UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**CHEMISTRY** **0620/11**

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)

*3111298563*

**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.


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**1** Which diagram shows the process of diffusion?

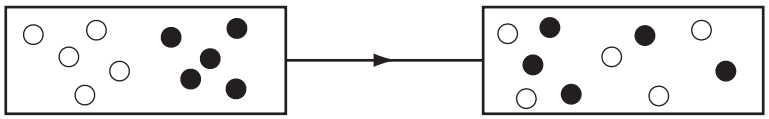
**A**



**B**

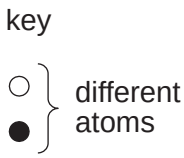


**C**



**D**






**2** Which method is most suitable to obtain zinc carbonate from a suspension of zinc carbonate in water?

**A** crystallisation

**B** distillation

**C** evaporation

**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

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**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.

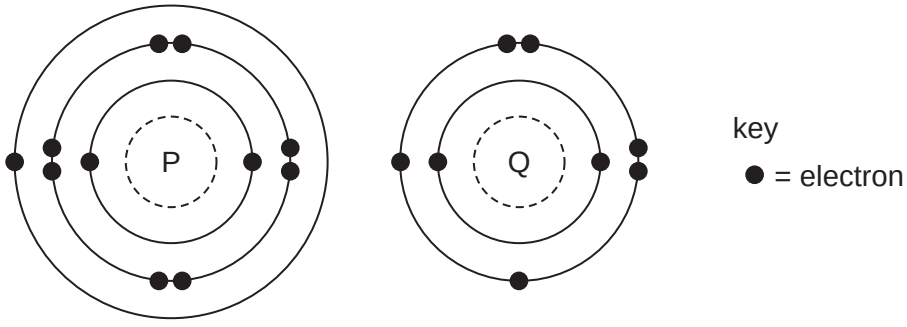
**5** Which atom has twice as many neutrons as protons?

**A** $^{1}_{1}H$ **B** $^{2}_{1}H$ **C** $^{3}_{1}H$ **D** $^{4}_{2}He$

**6** Which is a simple covalent molecule?

| | conducts electricity | | volatile |
|---|---|---|---|
| | when solid | when molten | |
| **A** | ✓ | ✓ | ✗ |
| **B** | ✓ | ✗ | ✓ |
| **C** | ✗ | ✓ | ✗ |
| **D** | ✗ | ✗ | ✓ |

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



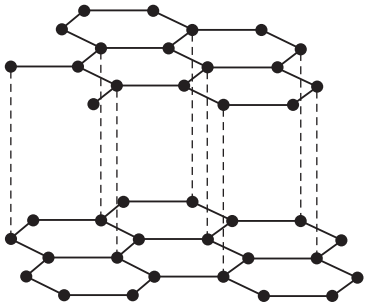

P and Q react to form an ionic compound.

What is the formula of this compound?

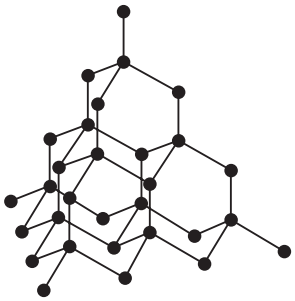
**A** $PQ_2$ **B** $P_2Q$ **C** $P_2Q_6$ **D** $P_6Q_2$

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

P



Q



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** The equation for the reaction between magnesium and dilute sulfuric acid is shown.

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$$

$M_r$ of $MgSO_4$ is 120

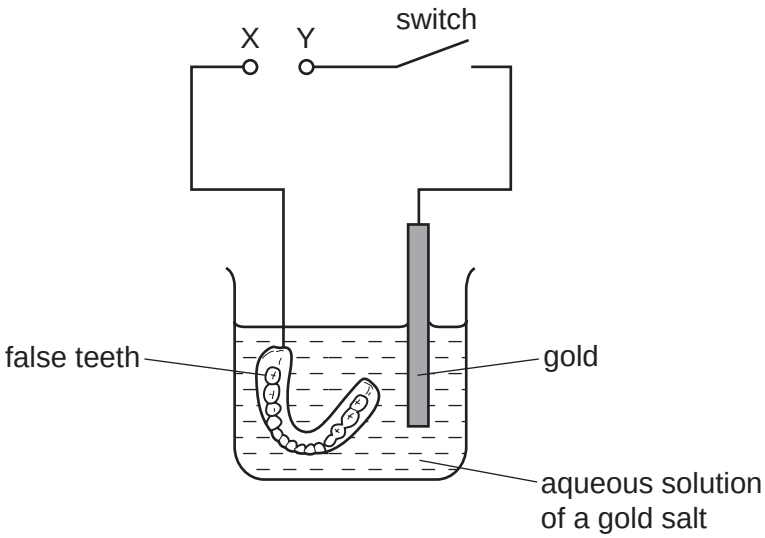
Which mass of magnesium sulfate will be formed if 12 g of magnesium are reacted with sulfuric acid?

**A** 5 g **B** 10 g **C** 60 g **D** 120 g

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**10** Winston Churchill, a British Prime Minister, had his false teeth electroplated with gold.

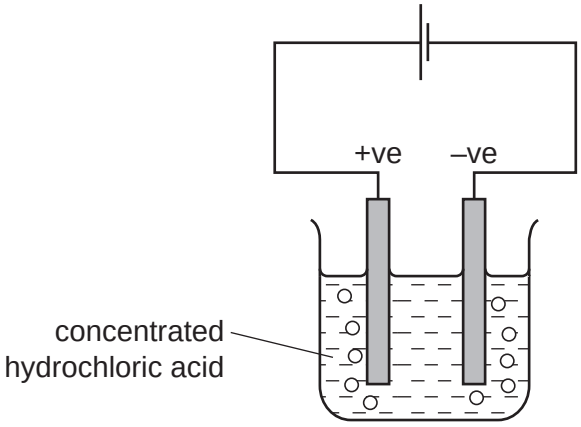
The teeth were coated with a thin layer of carbon and were then placed in the apparatus shown.




Which row is correct?

| | terminal X is | the carbon powder could be |
|---|---|---|
| **A** | negative | diamond |
| **B** | negative | graphite |
| **C** | positive | diamond |
| **D** | positive | graphite |

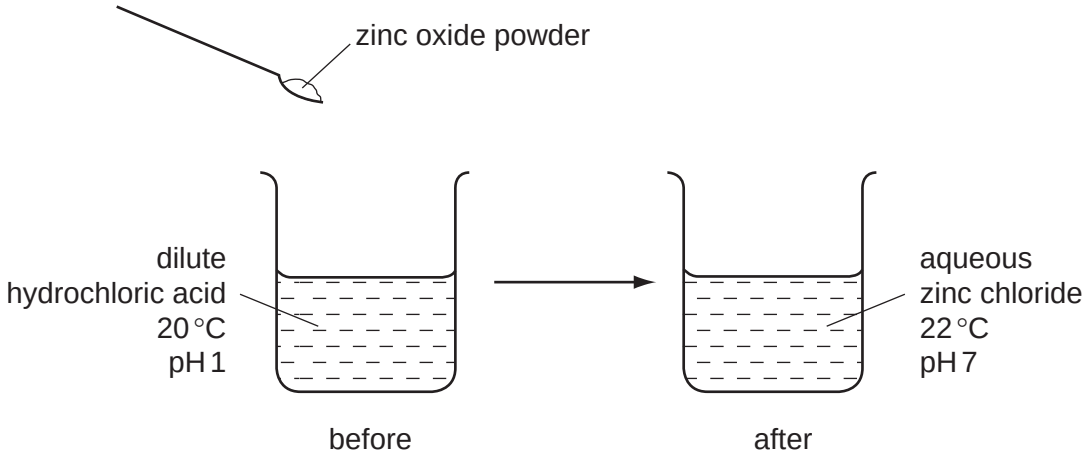
**11** The diagram shows that two gases are formed when concentrated hydrochloric acid is electrolysed using inert electrodes.




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 |

**12** The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.

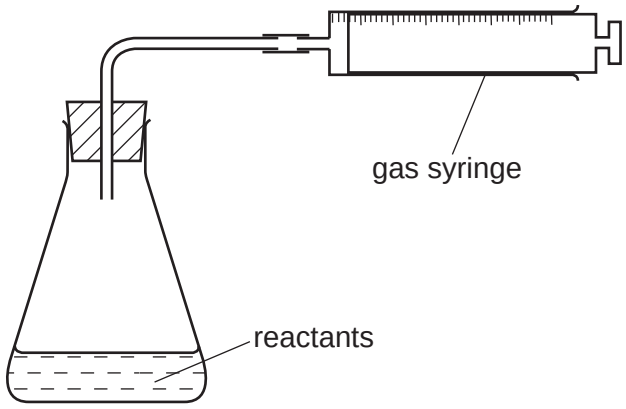



Which terms describe the reaction?

| | endothermic | neutralisation |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

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**13** The apparatus shown is used to measure the speed of a reaction.




Which equation represents a reaction where the speed can be measured using this apparatus?

**A** $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

**B** $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

**C** $Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$

**D** $2Na(s) + Br_2(l) \rightarrow 2NaBr(s)$

**14** The element vanadium, V, forms several oxides.

In which change is oxidation taking place?

**A** $VO_2 \rightarrow V_2O_3$

**B** $V_2O_5 \rightarrow VO_2$

**C** $V_2O_3 \rightarrow VO$

**D** $V_2O_3 \rightarrow V_2O_5$

**15** A gas is escaping from a pipe in a chemical plant.

A chemist tests this gas and finds that it is alkaline.

What is this gas?

**A** ammonia

**B** chlorine

**C** hydrogen

**D** sulfur dioxide

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**16** The results of three tests on a solution of compound X are shown in the table.

| test | result |
|---|---|
| aqueous sodium hydroxide added | white precipitate formed, soluble in excess |
| aqueous ammonia added | white precipitate formed, insoluble in excess |
| acidified silver nitrate added | white precipitate formed |

What is compound X?

**A** aluminium bromide

**B** aluminium chloride

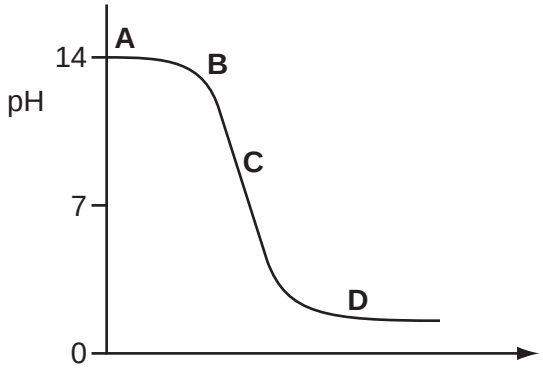
**C** zinc bromide

**D** zinc chloride

**17** The graph shows how the pH changes as an acid is added to an alkali.

$$\text{acid} + \text{alkali} \rightarrow \text{salt} + \text{water}$$

Which letter represents the area of the graph where both acid and salt are present?




**18** Dilute hydrochloric acid is added to a solid, S.

A flammable gas, G, is formed. Gas G is less dense than air.

What are S and G?

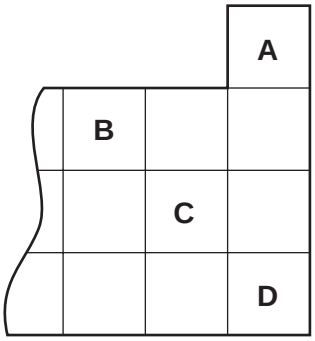
| | solid S | gas G |
|---|---|---|
| **A** | copper | hydrogen |
| **B** | copper carbonate | carbon dioxide |
| **C** | zinc | hydrogen |
| **D** | zinc carbonate | carbon dioxide |

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**19** The diagram shows a section of the Periodic Table.

Which element is described below?

'A colourless, unreactive gas that is denser than air.'




**20** Element X is below iodine in the Periodic Table.

Which row correctly shows the physical state of element X at room temperature and its reactivity compared with that of iodine?

| | physical state of element X at room temperature | reactivity compared with that of iodine |
|---|---|---|
| **A** | gas | less reactive |
| **B** | solid | less reactive |
| **C** | gas | more reactive |
| **D** | solid | more reactive |

**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** | ✓ | ✓ | ✗ | ✓ |
| **B** | ✓ | ✓ | ✓ | ✗ |
| **C** | ✓ | ✗ | ✓ | ✓ |
| **D** | ✗ | ✓ | ✓ | ✓ |

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**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 the uses of metals is correct?

**A** Aluminium is used in the manufacture of aircraft as it has a high density.

**B** Aluminium is used to make food containers as it conducts electricity.

**C** Stainless steel for cutlery is made by adding other elements to iron.

**D** Stainless steel is used to make chemical reactors as it corrodes readily.

**24** Which statement about the extraction of iron from its ore is correct?

**A** Iron is more difficult to extract than zinc.

**B** Iron is more difficult to extract than copper.

**C** Iron is easy to extract because it is a transition metal.

**D** Iron cannot be extracted by reduction with carbon.

**25** Metal X reacts violently with water.

Metal Y reacts slowly with steam.

Metal Z does not react with dilute hydrochloric acid.

What is the correct order of reactivity of these metals, most reactive first?

**A** $X \rightarrow Y \rightarrow Z$

**B** $X \rightarrow Z \rightarrow Y$

**C** $Z \rightarrow X \rightarrow Y$

**D** $Z \rightarrow Y \rightarrow X$

**26** Which property is shown by **all** metals?

**A** They are extracted from their ores by heating with carbon.

**B** They conduct electricity.

**C** They form acidic oxides.

**D** They react with hydrochloric acid to form hydrogen.

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**27** Some uses of water are listed.

1 for drinking

2 in chemical reactions

3 in swimming pools

4 in washing

For which uses is it necessary to chlorinate the water?

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

**28** Coal is a fossil fuel.

Which gas is **not** formed when coal burns?

**A** carbon dioxide

**B** carbon monoxide

**C** methane

**D** sulfur dioxide

**29** Which is a use of oxygen?

**A** filling balloons

**B** filling light bulbs

**C** food preservation

**D** making steel

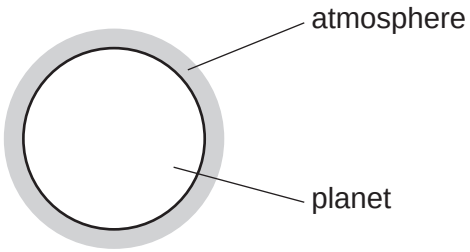
**30** Fertilisers need to supply crops with three main elements.

Which compound contains all three of these elements?

**A** $H_3PO_4$ **B** $KNO_3$ **C** $NH_4K_2PO_4$ **D** $NH_4NO_3$

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**31** 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

**32** Gas X is a waste gas from digestion in animals.

Gas Y is formed when gas X is burnt with a small amount of oxygen.

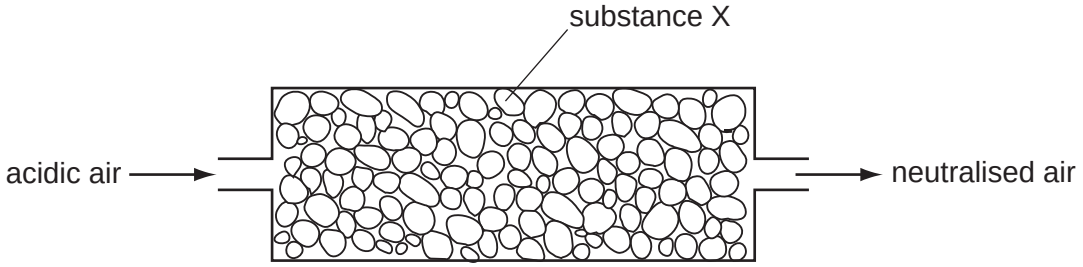
Gas Z is formed when gas X is burnt with an excess of oxygen.

What are X, Y and Z?

| | X | Y | Z |
|---|---|---|---|
| **A** | carbon dioxide | methane | carbon monoxide |
| **B** | carbon monoxide | methane | carbon dioxide |
| **C** | methane | carbon dioxide | carbon monoxide |
| **D** | methane | carbon monoxide | carbon dioxide |

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**33** Air containing an acidic impurity was neutralised by passing it through a column containing substance X.




What is substance X?

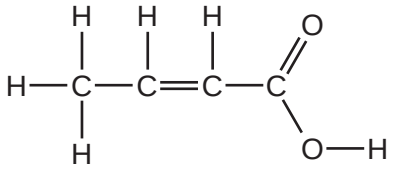
**A** calcium oxide

**B** sand

**C** sodium chloride

**D** concentrated sulfuric acid

**34** The structure of a compound is shown.



Which functional groups are present in this compound?

| | alcohol | alkene | carboxylic acid |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✗ | ✗ |
| **C** | ✗ | ✓ | ✓ |
| **D** | ✗ | ✗ | ✓ |

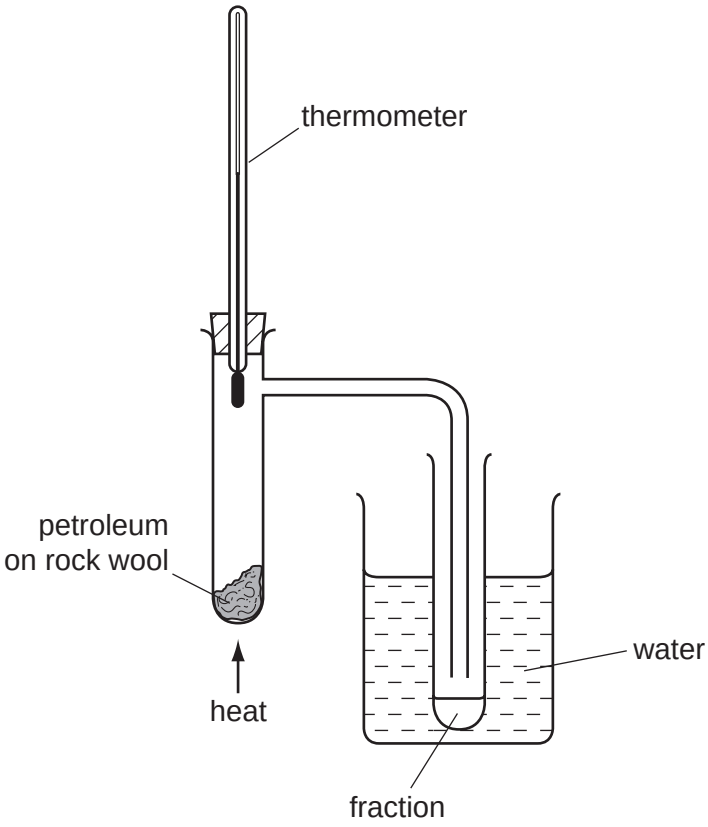
**35** Which fraction from the fractional distillation of petroleum does **not** match its correct use?

| | fraction | use |
|---|---|---|
| **A** | fuel oil | domestic heating |
| **B** | kerosene | jet fuel |
| **C** | naphtha | making roads |
| **D** | refinery gas | for heating and cooking |

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**[Turn over**

**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** When a long chain hydrocarbon is cracked, the following products are produced.

1 $C_3H_8$

2 $C_2H_4$

3 $C_3H_6$

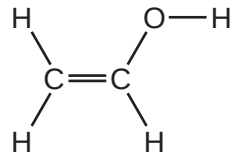
4 $C_2H_6$

Which products would decolourise bromine water?

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

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**38** PVA is a polymer. The monomer has the structure shown.



To which homologous series does this compound belong?

| | alcohols | alkenes |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**39** Which equation represents incomplete combustion of ethane?

**A** $C_2H_6 + O_2 \rightarrow 2CO + 3H_2$

**B** $C_2H_6 + 2O_2 \rightarrow 2CO_2 + 3H_2$

**C** $2C_2H_6 + 5O_2 \rightarrow 4CO + 6H_2O$

**D** $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

**40** Ethanol is an important chemical produced by the ……1…… of ……2…… .

Which words correctly complete gaps 1 and 2?

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

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**DATA SHEET**
**The Periodic Table of the Elements**

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | III | IV | V | VI | VII | 0 |
| | | | | | | | | | | | | | | | 4 He Helium 2 |
| | | | | | 1 H Hydrogen 1 | | | | | | | | | | |
| 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 | 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 † | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

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

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