | | |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 17 F Fluorine 9 | 18 Ne Neon 10 | | | | | | | | | | | | | | | | |
| 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | | | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulfur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 | | | | | | | | | | | | | | | | |
| 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 59 Co Cobalt 27 | 59 Ni Nickel 28 | 64 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 | | | | | | | | | | | | | | | | |
| 85 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | 101 Ru Ruthenium 44 | 101 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 | 137 Cs Caesium 55 | 138 Ba Barium 56 | 139 La Lanthanum 57 | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 190 Os Osmium 76 | 192 Ir Iridium 77 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | 210 Po Polonium 84 | 210 At Astatine 85 | 210 Rn Radon 86 |
| 226 Ra Radium 88 | 227 Ac Actinium 89 | | | | | | | | | | | 226 Fr Francium 87 | | | | | | | | | | | 226 Ra Radium 88 | 227 Ac Actinium 89 | | | | | | | | | |

| | | | | | | | | | | | | | |
|-----------------------------------|--|--|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|--|-------------------------------------|---------------------------------------|
| 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 162 Dy Dysprosium 66 | 165 Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 | | |
| 232 Th Thorium 90 | 238 U Uranium 92 | 238 Pa Protactinium 91 | 238 Pu Plutonium 94 | 238 Np Neptunium 93 | 238 Am Americium 95 | 238 Cm Curium 96 | 238 Bk Berkelium 97 | 238 Cf Californium 98 | 238 Es Einsteinium 99 | 238 Fm Fermium 100 | 238 Md Mendelevium 101 | 238 No Nobelium 102 | 238 Lr Lawrencium 103 |

| | | |
|---|----------|---|
| a | X | b |
|---|----------|---|

* 58-71 Lanthanoid series
† 90-103 Actinoid series

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

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