



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/12

Paper 1 Multiple Choice

May/June 2012

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.

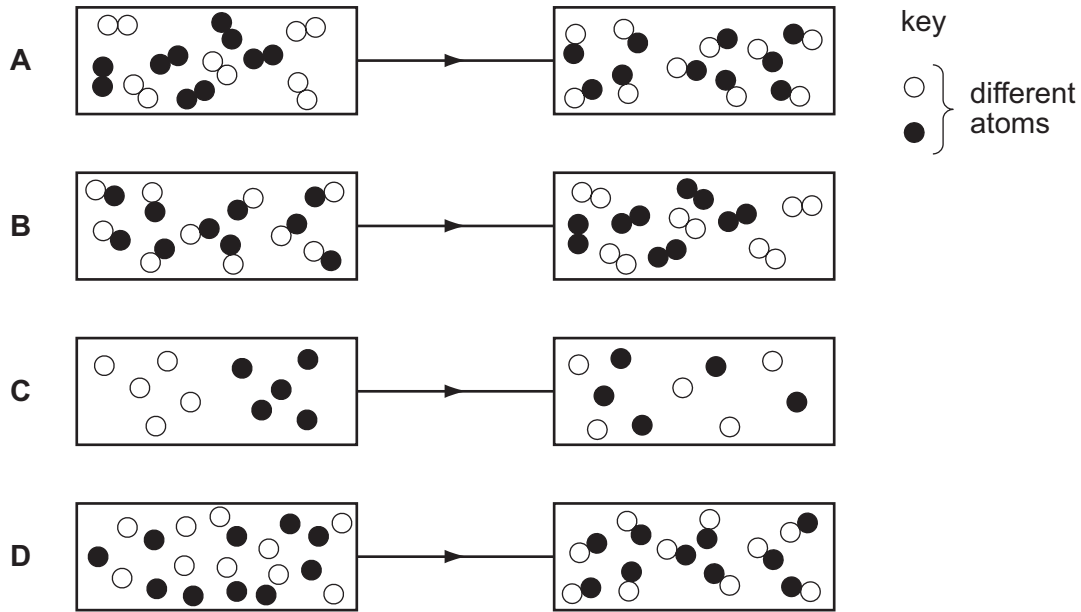
A copy of the Periodic Table is printed on page 16.

You may use a calculator.

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



1 Which diagram shows the process of diffusion?



2 Which method would be most suitable for the separation of a mixture of sand and water to obtain the sand?

- A chromatography
- B crystallisation
- C distillation
- D filtration

3 A student investigates how the concentration of an acid affects the speed of reaction with a 0.5 g mass of magnesium at 30 °C.

The student has a beaker, concentrated acid, water and the apparatus below.

- P a balance
- Q a clock
- R a measuring cylinder
- S a thermometer

Which pieces of apparatus does the student use?

- A P, Q and R only
- B P, Q and S only
- C Q, R and S only
- D P, Q, R and S

- 4 An element Y has the proton number 18.

The next element in the Periodic Table is an element Z.

Which statement is correct?

- A** Element Z has one more electron in its outer shell than element Y.
B Element Z has one more electron shell than element Y.
C Element Z is in the same group of the Periodic Table as element Y.
D Element Z is in the same period of the Periodic Table as element Y.
- 5 Which atom has twice as many neutrons as protons?

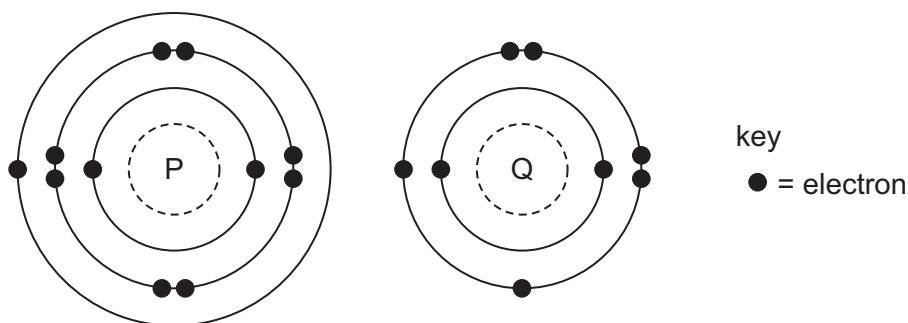
- A** ${}^1_1\text{H}$ **B** ${}^2_1\text{H}$ **C** ${}^3_1\text{H}$ **D** ${}^4_2\text{He}$

- 6 The table contains information about four substances.

Which substance is potassium chloride?

| | melting point /°C | conduction of electricity | |
|----------|----------------------|---------------------------|---------------------|
| | | when molten | in aqueous solution |
| A | 11 | no | yes |
| B | 98 | yes | yes |
| C | 772 | yes | yes |
| D | 1410 | no | insoluble |

- 7 The electronic structures of atoms P and Q are shown.

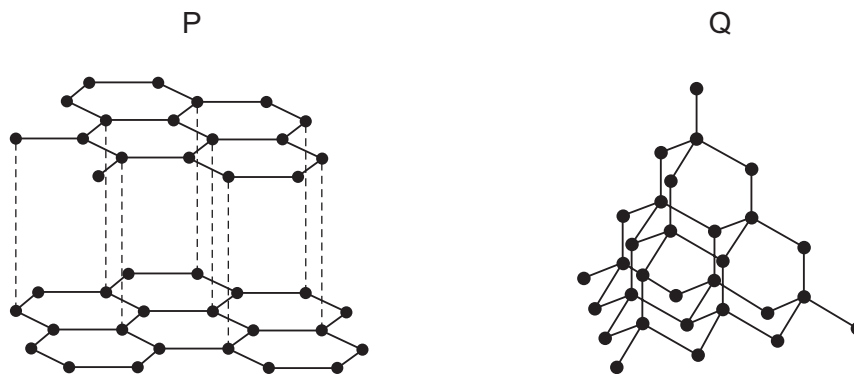


P and Q react to form an ionic compound.

What is the formula of this compound?

- A** PQ_2 **B** P_2Q **C** P_2Q_6 **D** P_6Q_2

8 The diagrams show the structures of two forms, P and Q, of a solid element.



What are suitable uses of P and Q, based on their structures?

| | use of solid P | use of solid Q |
|----------|----------------|----------------|
| A | drilling | drilling |
| B | lubricating | drilling |
| C | drilling | lubricating |
| D | lubricating | lubricating |

9 Methane, CH₄, burns in the air to form carbon dioxide and water.

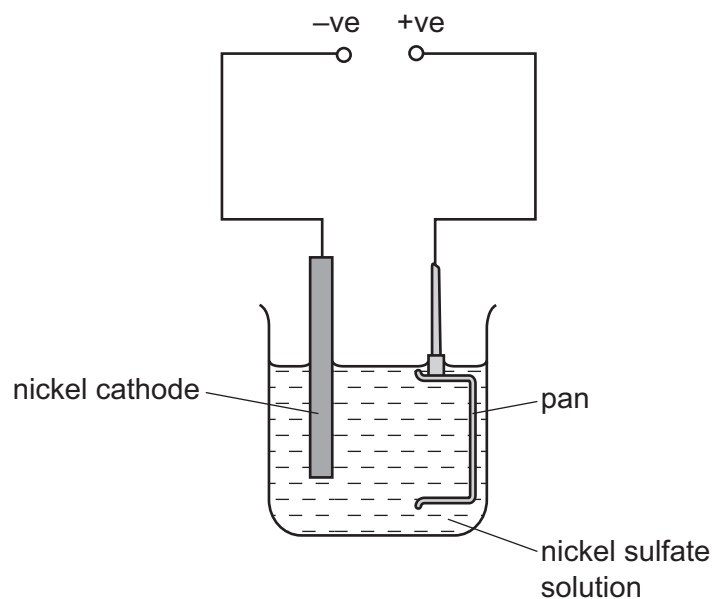
What is the balanced equation for this reaction?

- A** CH₄(g) + O₂(g) → CO₂(g) + 2H₂O(g)
- B** CH₄(g) + 2O₂(g) → CO₂(g) + 2H₂O(g)
- C** CH₄(g) + 2O₂(g) → CO₂(g) + H₂O(g)
- D** CH₄(g) + 3O₂(g) → CO₂(g) + 2H₂O(g)

10 In which reaction is lead(II) oxide, PbO, oxidised?

- A** PbO + C → Pb + CO
- B** PbO + CO → Pb + CO₂
- C** PbO + H₂ → Pb + H₂O
- D** 2PbO + O₂ → 2PbO₂

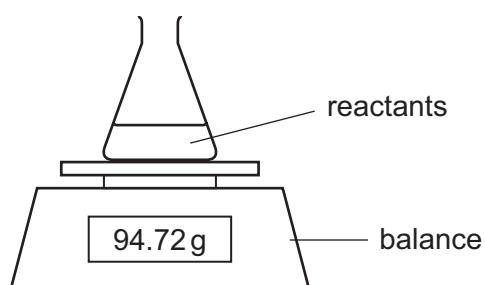
11 The diagram shows an unsuccessful experiment to nickel plate a pan.



Which change is necessary to plate the pan with nickel?

- A Add more nickel sulfate to the solution.
- B Heat the solution to 100 °C.
- C Increase the current in the circuit.
- D Make the pan the negative electrode.

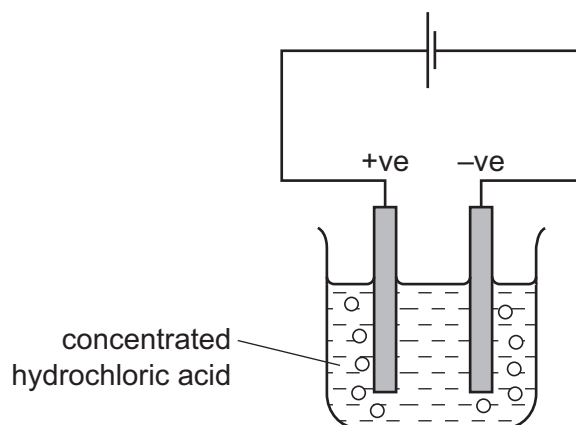
12 The rates of some chemical reactions can be measured by using the apparatus shown.



For which reaction is this apparatus suitable?

- A $\text{MgCO}_3 + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$
- B $\text{Mg} + \text{ZnCl}_2 \rightarrow \text{MgCl}_2 + \text{Zn}$
- C $\text{MgCl}_2 + 2\text{NaOH} \rightarrow \text{Mg(OH)}_2 + 2\text{NaCl}$
- D $\text{MgO} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$

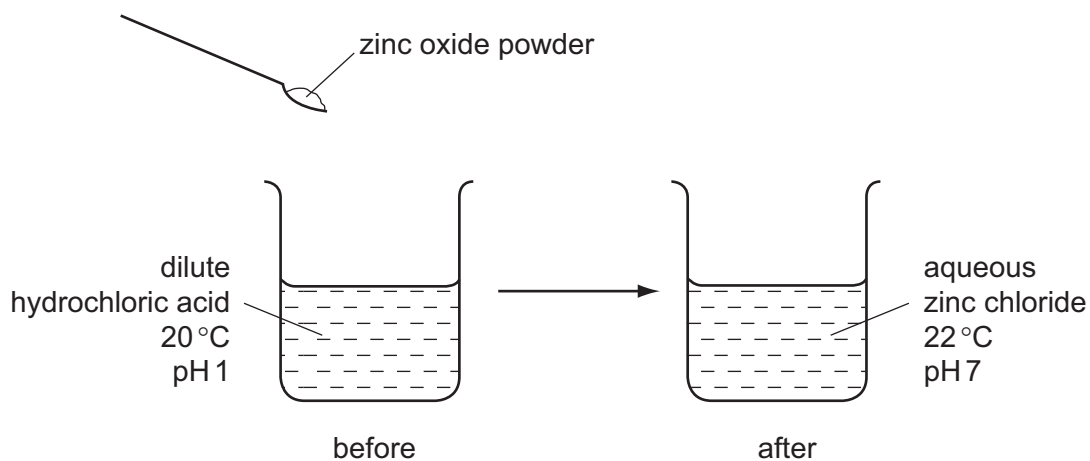
- 13 The diagram shows that two gases are formed when concentrated hydrochloric acid is electrolysed using inert electrodes.



Which row correctly describes the colours of the gases at the electrodes?

| | anode (+ve) | cathode (-ve) |
|----------|--------------|---------------|
| A | colourless | colourless |
| B | colourless | yellow-green |
| C | yellow-green | colourless |
| D | yellow-green | yellow-green |

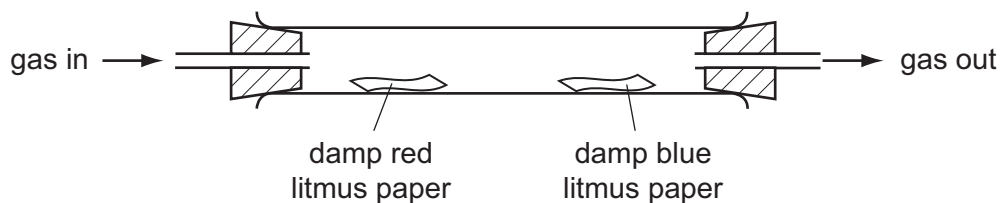
- 14 The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.



Which terms describe the reaction?

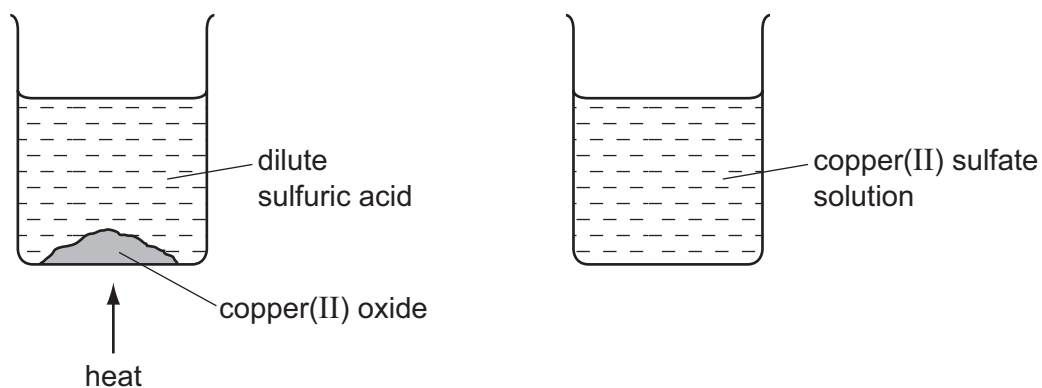
| | endothermic | neutralisation |
|----------|-------------|----------------|
| A | ✓ | ✓ |
| B | ✓ | x |
| C | x | ✓ |
| D | x | x |

15 Four different gases are passed through the apparatus shown.



Which gas has no effect on either piece of litmus paper?

- A ammonia
 - B carbon dioxide
 - C chlorine
 - D hydrogen
- 16 An aqueous solution of copper(II) sulfate was made by adding excess copper(II) oxide to dilute sulfuric acid. The mixture was heated, stirred and then filtered.



What was the pH of the acid before adding the copper(II) oxide and of the solution after filtration?

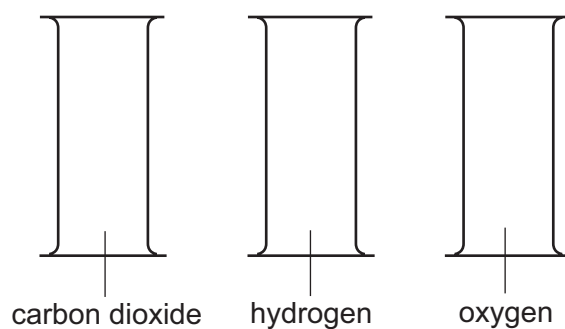
| | pH of acid before adding copper(II) oxide | pH of solution after filtration |
|----------|---|---------------------------------|
| A | greater than 7 | 7 |
| B | greater than 7 | less than 7 |
| C | less than 7 | 7 |
| D | less than 7 | greater than 7 |

17 Aqueous potassium iodide is added to aqueous silver nitrate.

What are the colours of the final precipitate and solution?

| | precipitate | solution |
|----------|-------------|------------|
| A | brown | colourless |
| B | white | yellow |
| C | yellow | colourless |
| D | yellow | white |

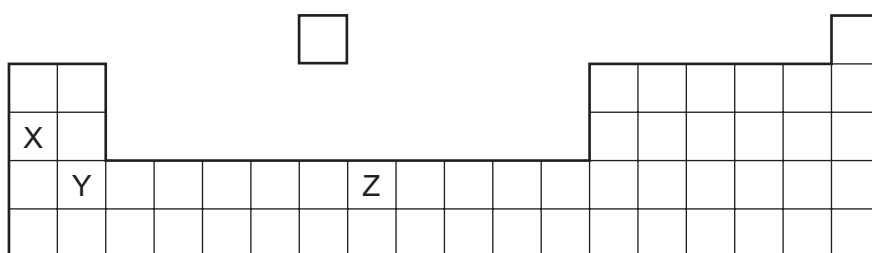
18 Three gas jars contain carbon dioxide, hydrogen and oxygen, as shown.



Which one of the following tests could be used to discover which gas is in each jar?

- A** a glowing splint
- B** a lighted splint
- C** damp blue litmus paper
- D** limewater

19 The diagram shows an outline of part of the Periodic Table.



Which statement about elements X, Y and Z is **not** correct?

- A** All are metals.
- B** All conduct electricity.
- C** All form coloured compounds.
- D** All react with oxygen.

20 Elements X, Y and Z are in Group VII of the Periodic Table.

X is a gas.

Y is less reactive than Z

Z is a red liquid.

When X, Y and Z are put in order of increasing proton number, which order is correct?

A $X \rightarrow Y \rightarrow Z$ **B** $X \rightarrow Z \rightarrow Y$ **C** $Y \rightarrow X \rightarrow Z$ **D** $Y \rightarrow Z \rightarrow X$

21 Which properties of the element titanium, Ti, can be predicted from its position in the Periodic Table?

| | can be used as a catalyst | conducts electricity when solid | has low density | forms coloured compounds |
|----------|---------------------------|---------------------------------|-----------------|--------------------------|
| A | ✓ | ✓ | x | ✓ |
| B | ✓ | ✓ | ✓ | x |
| C | ✓ | x | ✓ | ✓ |
| D | x | ✓ | ✓ | ✓ |

22 Five elements have proton numbers 10, 12, 14, 16 and 18.

What are the proton numbers of the three elements that form oxides?

A 10, 12 and 14

B 10, 14 and 18

C 12, 14 and 16

D 14, 16 and 18

23 Which statement about aluminium is **not** correct?

A It is resistant to corrosion.

B It is strong and has a high density.

C It is used in food containers.

D It is used in the manufacture of aircraft.

24 Many metals are extracted from their ores by heating the metal oxide with carbon.

Which metal **cannot** be extracted using this method?

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

25 A metal has the following properties.

- It does not react with cold water.
- It reacts with dilute hydrochloric acid.
- It cannot be extracted from its oxide using carbon.

Between which two metals in the reactivity series should it be placed?

- A calcium and magnesium
- B iron and copper
- C magnesium and zinc
- D zinc and iron

26 Which statements about the general properties of metals are correct?

- 1 conduct electricity when solid
- 2 form acidic oxides
- 3 high melting point

- A 1 and 3 B 1 only C 2 and 3 D 2 only

27 Water for human use is treated by filtration then chlorination.

Which uses do **not** need water of this quality?

- 1 water for cooling in industry
- 2 water for flushing toilets in the home
- 3 water for drinking

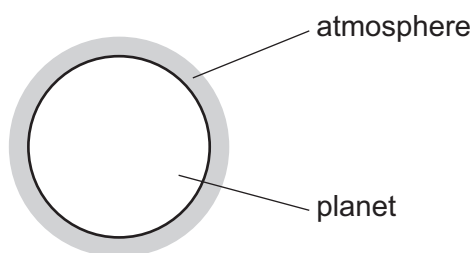
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

28 Carbon monoxide is an air pollutant produced when petrol is burned in a car engine.

Why is carbon monoxide considered to be an air pollutant?

- A It causes global warming.
- B It causes the corrosion of buildings.
- C It is a greenhouse gas.
- D It is poisonous.

29 A new planet has been discovered and its atmosphere has been analysed.



The table shows the composition of the atmosphere.

| gas | percentage by volume |
|----------------|----------------------|
| carbon dioxide | 4 |
| nitrogen | 72 |
| oxygen | 24 |

Which gases are present in the atmosphere of the planet in a higher percentage than they are in the Earth's atmosphere?

- A carbon dioxide and oxygen
- B carbon dioxide only
- C nitrogen and oxygen
- D nitrogen only

30 Acetylene, C_2H_2 , is a hydrocarbon. When acetylene and oxygen react, the hot flame produced can be used to weld steel.

Which statement is correct?

- A Acetylene and oxygen react exothermically.
- B Acetylene is saturated.
- C Oxygen and steel react endothermically.
- D Oxygen is a gaseous fuel.

31 Fertilisers are used to provide three elements needed to increase the yield of crops.

Which two compounds, when used together, would provide all three of these elements?

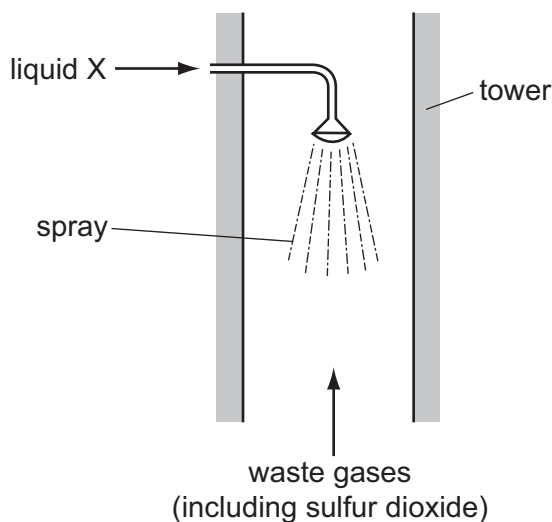
- A ammonium nitrate and calcium phosphate
- B ammonium nitrate and potassium sulfate
- C potassium nitrate and calcium phosphate
- D potassium nitrate and potassium sulfate

32 Carbon dioxide and methane are 'greenhouse gases' which contribute to global warming.

Which process does **not** increase global warming?

- A burning fossil fuels
- B decay of organic waste
- C farming cattle for beef
- D growing crops such as sugar cane

33 When coal and oil burn in power stations, the acidic gas sulfur dioxide is formed. Sulfur dioxide is removed by absorbing it in a liquid sprayed down a tower.



What is liquid X?

- A calcium hydroxide solution
- B sodium chloride solution
- C dilute hydrochloric acid
- D water

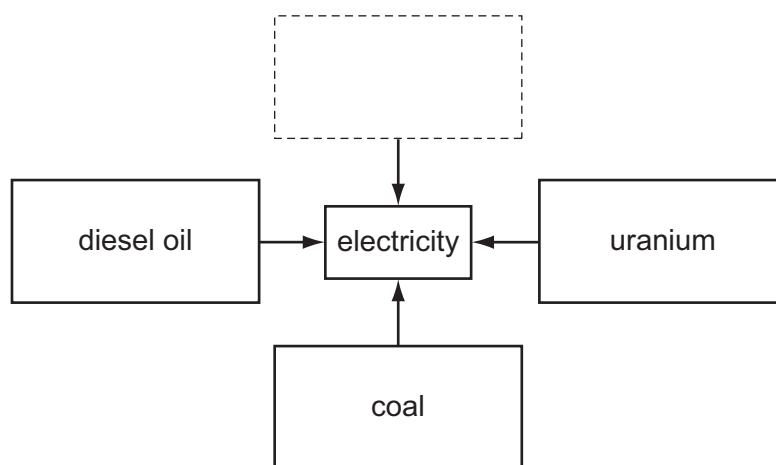
34 The table shows bonds that are present and bonds that are not present in compound X.

| bond | |
|------|---|
| C–C | ✓ |
| C=C | x |
| C–H | ✓ |
| C–O | ✓ |
| C=O | ✓ |
| O–H | ✓ |

What type of compound is X?

- A a carboxylic acid
- B an alcohol
- C an alkane
- D an alkene

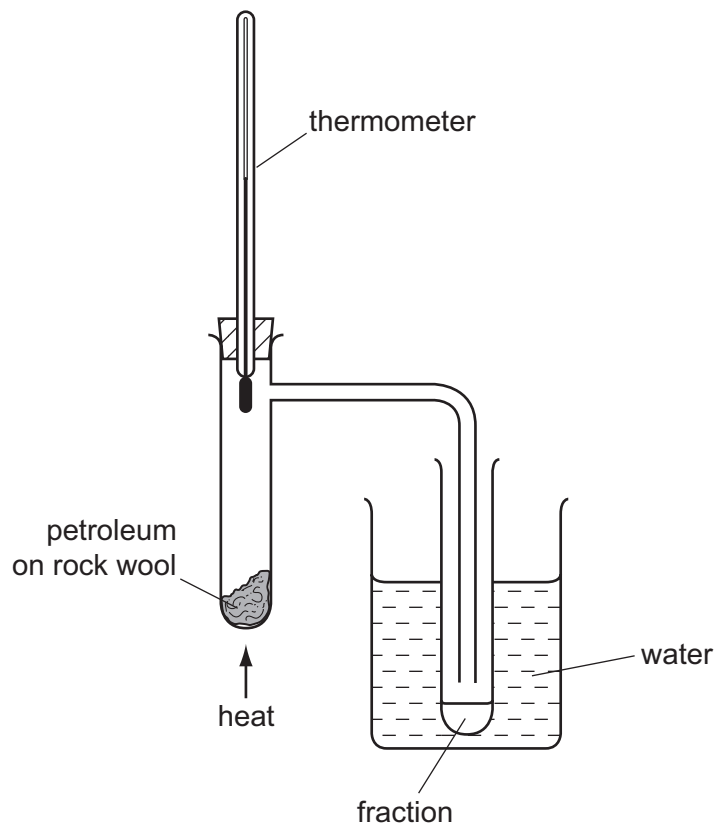
35 The diagram shows different fuels from which electricity can be generated.



Which box completes the diagram?

- | A | B | C | D |
|---------|---------|-------------|-------|
| ammonia | bitumen | natural gas | steam |

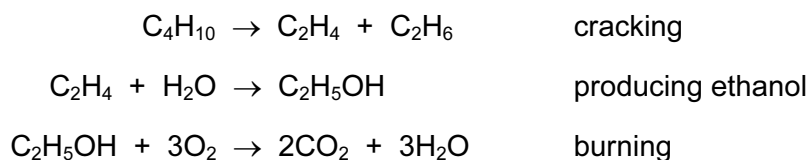
36 The diagram shows apparatus used to separate petroleum into four fractions.



Which fraction contains the smallest hydrocarbon molecules?

| fraction | boiling point range / °C |
|----------|--------------------------|
| A | up to 70 |
| B | 70 to 120 |
| C | 120 to 170 |
| D | over 170 |

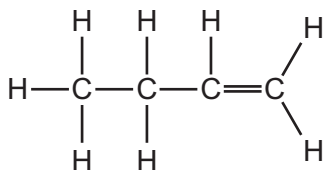
37 Ethanol is a fuel used in cars. It can be made from petroleum.



Compounds of how many homologous series appear in these equations?

- A** 1 **B** 2 **C** 3 **D** 4

38 Butene is an alkene which is manufactured by cracking hydrocarbons.



Which hydrocarbon can be cracked to make butene?

- A ethane, C_2H_6
 B decane, $\text{C}_{10}\text{H}_{22}$
 C methane, CH_4
 D propane, C_3H_8
- 39 Which substance does **not** produce carbon dioxide when it burns in oxygen?
- A butane
 B ethanol
 C ethene
 D hydrogen
- 40 Ethanol is an important chemical produced by the1..... of2.....

Which words correctly complete gaps 1 and 2?

| | 1 | 2 |
|----------|--------------|---------|
| A | combustion | ethane |
| B | combustion | glucose |
| C | fermentation | ethane |
| D | fermentation | glucose |

DATA SHEET

The Periodic Table of the Elements

| Group | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|------------------------------------|---------------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|----------------------------------|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|----------------------------------|--|--|--|-------------------------------|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | 0 | | | | |
| | | | | | | | | | | 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 | 19 F Fluorine 9 | 20 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 | 96 Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 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 | | | | |
| 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La Lanthanum 57 * | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 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 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 | | | | |
| Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 † | | | | | | | | | | | | | | | | | | | |

*58-71 Lanthanoid series

†90-103 Actinoid series

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

| | | | | | | | | | | | | | |
|-----------------------------------|--|-------------------------------------|-------------------------------|------------------------------------|------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-----------------------------------|----------------------------------|-----------------------------------|-------------------------------------|------------------------------------|
| 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 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 | Pa Protactinium 91 | 238 U Uranium 92 | Np Neptunium 93 | Pu Plutonium 94 | Am Americium 95 | Cm Curium 96 | Bk Berkelium 97 | Cf Californium 98 | Es Einsteinium 99 | Fm Fermium 100 | Md Mendelevium 101 | No Nobelium 102 | Lr Lawrencium 103 |

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

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