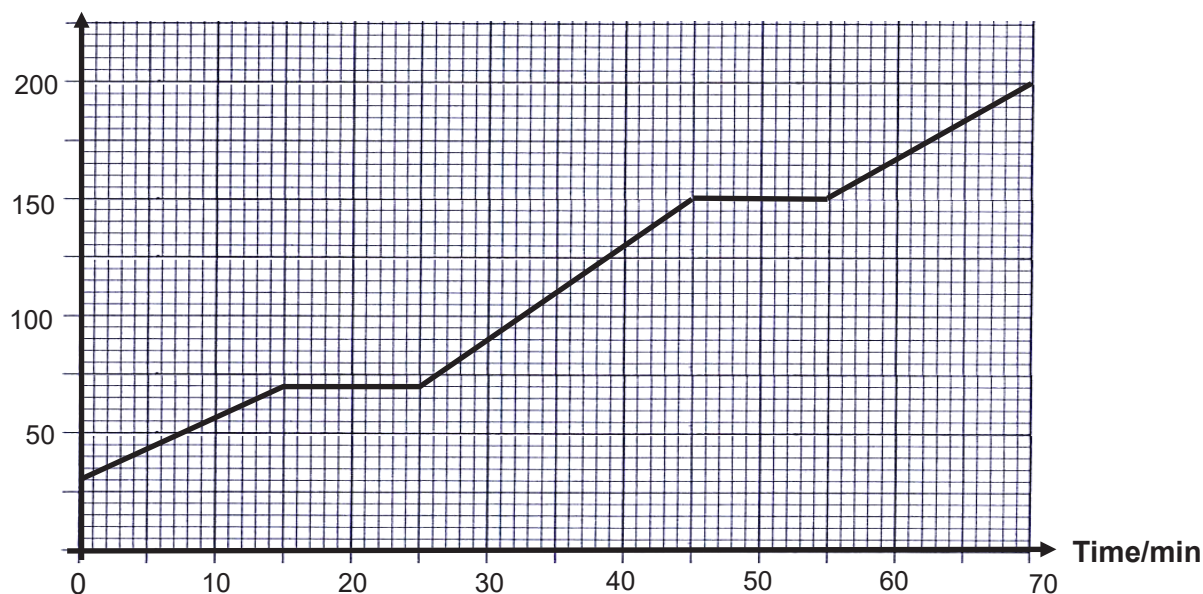


Answer **all** the questions in the spaces provided.

- 1 The figure below shows the graph obtained in an experiment where a solid substance **X** was heated from room temperature to 200°C.

Temperature/°C



- (a) Using the graph, determine
- (i) the melting point of solid **X**, .....
- (ii) the time at which solid **X** starts to boil. .... [1]
- (b) Draw in the box below, the arrangement of the particles of **X** at 160°C.



[1]

- 2 Magnesium has a proton number of 12 and chlorine has a proton number of 17.

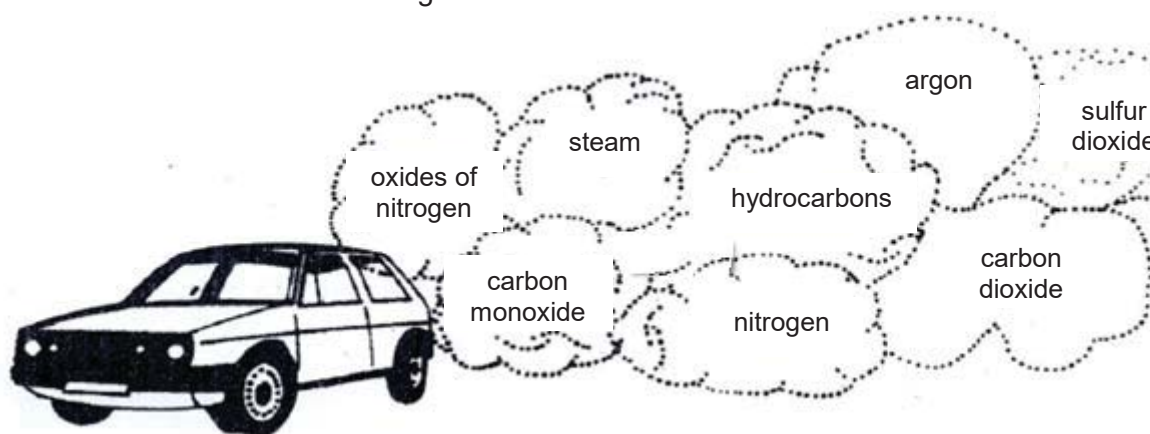
- (a) (i) Explain how and why a magnesium atom forms a magnesium ion.
- .....
- .....
- ..... [1]
- (ii) State the symbol for the magnesium ion. .... [1]
- (b) Draw a 'dot and cross' diagram of the compound formed between magnesium and chlorine. Show **all** the electrons.

[2]

- (c) At the start of the experiment there is 4.8 g of magnesium.  
Calculate the amount of magnesium in moles.

Amount of magnesium = ..... mol [1]

- 3 Cars which run on petrol as their fuel are the main source of air pollution today. Some of the substances found in the exhaust gases of a car are shown below.

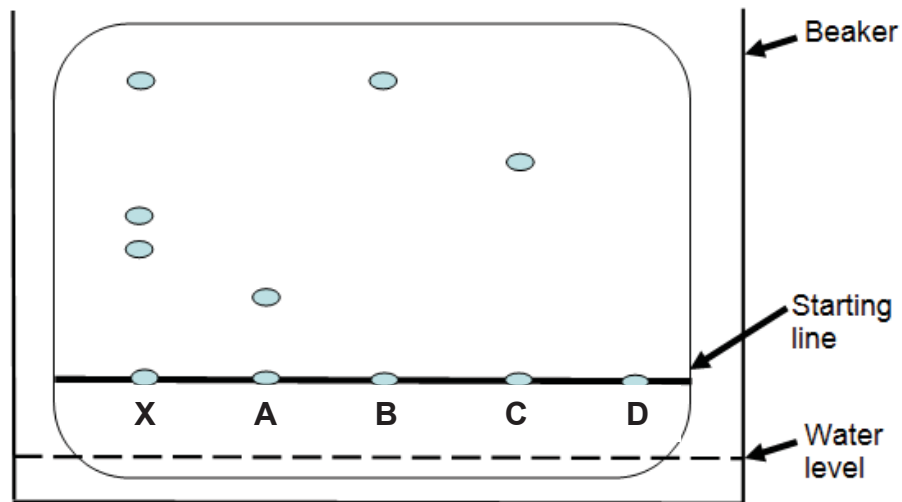


- (a) From the diagram above, name the gas that is:
- (i) the most abundant in the earth's atmosphere, ..... [1]
- (ii) produced in the engine of the car as a result of the high temperature in the engine.  
..... [1]
- (b) Carbon monoxide is a gas found in the exhaust gases of the car. It is fatal to human beings when large quantities are inhaled.
- (i) Briefly describe how carbon monoxide is produced in the car engine.  
.....  
..... [1]
- (ii) Explain how carbon monoxide harms the human body when it is inhaled.

.....  
 .....  
 ..... [1]

- 4 Substance **X** is a mixture of dyes that was recently developed by an ice-cream company who are planning to use it in ice-creams.

A paper chromatography was performed to check if substance **X** is safe for consumption. Dyes **A**, **B**, **C** and **D** are known harmful substances. Water was used as the solvent. The diagram below shows the resulting chromatogram.



- (a) Is substance **X** safe to be consumed? Explain your answer.

.....  
 ..... [1]

- (b) Dye **D** did not separate into its components. Suggest why this is so.

.....  
 ..... [1]

- (c) What will happen if the starting line is below the water level?

.....  
 ..... [1]

### Section B [16 marks]