

FOR OFFICIAL USE

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**0500/401**NATIONAL  
QUALIFICATIONS  
2002THURSDAY, 16 MAY  
1.00 PM – 2.30 PMCHEMISTRY  
STANDARD GRADE  
General Level**Fill in these boxes and read what is printed below.**

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day Month Year

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Number of seat

- All questions should be attempted.
- Necessary data will be found in the Data Booklet provided for Chemistry at Standard Grade and Intermediate 2.
- The questions may be answered in any order but all answers are to be written in this answer book, and must be written clearly and legibly in ink.
- Rough work, if any should be necessary, as well as the fair copy, is to be written in this book.  
Rough work should be scored through when the fair copy has been written.
- Additional space for answers and rough work will be found at the end of the book.
- The size of the space provided for an answer should not be taken as an indication of how much to write. It is not necessary to use all the space.
- Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.



1. The periodic table on page 8 of the data booklet shows the names of the elements.

|        |          |           |
|--------|----------|-----------|
| A      | B        | C         |
| curium | lithium  | magnesium |
| D      | E        | F         |
| cobalt | platinum | aluminium |

- (a) Identify the alkali metal.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (b) Identify the element made by scientists.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (c) Identify the element which is used as the catalyst in the manufacture of nitric acid (Ostwald Process).

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

[Turn over

2. The formulae of some gases are shown in the grid.

|   |                |   |                 |   |                 |
|---|----------------|---|-----------------|---|-----------------|
| A | CO             | B | H <sub>2</sub>  | C | Cl <sub>2</sub> |
| D | O <sub>2</sub> | E | CO <sub>2</sub> | F | NO <sub>2</sub> |

- (a) Identify the gas produced in the reaction of magnesium with hydrochloric acid.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (b) Identify the **two** gases that do **not** exist as diatomic molecules.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (c) Identify the poisonous gas produced by the **incomplete combustion** of hydrocarbons.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

3. The formulae for some hydrocarbons are shown in the grid.

|                           |                           |                           |
|---------------------------|---------------------------|---------------------------|
| A                         | B                         | C                         |
| $\text{CH}_4$             | $\text{C}_2\text{H}_4$    | $\text{C}_6\text{H}_{14}$ |
| D                         | E                         | F                         |
| $\text{C}_5\text{H}_{12}$ | $\text{C}_4\text{H}_{10}$ | $\text{C}_4\text{H}_8$    |

- (a) Identify the **two** hydrocarbons which could be produced when propane ( $\text{C}_3\text{H}_8$ ) is cracked.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (b) Identify the **two** unsaturated hydrocarbons.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (c) Identify the hydrocarbon with the highest boiling point.  
You may wish to use page 6 of the data booklet to help you.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

[Turn over

4. The grid contains the names of some chemical processes.

|                |                |              |
|----------------|----------------|--------------|
| A              | B              | C            |
| respiration    | photosynthesis | distillation |
| D              | E              | F            |
| electroplating | galvanising    | cracking     |

- (a) Identify the process that uses light energy.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (b) Identify the process that can be used to separate alcohol and water.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

- (c) Identify the **two** processes that provide protection against corrosion.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

5. The names of some calcium compounds are shown in the grid.

|   |                   |   |                  |   |                  |
|---|-------------------|---|------------------|---|------------------|
| A | calcium carbonate | B | calcium iodide   | C | calcium sulphate |
| D | calcium bromide   | E | calcium fluoride | F | calcium chloride |

(a) Identify the **two** compounds which contain oxygen.

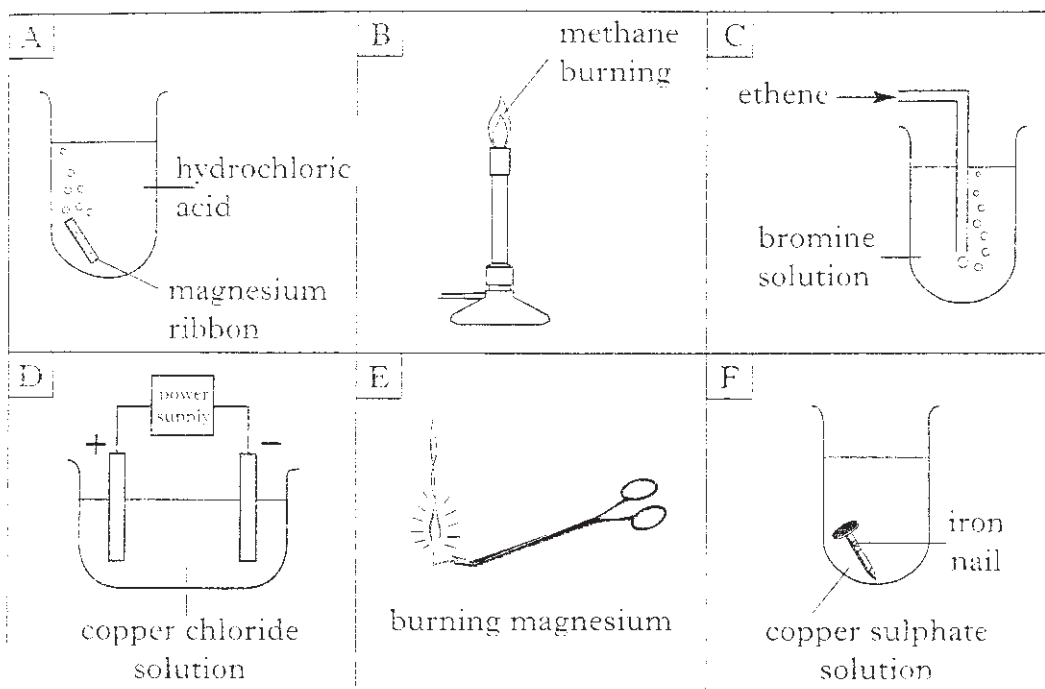
|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

(b) Identify the compound which will neutralise an acid.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

[Turn over

6. The grid below shows some simple experiments.



(a) Identify the experiment which gives water as a product.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

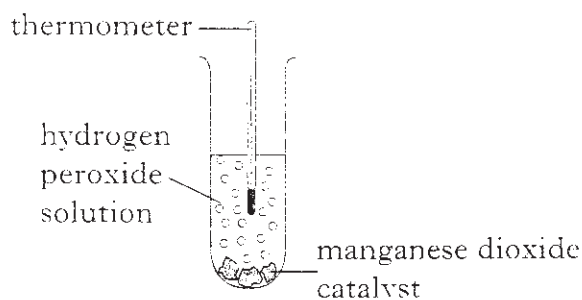
(b) Identify the experiment in which an addition reaction takes place.

|   |   |   |
|---|---|---|
| A | B | C |
| D | E | F |

7. Manganese dioxide acts as a catalyst in the following reaction:



The diagram shows how the reaction can be carried out.



Several experiments were carried out using the same mass of manganese dioxide and the same volume of hydrogen peroxide solution.

|   | Concentration of hydrogen peroxide solution (mol/l) | Temperature /°C | Form of manganese dioxide |
|---|---|-----------------|---------------------------|
| A | 0.5   | 20              | powder                    |
| B | 1.0   | 30              | lump                      |
| C | 1.5   | 20              | lump                      |
| D | 1.5   | 30              | powder                    |
| E | 0.5   | 20              | lump                      |
| F | 2.0   | 20              | powder                    |

(a) Identify the **two** experiments which should be compared to show the effect of particle size on the speed of the reaction.

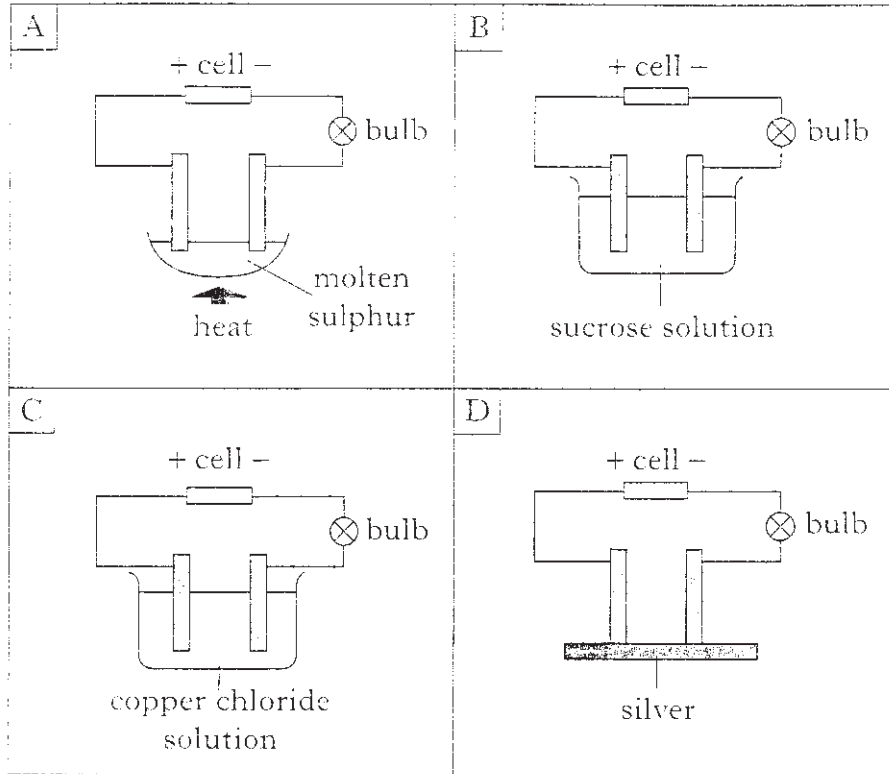
|   |
|---|
| A |
| B |
| C |
| D |
| E |
| F |

(b) Identify the experiment with the **slowest** speed of reaction.

|   |
|---|
| A |
| B |
| C |
| D |
| E |
| F |



8. Leia was investigating electrical conductivity.  
She set up four experiments.



Identify the experiment(s) in which the bulb will light.

|   |   |
|---|---|
| A | B |
| C | D |

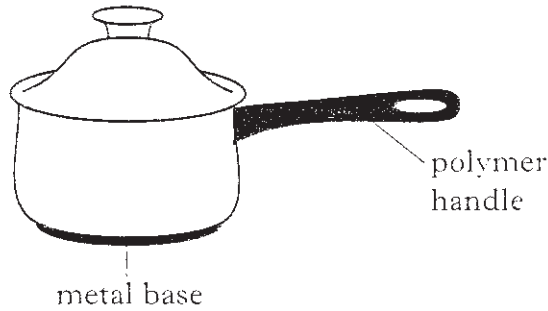
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**PART 2**

A total of 40 marks is available in this part of the paper.

9.



(a) The handle of the cooking pot is made of a polymer which does not melt when it gets hot.

What **term** is used to describe this type of polymer?

\_\_\_\_\_

1

(b) The metal base of the cooking pot does not melt either.

Give **another** property of the metal which makes it suitable to be used as the base of the pot.

\_\_\_\_\_

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(2)

[Turn over

10. Crude oil is a mixture of hydrocarbons. It is separated into different fractions at the oil refinery.

(a) What is a hydrocarbon?

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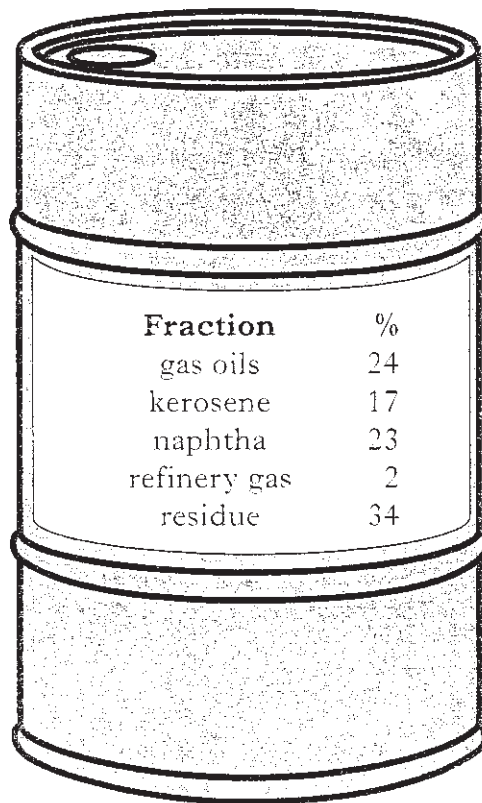
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(b) The diagram shows the percentage of each fraction obtained from a barrel of crude oil.



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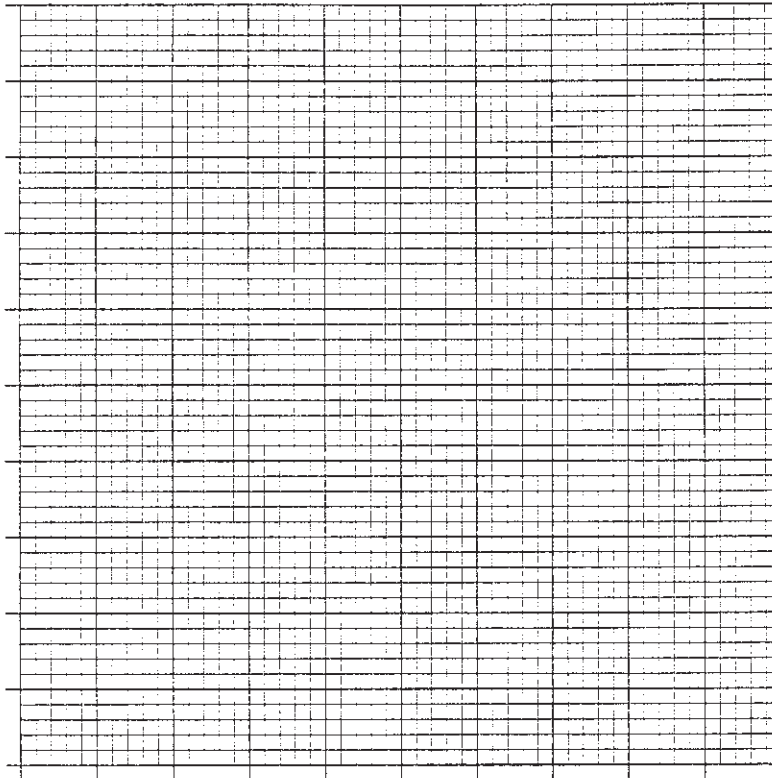
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10. (b) (continued)

- (i) Present this information in the form of a bar graph.  
*Use appropriate scales to fill most of the graph paper.*  
 (Additional graph paper, if required, can be found on page 24.)



2

- (ii) Bitumen (tar) is used for road surfacing.  
 From which fraction is bitumen obtained?

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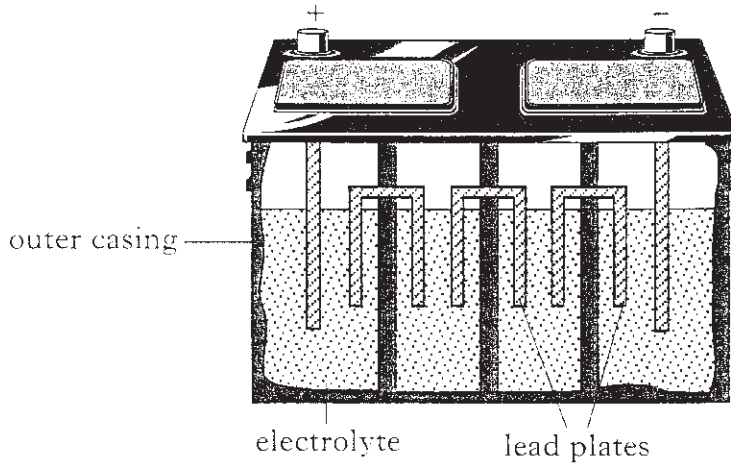


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11. (continued)

(b) Car batteries can be recharged.



What type of electrolyte is used in a car battery?

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(c) Give **one** advantage of using batteries rather than mains electricity.

\_\_\_\_\_

\_\_\_\_\_

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(5)

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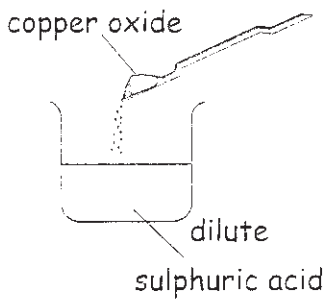
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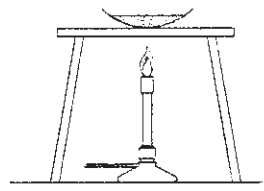
16. Laurie carried out an experiment to make copper sulphate crystals.

**Preparing Copper Sulphate Crystals**

Instructions:

1. Measure 40 cm<sup>3</sup> of dilute sulphuric acid into a clean beaker.
2. Carefully add a spatulaful of copper oxide to the beaker and stir with a stirring rod.
3. Continue to add the copper oxide until no more reacts.
4. Remove the excess copper oxide.
5. Boil the solution for 30 seconds then leave it to cool and crystallise.





(a) Name the type of chemical reaction taking place between the copper oxide and the dilute sulphuric acid.

\_\_\_\_\_

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(b) How is the excess copper oxide removed in step 4?

\_\_\_\_\_

\_\_\_\_\_

1

(c) Why would copper sulphate not be made by adding copper metal to dilute sulphuric acid?

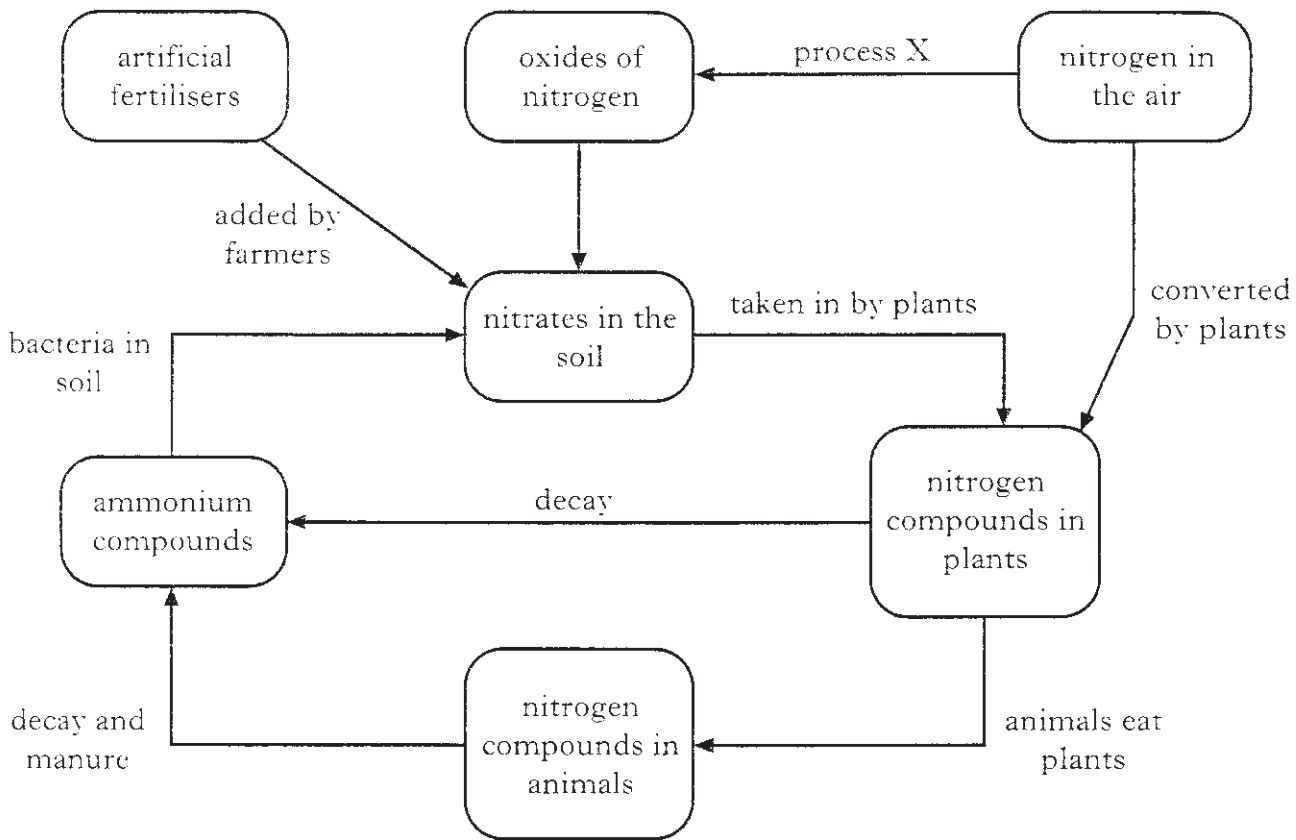
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(3)

17. The diagram shows part of the nitrogen cycle.



(a) (i) How are some plants able to convert nitrogen from the air into nitrogen compounds?

\_\_\_\_\_

\_\_\_\_\_

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(ii) Process X takes place in the air.  
What provides the energy for this process?

\_\_\_\_\_

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(b) Plants need phosphorus to grow.  
Suggest why calcium phosphate is **not** suitable as a fertiliser.  
You may wish to use page 5 of the data booklet.

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(c) Nitrogen and phosphorus are two of the essential elements supplied by fertilisers. Name the third essential element.

\_\_\_\_\_

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(4)

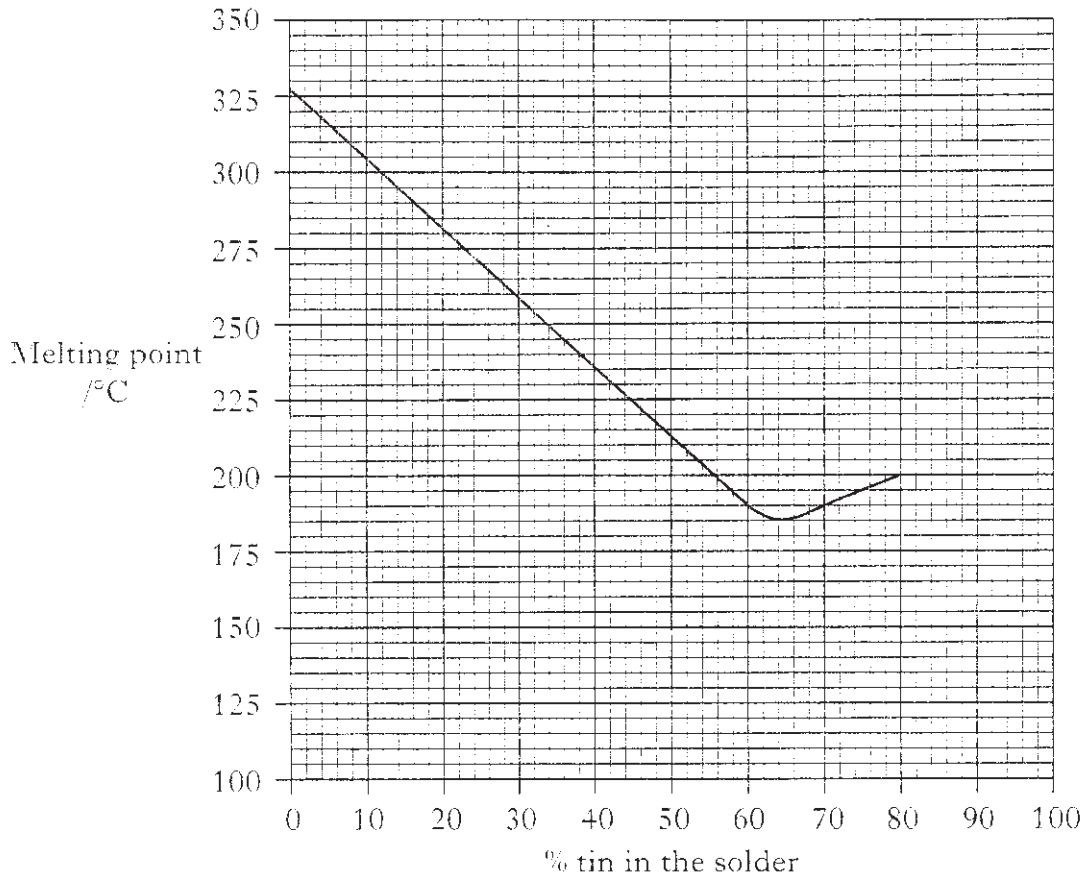
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18. Solders are mixtures of lead (melting point 328 °C) and tin (melting point 232 °C).

The graph shows the melting points of solders containing different percentages of tin.



- (a) What name is given to mixtures of metals like solders?

\_\_\_\_\_

1

- (b) Describe the trend in the melting point of solder as the percentage of tin increases from 20% to 50%.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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- (c) Use the graph to estimate the melting point of solder containing 90% tin.

\_\_\_\_\_

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19. The table contains information about some popular gemstones.

| Name     | Formula of main chemical  | Common colour | Source of colour            |
|----------|---|---------------|-----------------------------|
| diamond  | C   | colourless    | —                           |
| amethyst | SiO <sub>2</sub>  | purple        | iron compounds              |
| sapphire | Al <sub>2</sub> O <sub>3</sub>                                  | blue          | titanium and iron compounds |
| emerald  | Be <sub>3</sub> Al <sub>2</sub> Si <sub>6</sub> O <sub>18</sub> | green         | chromium compounds          |
| ruby     | Al <sub>2</sub> O <sub>3</sub>                                  | red           | chromium compounds          |

(a) (i) **Name** the main chemical found in both sapphire and ruby.

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(ii) What **type** of metal element is present in the compounds which cause the colour in the gemstones?

You may wish to use page 8 of the data booklet to help you.

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(b) Diamond does not conduct electricity.

Name the form of carbon which conducts electricity.

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(3)

[END OF QUESTION PAPER]