Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

COMBINED SCIENCE   **0653/32**

Paper 3 (Core)   **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
A copy of the Periodic Table is printed on page 24.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **21** printed pages and **3** blank pages.

CAMBRIDGE
International Examinations

[Turn over

1 (a) The boxes on the left show some structures of the alimentary canal and associated organs. The boxes on the right show their functions.

Draw **one** line from each structure on the left to its correct function on the right. One line has been done for you.

structure	function

| anus | assimilation |

| liver | digestion and absorption |

| mouth | digestion only |

| small intestine | egestion |

| stomach | ingestion |

[3]

(b) Large pieces of food are broken down by the action of teeth. It is important that teeth are cared for so that they do not decay.

The composition of $100\,cm^3$ of a soft drink is shown in Table 1.1.

Table 1.1

substance	mass / g
fat	0
carbohydrate as sugar	9.9
fibre	0
protein	0.1

Use the information in Table 1.1 to explain in detail why the soft drink is harmful for teeth.

....

....

....

....[3]

(c) State **two** ways in which people can care for their teeth.

1. ....

2. ....

[2]

2 A student investigates the combustion of a hydrocarbon, as shown in Fig. 2.1.

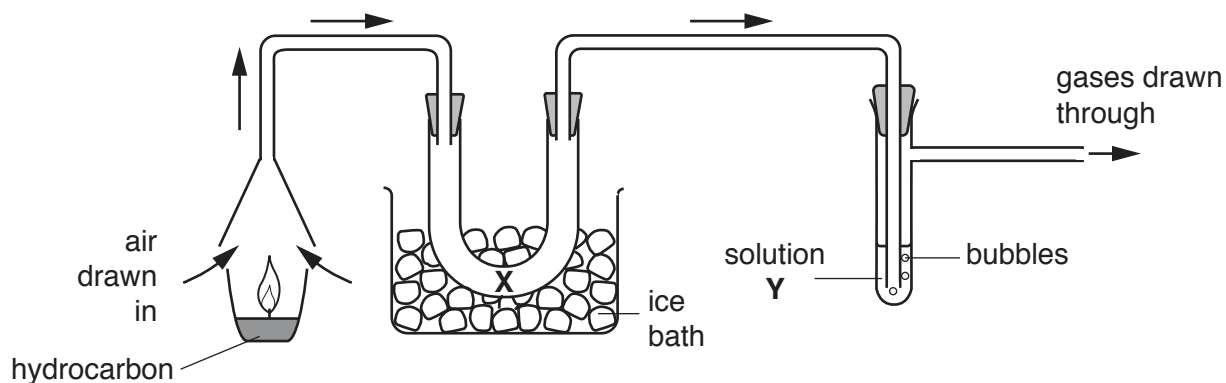Gases move through the apparatus in the direction shown by the arrows.

Fig. 2.1

(a) The student thinks that carbon dioxide and water are formed when the hydrocarbon burns.

(i) Suggest a chemical that the student uses at position **X** to test for the presence of water.

....[1]

(ii) The student uses solution **Y** to test for carbon dioxide.

Identify solution **Y**.

....[1]

(b) Hexane is a hydrocarbon. The products of the complete combustion of hexane are carbon dioxide and water.

Complete the word equation for this reaction.

hexane	+		→		+	
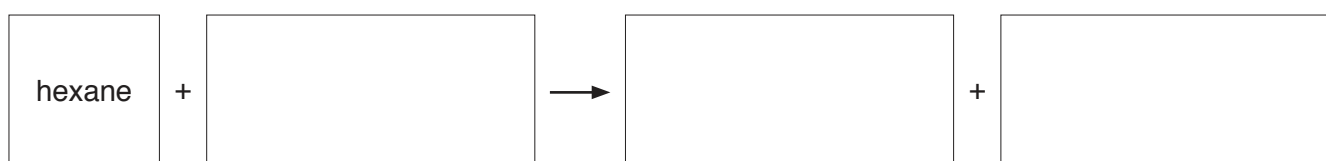
[2]

(c) Name the hydrocarbon that is the main constituent of natural gas.

....[1]

(d) (i) Carbon and hydrogen are non-metallic elements.

State the type of bond that forms between atoms of these two elements.

....[1]

(ii) Draw the structure of a molecule of ethane, C_2H_6.

[2]

(iii) An atom of carbon is represented by:

$$^{12}_{6}C$$

State the atomic number and the number of neutrons in this atom.

atomic number   ....

number of neutrons ....

[2]

3 Fig. 3.1 shows a crane carrying a load.

The crane is floating in the sea on a calm day.
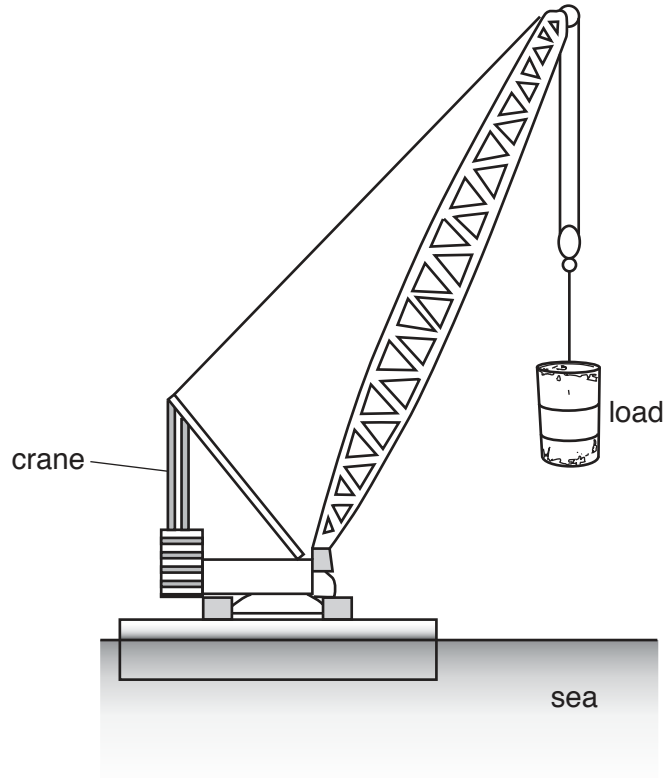
Fig. 3.1

(a) (i) The load is stationary.

On Fig. 3.1 draw two force arrows to show the vertical forces acting on the load. [2]

(ii) One of the forces acting on the load is called *tension*.

Name the other force acting on the load.

....[1]

(b) The crane lifts a load upwards from the sea bed to the surface of the sea at a constant speed of 0.60 m / s. The depth of the sea is 200 m.

Calculate the time taken to lift the load from the sea bed to the surface.

Show your working.

time = ... s [2]

(c) The load being lifted by the crane is a large container full of sea water.

The volume inside the container is 5000 dm^3. The density of sea water is 1.025 kg/dm^3.

Calculate the mass of sea water being lifted.

State the formula you use and show your working.

formula

working

mass = ... kg [2]

(d) Two cranes, **A** and **B**, are working to lift loads. Crane **A** has a power output of 35 kW, crane **B** has a power output of 40 kW.

(i) Name the unit with the symbol W.

....[1]

(ii) Both cranes can lift the same load through the same distance from the sea bed to the surface.

Explain why the higher power output from crane **B** means it can lift the load to the surface faster than crane **A**.

....

....

....

....[2]

4   **(a)** Gardeners can increase the numbers of plants by splitting a parent plant in two, including the root, as shown in Fig. 4.1.

parent plant   **two smaller plants**

Fig. 4.1

   (i) State **two** reasons why this is an example of **asexual** reproduction.

   1. ....

   2. ....
   [2]

   (ii) Describe evidence from Fig. 4.1 which shows that the plant also reproduces sexually.

   ....[1]

(b) Seeds germinate when they have the correct environmental conditions.

In Table 4.1 place a tick (✓) in all of the boxes which show the conditions needed for germination.

Table 4.1

| condition	needed for germination
carbon dioxide	
chlorophyll	
light	
oxygen	
warmth	
water	

[2]

(c) Germinating seeds use glucose as an energy supply. Enzymes break down the starch stored in the seeds to form glucose.

Define the term *enzyme*.

....

....

....[2]

(d) (i) Energy is released in the seeds by aerobic respiration.

Write the **word** equation for aerobic respiration in the boxes provided.

	+		→	+

[2]
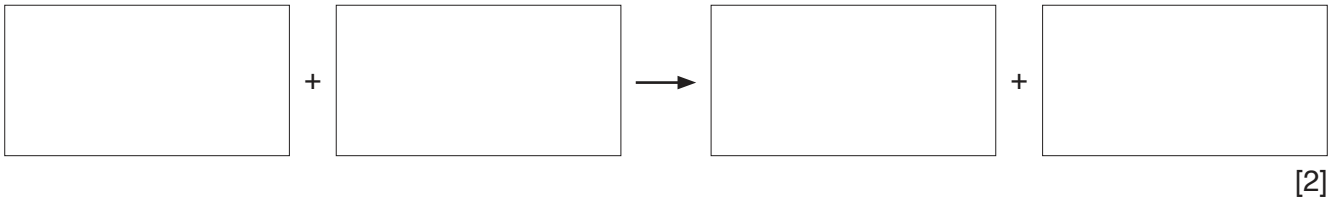
(ii) Suggest **two** uses of the energy released in seeds.

1. ....

2. ....

[2]

5 (a) A student adds magnesium powder to dilute hydrochloric acid.

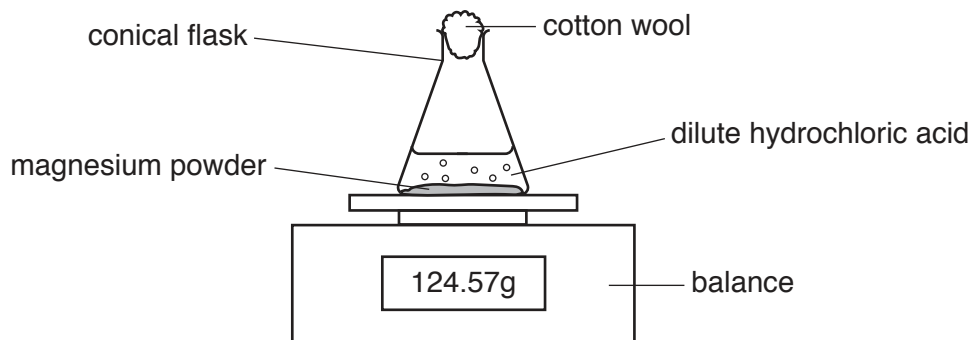She then uses a balance to investigate the rate of this reaction, as shown in Fig. 5.1.

conical flask — cotton wool

magnesium powder — dilute hydrochloric acid

124.57g — balance

Fig. 5.1

(i) Describe the change in the mass, if any, of the conical flask and its contents.

Explain your answer.

change ....

explanation ....

....
[2]

(ii) Describe **one** change that can be made to decrease the rate of this reaction.

....

....[1]

(iii) Predict the effect of using calcium, rather than magnesium, on the rate of reaction.

Explain your answer using ideas about reactivity.

effect ....

explanation ....

....
[2]

(b) Magnesium is produced by the electrolysis of magnesium chloride.

(i) State the energy source used in electrolysis.

....[1]

(ii) Predict the type of bond present in magnesium chloride.

....[1]

(iii) Magnesium chloride is produced when one atom of magnesium combines with two atoms of chlorine.

Predict the formula of magnesium chloride.

....[1]

(iv) Magnesium is also produced by heating magnesium oxide with silicon.
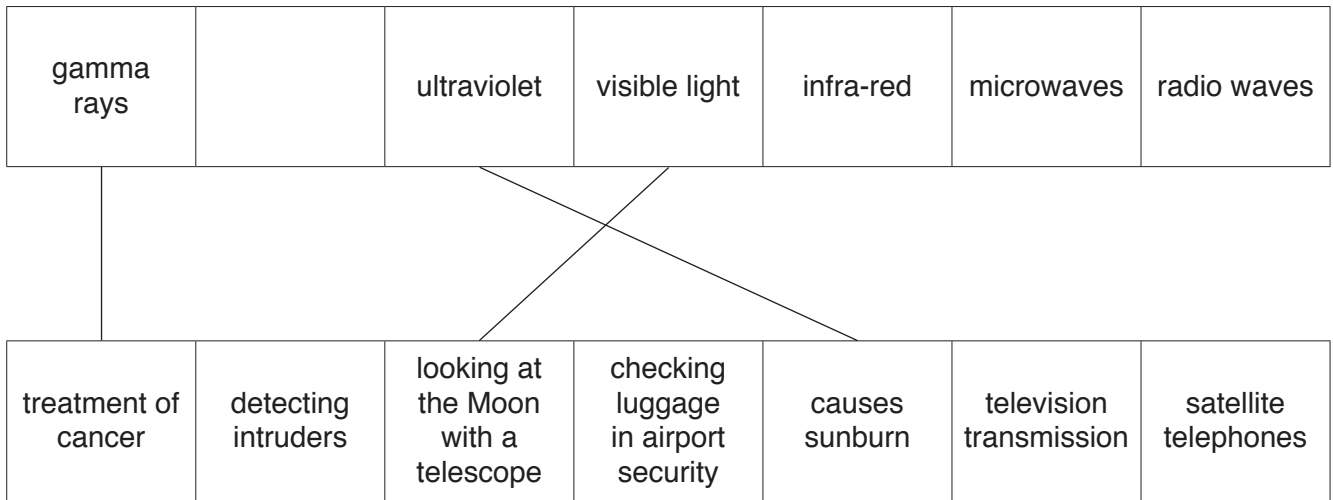
In this process, oxygen is removed from magnesium oxide.

State the type of reaction that leads to the loss of oxygen from a substance.

....[1]

6 (a) Fig. 6.1 shows an incomplete electromagnetic spectrum linked to some uses of different parts of the electromagnetic spectrum.

electromagnetic spectrum

gamma rays		ultraviolet	visible light	infra-red	microwaves	radio waves

treatment of cancer	detecting intruders	looking at the Moon with a telescope	checking luggage in airport security	causes sunburn	television transmission	satellite telephones

uses

Fig. 6.1

(i) On Fig. 6.1 complete the empty box in the electromagnetic spectrum. [1]

(ii) On Fig. 6.1 draw **four more** lines so that each type of electromagnetic wave is linked to a use of that type.

Three lines have already been done for you. [2]

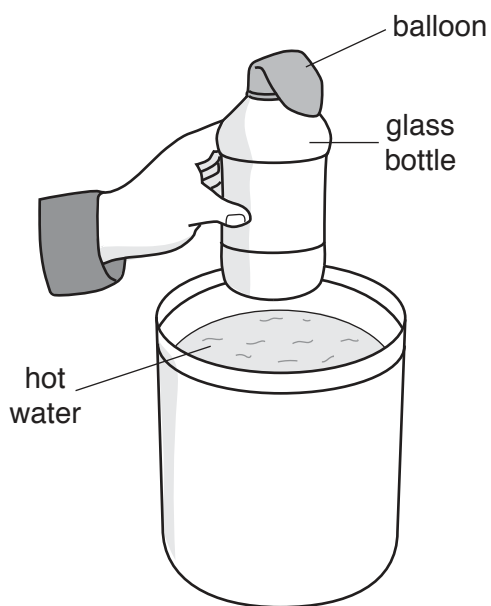**(b)** Fig. 6.2a and Fig. 6.2b show an experiment to investigate the transfer of thermal energy (heat).

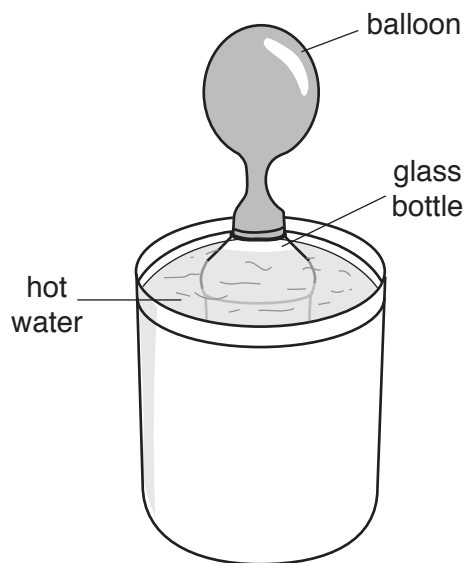**Fig. 6.2a**   **Fig. 6.2b**

Fig. 6.2a shows the apparatus before the glass bottle is lowered into the hot water.

Fig. 6.2b shows the apparatus after the bottle has been in the water for five minutes.

The bottle and the air inside are slowly heated as thermal energy travels through the glass and warms the air inside. As the bottle is heated, the balloon fills with air.

(i) Name the process by which thermal energy travels through the glass.

....[1]

(ii) Suggest why the heating of the air in the bottle is slow.

....

....[1]

(iii) Explain why the balloon above the glass bottle fills with warm air as the air is heated.

....

....[1]

7 (a) The rate of photosynthesis in trees in a European forest changes during the year. Fig. 7.1 shows how the rate of photosynthesis changes between the months of January and August.

Fig. 7.1

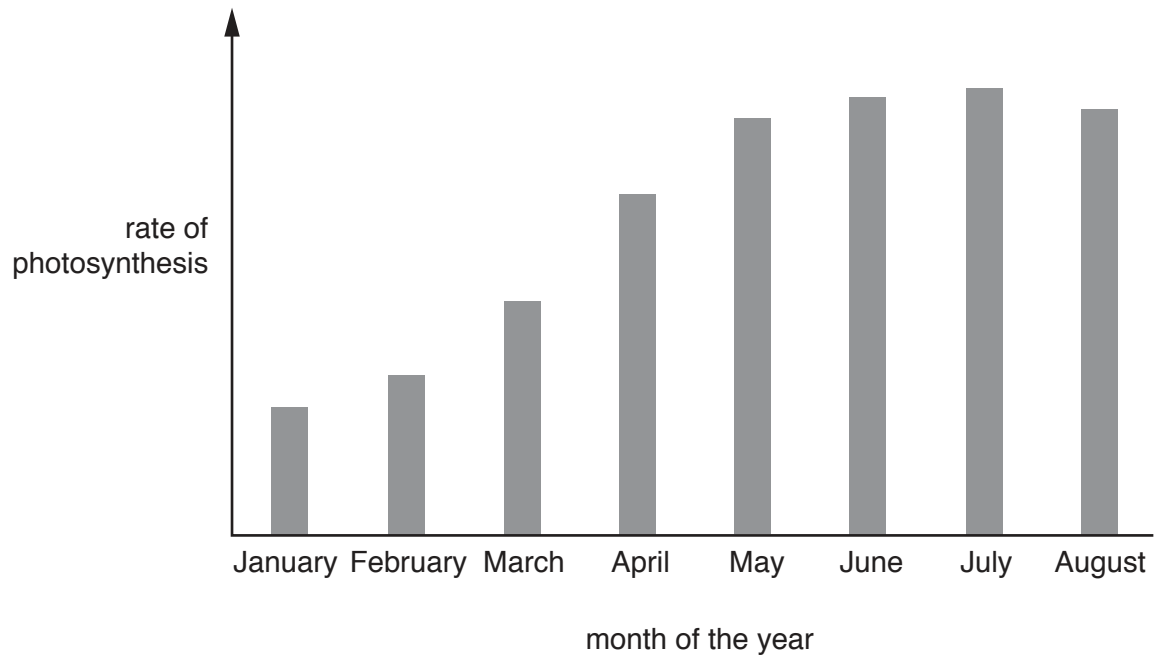Use the information in Fig. 7.1 to state the month during which the trees have the greatest rate of photosynthesis.

....[1]

(b) Fig. 7.2 shows how the appearance of **one** of the trees in the forest changes from January to June.

tree in January   same tree in June

Fig. 7.2

In the forest there are many tall trees which are very close together.

The forest also has smaller plants which grow on the ground between the trees.

Suggest and explain why the greatest rate of photosynthesis in these smaller plants occurs between March and April.

....

....

....

....

....[3]

(c) Some trees are removed from the forest.

  (i) Suggest **two** reasons why this causes a reduction in the population of birds.

  1. ....

  2. ....
                                                                                                                                                          [2]

  (ii) Describe **one** effect this removal of trees has on the soil.

  ....

  ....[1]

8 (a) (i) Period 3 of the Periodic Table contains the elements from sodium to argon.

State the change in metallic character of the elements from left to right across Period 3.

from .... to ....[1]

(ii) Metal **Q** has a low melting point and it is soft. It reacts vigorously with water.

Predict the number of the group in which **Q** is shown in the Periodic Table.

.... [1]

(iii) Metal **R** has a high melting point and forms coloured compounds.

Name the collection of metals in the Periodic Table which includes **R**.

....[1]

(b) Bromine, chlorine and iodine are Group VII elements.

A student mixes bromine, chlorine and iodine with separate solutions of sodium bromide, sodium chloride and sodium iodide.

Some results are shown in Table 8.1.

Table 8.1

	bromine	chlorine	iodine
sodium bromide	✗		
sodium chloride		✗	
sodium iodide			✗

key: ✓ = reaction occurs

✗ = no reaction

Complete Table 8.1 using ✓ and ✗ to show which element reacts with each solution. [2]

(c) Explain the use of chlorine in water purification.

....

....[1]

(d) The reaction between sodium and chlorine is exothermic.

Sodium chloride is formed in this reaction.

(i) State what is meant by *exothermic*.

....

....[1]

(ii) Suggest **one** substance that reacts safely with dilute hydrochloric acid to form sodium chloride.

....[1]

9 Fig. 9.1 shows a simple circuit set up to investigate the current through an electric motor.
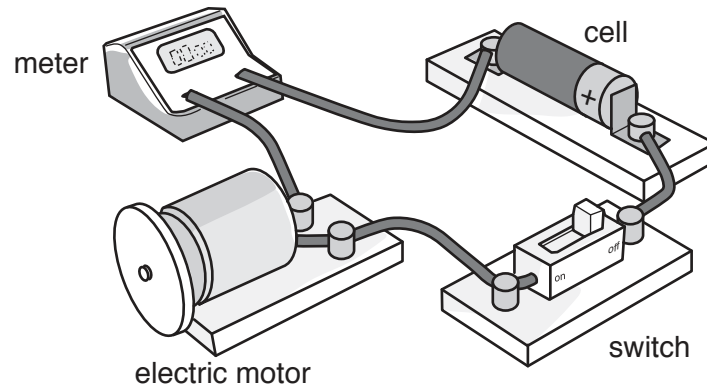
Fig. 9.1

(a) (i) On Fig. 9.2 use the correct circuit symbols to complete the circuit diagram for the circuit arrangement shown in Fig. 9.1. The symbol for an electric motor is shown.

Fig. 9.2

[3]

(ii) On Fig. 9.2, using the correct circuit symbol, connect a meter into the circuit that can measure the potential difference across the motor. [2]

(b) The cell has a voltage of 1.5 V. The resistance of the motor when turning is 5.0 Ω.

(i) Calculate the current through the motor.

State the formula you use and show your working.

formula

working

current = ...A [2]

(ii) Fig. 9.3 shows a second identical cell added in series with the cell in the circuit in Fig. 9.1.
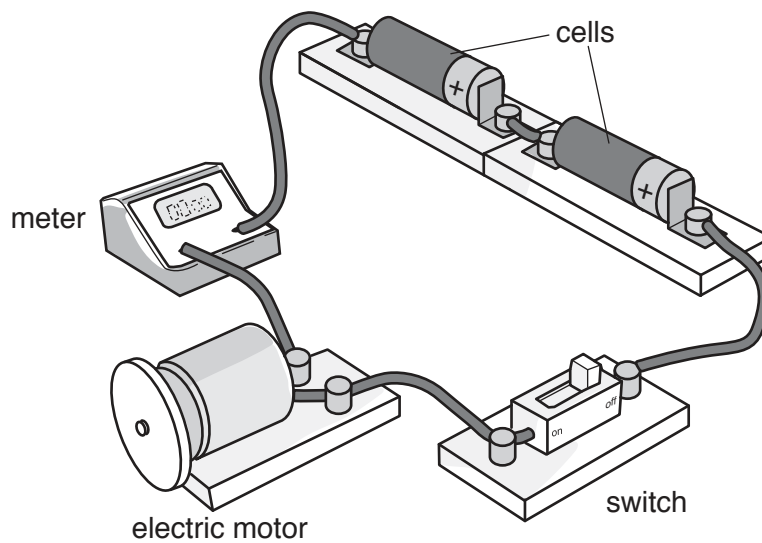
Fig. 9.3

Suggest what happens to the reading on the meter.

Explain why this happens.

....

....

....[2]

(c) The motor in Fig. 9.3 is placed in front of a mirror and a student tries to look at the reflection of the motor in the mirror, as shown in Fig. 9.4.
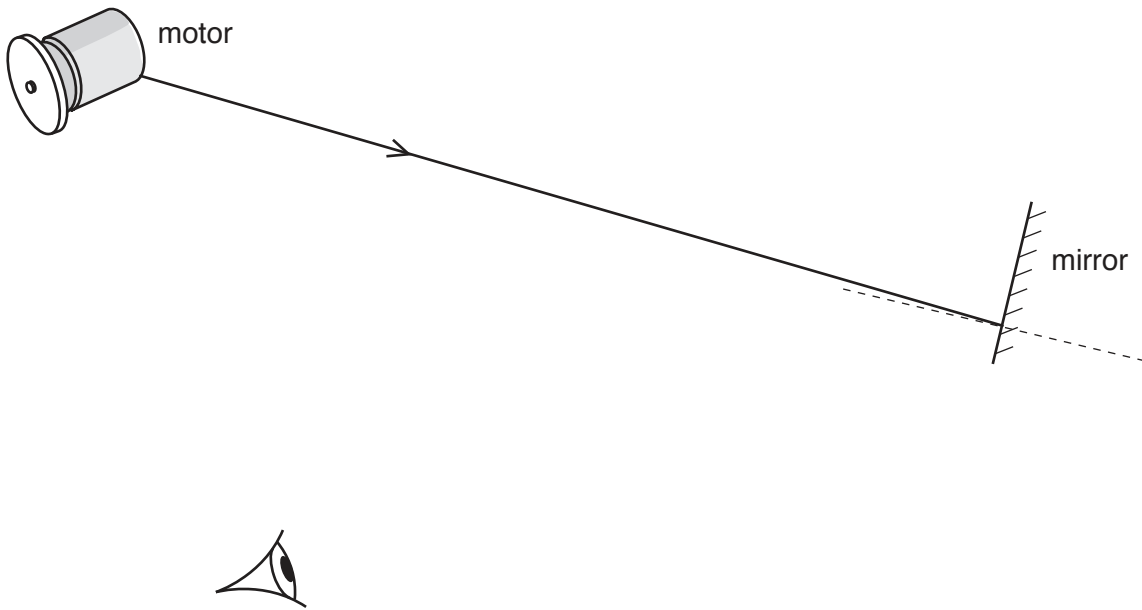

Fig. 9.4

(i) State the law of reflection of light.

....

....[1]

(ii) The student cannot see the motor in the mirror, as shown in Fig. 9.4.

On Fig. 9.4 re-draw the mirror in a position where the student's eye can see the reflection of the motor in the mirror. [1]

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The Periodic Table of Elements

Group

Key

atomic number
atomic symbol
name
relative atomic mass

I	II	III	IV	V	VI	VII	VIII
							2 **He** helium 4
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 **A**l aluminium 27	14 **Si** silicon 28	15 **P** phosphorus 31	16 **S** sulfur 32	17 **C**l chlorine 35.5	18 **Ar** argon 40

Transition elements:

1 **H** hydrogen 1							
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
19 **K** potassium 39	20 **Ca** calcium 40	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 **T**l 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 ...	114 **F**l 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 $24\,dm^3$ at room temperature and pressure (r.t.p.).