



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**CHEMISTRY**

**0620/11**

Paper 1 Multiple Choice

**October/November 2011**

**45 Minutes**

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



**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 16.

You may use a calculator.

This document consists of **16** printed pages.



1 In which substance are the particles close together and slowly moving past each other?

- A air
- B ice
- C steam
- D water

2 A student was provided with only a thermometer, a stopwatch and a beaker.

What could the student measure?

- A 10.5 g solid and 24.8 cm<sup>3</sup> liquid
- B 10.5 g solid and 25 °C
- C 24.8 cm<sup>3</sup> liquid and 45 seconds
- D 25 °C and 45 seconds

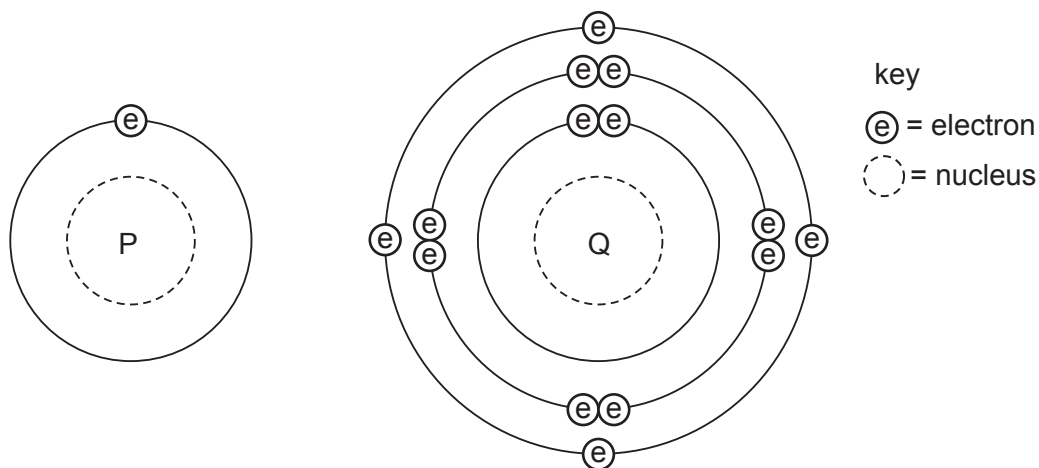
3 Mixture 1 contains sand and water.

Mixture 2 contains salt and water.

Which method of separation could be used to obtain each of the required products from each mixture?

|          | mixture 1       |                 | mixture 2       |                 |
|----------|-----------------|-----------------|-----------------|-----------------|
|          | to obtain sand  | to obtain water | to obtain salt  | to obtain water |
| <b>A</b> | crystallisation | distillation    | filtration      | filtration      |
| <b>B</b> | crystallisation | filtration      | filtration      | distillation    |
| <b>C</b> | filtration      | distillation    | crystallisation | filtration      |
| <b>D</b> | filtration      | filtration      | crystallisation | distillation    |

- 4 The diagram shows the electronic structures of atoms P and Q.



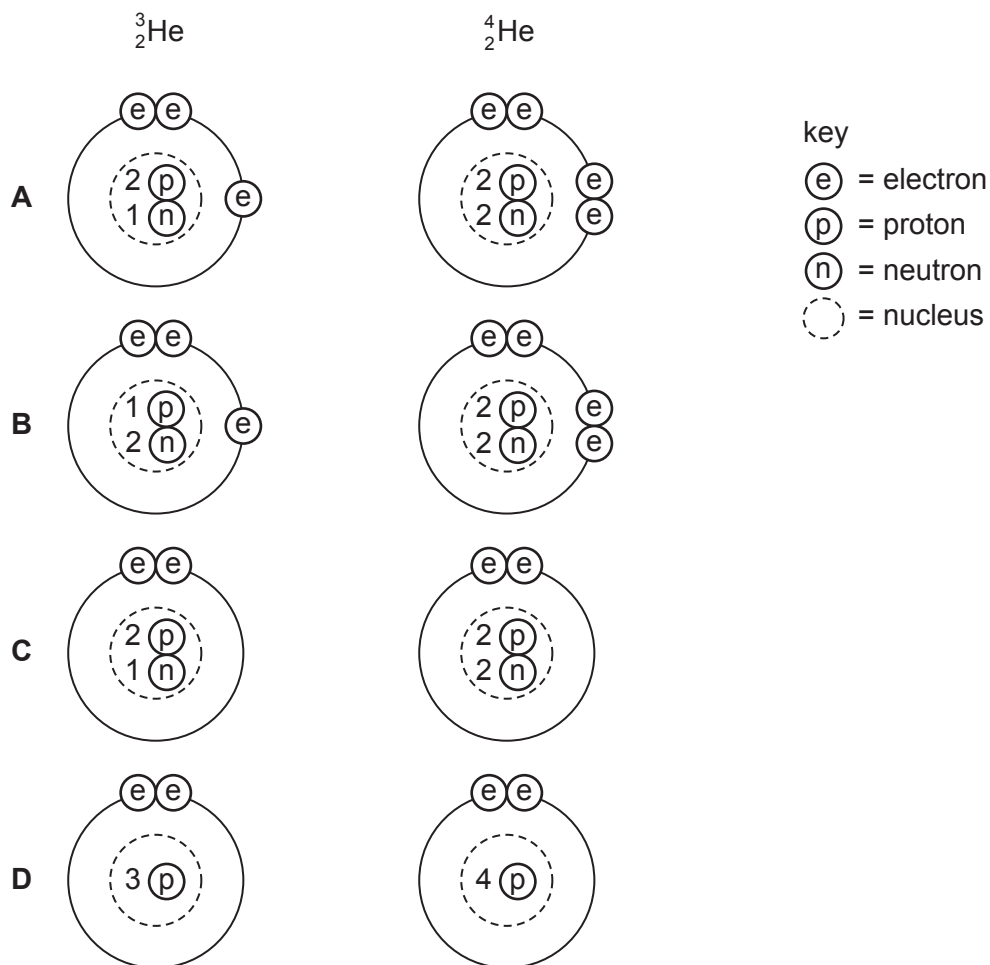
P and Q combine to form a molecule.

What is the formula of this molecule?

- A**  $PQ_4$       **B**  $PQ$       **C**  $P_2Q$       **D**  $P_4Q$

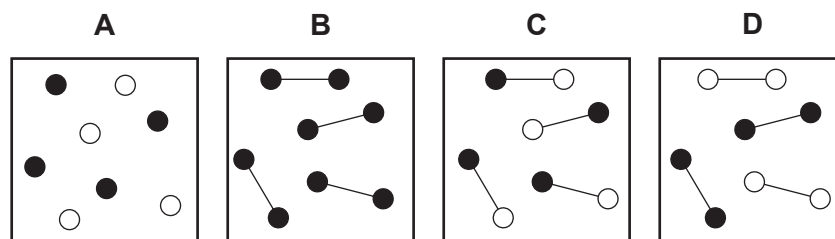
- 5 Two isotopes of helium are  ${}^3_2\text{He}$  and  ${}^4_2\text{He}$ .

Which two diagrams show the arrangement of particles in these two isotopes?



- 6 Two elements, represented by  $\bigcirc$  and  $\bullet$ , form a compound.

Which diagram shows molecules of the compound?



- 7 The table describes the structures of four particles.

| particle        | number of protons | number of neutrons | number of electrons |
|-----------------|-------------------|--------------------|---------------------|
| O               | 8                 | 8                  | 8                   |
| O <sup>2-</sup> | 8                 | 8                  | <b>X</b>            |
| Na              | 11                | <b>Y</b>           | 11                  |
| Na <sup>+</sup> | 11                | 12                 | <b>Z</b>            |

What are the correct values of **X**, **Y** and **Z**?

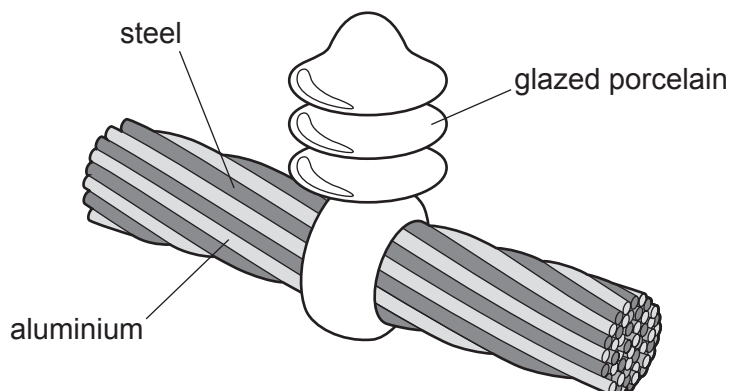
|          | <b>X</b> | <b>Y</b> | <b>Z</b> |
|----------|----------|----------|----------|
| <b>A</b> | 9        | 11       | 10       |
| <b>B</b> | 9        | 11       | 11       |
| <b>C</b> | 10       | 12       | 10       |
| <b>D</b> | 10       | 12       | 11       |

- 8 The relative formula mass,  $M_r$ , of copper(II) sulfate, CuSO<sub>4</sub>, is 160.

Which mass of sulfur is present in 160 g of copper(II) sulfate?

- A** 16 g      **B** 32 g      **C** 64 g      **D** 128 g

- 9 The diagram shows a section of an overhead power cable.



Which statement explains why a particular substance is used?

- A Aluminium has a low density and is a good conductor of electricity.
  - B Porcelain is a good conductor of electricity.
  - C Steel can rust in damp air.
  - D Steel is more dense than aluminium.
- 10 Metals could be extracted from their molten chlorides using electrolysis.

Which substances are formed at each electrode?

|   | anode    | cathode  |
|---|----------|----------|
| A | chlorine | hydrogen |
| B | chlorine | metal    |
| C | hydrogen | metal    |
| D | metal    | chlorine |

- 11 Concentrated aqueous potassium bromide solution is electrolysed using inert electrodes.

The ions present in the solution are  $K^+$ ,  $Br^-$ ,  $H^+$  and  $OH^-$ .

To which electrodes are the ions attracted during this electrolysis?

|   | attracted to anode | attracted to cathode |
|---|--------------------|----------------------|
| A | $Br^-$ and $K^+$   | $H^+$ and $OH^-$     |
| B | $Br^-$ and $OH^-$  | $H^+$ and $K^+$      |
| C | $H^+$ and $K^+$    | $Br^-$ and $OH^-$    |
| D | $H^+$ and $OH^-$   | $Br^-$ and $K^+$     |

- 12 Which fuel needs oxygen in order to produce heat energy and which type of reaction produces the energy?

|          | fuel                  | type of reaction |
|----------|-----------------------|------------------|
| <b>A</b> | a radioactive isotope | endothermic      |
| <b>B</b> | a radioactive isotope | exothermic       |
| <b>C</b> | hydrogen              | endothermic      |
| <b>D</b> | hydrogen              | exothermic       |

- 13 Some reactions are listed.

methane + oxygen → carbon dioxide + water

sodium + water → sodium hydroxide + hydrogen

magnesium + hydrochloric acid → magnesium chloride + hydrogen

Which word correctly describes all of these reactions?

- A** combustion  
**B** endothermic  
**C** exothermic  
**D** neutralisation
- 14 The sign  $\rightleftharpoons$  is used in some equations to show that a reaction is reversible.

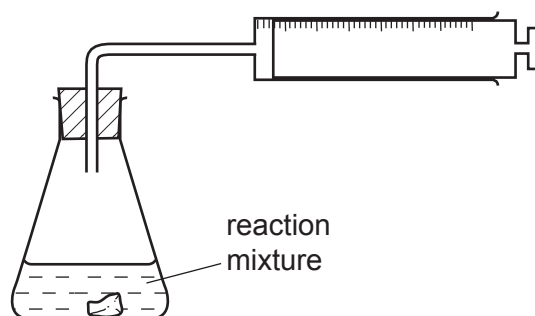
Two incomplete equations are given.

|          | reactants                             | products                                  |
|----------|---------------------------------------|-------------------------------------------|
| <b>P</b> | $\text{CoCl}_2 + 2\text{H}_2\text{O}$ | $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ |
| <b>Q</b> | $\text{C} + \text{O}_2$               | $\text{CO}_2$                             |

For which of these reactions can a  $\rightleftharpoons$  sign be correctly used to complete the equation?

|          | <b>P</b> | <b>Q</b> |
|----------|----------|----------|
| <b>A</b> | ✓        | ✓        |
| <b>B</b> | ✓        | x        |
| <b>C</b> | x        | ✓        |
| <b>D</b> | x        | x        |

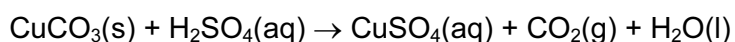
- 15 An experiment to determine the rate of a chemical reaction could be carried out using the apparatus shown.



Which reaction is being studied?

- A**  $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$   
**B**  $\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$   
**C**  $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$   
**D**  $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

- 16 Copper(II) carbonate reacts with dilute sulfuric acid.



The speed of the reaction can be changed by varying the conditions.

Which conditions would always increase the speed of this chemical reaction?

- 1 Increase the concentration of the reactants.
- 2 Increase the size of the pieces of copper(II) carbonate.
- 3 Increase the temperature.
- 4 Increase the volume of sulfuric acid.

- A** 1, 3 and 4      **B** 1 and 3 only      **C** 2 and 3      **D** 3 and 4 only

- 17 Which type of reaction always forms a salt and water?

- A** exothermic  
**B** neutralisation  
**C** oxidation  
**D** polymerisation

18 Which property is **not** characteristic of a base?

- A It reacts with a carbonate to form carbon dioxide.
- B It reacts with an acid to form a salt.
- C It reacts with an ammonium salt to form ammonia.
- D It turns universal indicator paper blue.

19 An alloy contains copper and zinc.

Some of the zinc has become oxidised to zinc oxide.

What is the result of adding an excess of dilute sulfuric acid to the alloy?

- A A blue solution and a white solid remains.
- B A colourless solution and a pink/brown solid remains.
- C The alloy dissolves completely to give a blue solution.
- D The alloy dissolves completely to give a colourless solution.

20 The results of three tests on a solution of compound **X** are shown.

| test                           | result                                      |
|--------------------------------|---------------------------------------------|
| aqueous sodium hydroxide added | white precipitate formed, soluble in excess |
| aqueous ammonia added          | white precipitate formed, soluble in excess |
| dilute hydrochloric acid added | bubbles of gas                              |

What is compound **X**?

- A aluminium carbonate
- B aluminium chloride
- C zinc carbonate
- D zinc chloride

**21** Statement 1: Helium is a reactive gas.

Statement 2: Helium can be used to fill balloons.

Which is correct?

- A** Both statements are correct and statement 2 explains statement 1.
- B** Both statements are correct but statement 2 does not explain statement 1.
- C** Statement 1 is correct but statement 2 is incorrect.
- D** Statement 2 is correct but statement 1 is incorrect.

**22** An element has the following properties.

- It forms coloured compounds.
- It acts as a catalyst.
- It melts at 1539 °C.

In which part of the Periodic Table is the element found?

- A** Group I
- B** Group IV
- C** Group VII
- D** transition elements

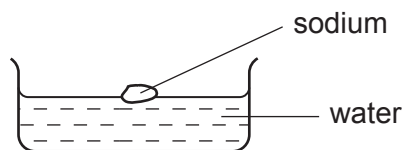
**23** The table shows some properties of two elements in Group VII of the Periodic Table.

| element  | state at 20 °C | density/g per cm <sup>3</sup> | melting point/°C |
|----------|----------------|-------------------------------|------------------|
| chlorine | gas            | 0.0032                        | −101             |
| bromine  | liquid         | 3.1                           | −7               |

Which properties is fluorine likely to have?

|          | state at 20 °C | density/g per cm <sup>3</sup> | melting point/°C |
|----------|----------------|-------------------------------|------------------|
| <b>A</b> | gas            | 0.0017                        | −220             |
| <b>B</b> | gas            | 0.17                          | −188             |
| <b>C</b> | liquid         | 0.0017                        | −220             |
| <b>D</b> | liquid         | 0.17                          | −188             |

24 When sodium reacts with water, a solution and a gas are produced.



The solution is tested with litmus paper and the gas is tested with a splint.

What happens to the litmus paper and to the splint?

|          | litmus paper | splint                  |
|----------|--------------|-------------------------|
| <b>A</b> | blue to red  | glowing splint relights |
| <b>B</b> | blue to red  | lighted splint 'pops'   |
| <b>C</b> | red to blue  | glowing splint relights |
| <b>D</b> | red to blue  | lighted splint 'pops'   |

25 Which statements are correct?

- 1 Metals are often used in the form of alloys.
- 2 Stainless steel is an alloy of iron.
- 3 Alloys always contain more than two metals.

**A** 1 and 2 only    **B** 1 and 3 only    **C** 2 and 3 only    **D** 1, 2 and 3

26 Which statement is true about **all** metals?

- A** They are attracted to a magnet.
- B** They are weak and brittle.
- C** They may be used to form alloys.
- D** They react with water.

27 A chemical engineer plans to produce hydrochloric acid.

Which metal is best for the reaction container?

- A** copper
- B** iron
- C** magnesium
- D** zinc

- 28** Alloy X is strong and has a low density.

Alloy Y is heavy but is resistant to corrosion.

Which could be uses of X and Y?

|          | bridge supports | aircraft | overhead cables |
|----------|-----------------|----------|-----------------|
| <b>A</b> | X               | X        | Y               |
| <b>B</b> | X               | Y        | Y               |
| <b>C</b> | Y               | X        | X               |
| <b>D</b> | Y               | Y        | X               |

- 29** A metal is extracted from hematite, its oxide ore.

What is the metal and how is the oxide reduced?

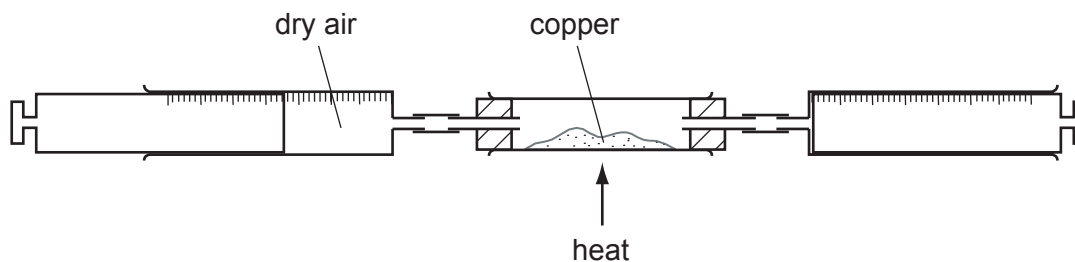
|          | metal | method of reduction |
|----------|-------|---------------------|
| <b>A</b> | Al    | electrolysis        |
| <b>B</b> | Al    | heating with carbon |
| <b>C</b> | Fe    | electrolysis        |
| <b>D</b> | Fe    | heating with carbon |

- 30** A liquid turns white anhydrous copper sulfate blue and has a boiling point of 103°C.

Which could be the identity of the liquid?

- A** alcohol
- B** petrol
- C** salt solution
- D** pure water

- 31 Dry air is passed over hot copper until all the oxygen has reacted.



The volume of gas at the end of the reaction is  $120\text{ cm}^3$ .

What is the starting volume of dry air?

- A**  $132\text{ cm}^3$       **B**  $150\text{ cm}^3$       **C**  $180\text{ cm}^3$       **D**  $600\text{ cm}^3$

- 32 In which row is the air pollutant **not** correctly matched with its source?

|          | air pollutant   | source                              |
|----------|-----------------|-------------------------------------|
| <b>A</b> | carbon monoxide | incomplete combustion of fuels      |
| <b>B</b> | lead compounds  | burning petrol in cars              |
| <b>C</b> | nitrogen oxides | decomposing vegetation              |
| <b>D</b> | sulfur dioxide  | burning coal and other fossil fuels |

- 33 Iron is a metal that rusts in the presence of oxygen and water.

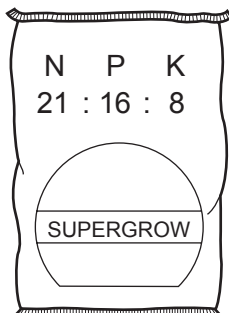
Mild steel is used for .....1..... and is prevented from rusting by .....2..... .

Stainless steel is prevented from rusting by .....3..... it with another metal.

Which words correctly complete gaps 1, 2 and 3?

|          | 1          | 2        | 3        |
|----------|------------|----------|----------|
| <b>A</b> | car bodies | greasing | covering |
| <b>B</b> | car bodies | painting | mixing   |
| <b>C</b> | cutlery    | greasing | covering |
| <b>D</b> | cutlery    | painting | mixing   |

34 Which combination of chemical compounds could be used to produce the fertiliser shown?

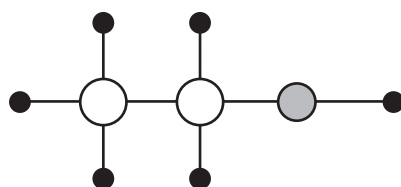


- A  $\text{NH}_4\text{NO}_3$ ,  $\text{Ca}_3(\text{PO}_4)_2$
- B  $\text{NH}_4\text{NO}_3$ ,  $\text{CO}(\text{NH}_2)_2$
- C  $\text{NH}_4\text{NO}_3$ ,  $\text{K}_2\text{SO}_4$ ,  $(\text{NH}_4)_2\text{SO}_4$
- D  $(\text{NH}_4)_3\text{PO}_4$ ,  $\text{KCl}$

35 Which pollutant gas is produced by the decomposition of vegetation?

- A carbon monoxide
- B methane
- C nitrogen oxide
- D sulfur dioxide

36 The diagram represents the molecule of an organic compound.



key

○ = carbon

● = oxygen

● = hydrogen

What is the name of the compound?

- A ethane
- B ethanoic acid
- C ethanol
- D ethene

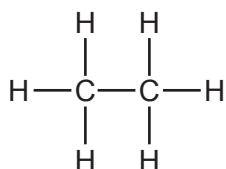
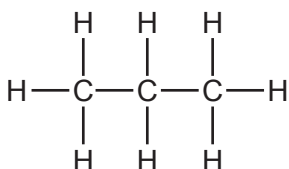
37 Petroleum is a very important raw material that is separated into more useful products.

Which terms describe petroleum and the method used to separate it?

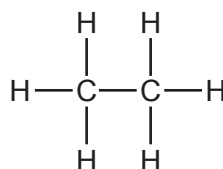
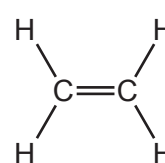
|          | petroleum is a | method used to separate petroleum |
|----------|----------------|-----------------------------------|
| <b>A</b> | compound       | cracking                          |
| <b>B</b> | compound       | fractional distillation           |
| <b>C</b> | mixture        | cracking                          |
| <b>D</b> | mixture        | fractional distillation           |

38 Which pair of compounds are members of the same homologous series?

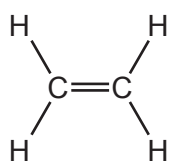
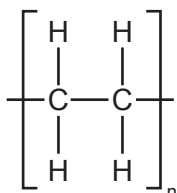
**A**



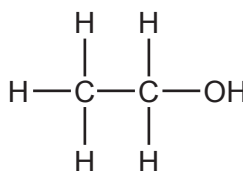
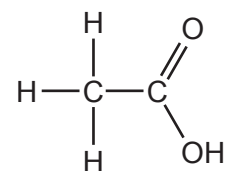
**B**



**C**



**D**



**39** The table shows the composition of four different types of petroleum (crude oil).

| fraction | Arabian Heavy<br>/ % | Arabian Light<br>/ % | Iranian Heavy<br>/ % | North Sea<br>/ % |
|----------|----------------------|----------------------|----------------------|------------------|
| gasoline | 18                   | 21                   | 21                   | 23               |
| kerosene | 11.5                 | 13                   | 13                   | 15               |
| diesel   | 18                   | 20                   | 20                   | 24               |
| fuel oil | 52.5                 | 46                   | 46                   | 38               |

Which type of petroleum is best for the motor vehicle industry?

- A** Arabian Heavy
- B** Arabian Light
- C** Iranian Heavy
- D** North Sea

**40** When glucose is fermented, ethanol is formed together with

- A** carbon dioxide.
- B** ethene.
- C** methane.
- D** oxygen.

The volume of one mole of any gas is  $24 \text{ dm}^3$  at room temperature and pressure (r.t.p.).

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