



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**CHEMISTRY**

**5070/01**

Paper 1 Multiple Choice

**October/November 2009**

**1 hour**

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

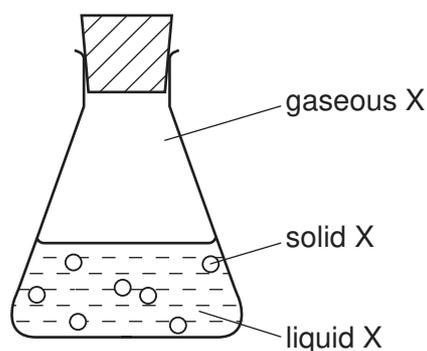
Any rough working should be done in this booklet.

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

This document consists of **13** printed pages and **3** blank pages.



- 1 In which option do the three particles each have the same number of electrons?
- A  $Cl^-$   $Br^-$   $I^-$
- B  $F^-$  Ne  $Na^+$
- C  $K^+$   $Ca^{2+}$   $Br^-$
- D  $Li^+$   $Na^+$   $K^+$
- 2 Why does neon gas, Ne, diffuse faster than carbon dioxide gas,  $CO_2$ ?
- A Neon atoms have the lower mass.
- B Neon does not form molecules.
- C Neon is a noble gas.
- D Neon is less dense than air.
- 3 Which reagent could be used to distinguish between dilute nitric acid and dilute hydrochloric acid?
- A aqueous barium chloride
- B aqueous silver nitrate
- C aqueous sodium hydroxide
- D copper(II) carbonate
- 4 The conical flask contains compound X which is present in solid, liquid and gaseous states.



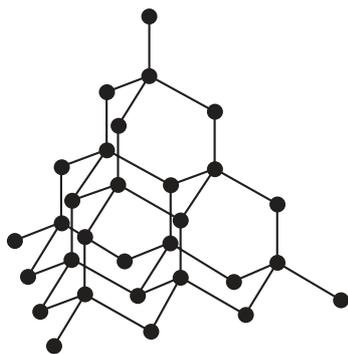
Which statement is correct?

- A A gaseous X molecule has a lower mass than a liquid X molecule.
- B Energy is released when X changes from liquid to solid.
- C Liquid X is at a higher temperature than solid X.
- D Liquid X molecules vibrate about fixed positions.

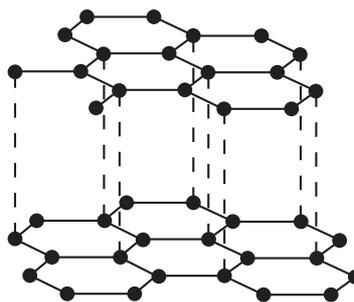
5 Which statement is always true when two atoms join together by a covalent bond?

- A One atom is a metal, the other atom is a non-metal.
- B One atom loses one electron, the other atom gains one electron.
- C The two atoms share one electron.
- D The two atoms share two electrons.

6 The diagram shows the structures of diamond and graphite.



diamond



graphite

Which property do these substances have in common?

- A They are giant structures.
  - B They can act as lubricants.
  - C They can conduct electricity.
  - D They contain only covalent bonds.
- 7 Calcium reacts with phosphorus to form the ionic compound calcium phosphide.

Which ions will this compound contain?

- A  $\text{Ca}^{2+}$  and  $\text{P}^{3-}$
- B  $\text{Ca}^{2+}$  and  $\text{P}^{5-}$
- C  $\text{Ca}^{2-}$  and  $\text{P}^{3+}$
- D  $\text{Ca}^{2-}$  and  $\text{P}^{5+}$

- 8 All of the following substances can conduct electricity.

Which substance's conductivity is **not** due to the movement of electrons?

- A aluminium
- B graphite
- C lithium chloride
- D mercury

- 9 A sample of hydrogen is a mixture of the two isotopes  ${}^1_1\text{H}$  and  ${}^2_1\text{H}$ .

The relative atomic mass of oxygen is 16.

What are possible values of the relative molecular mass of different molecules of water formed by the combination of oxygen and hydrogen?

- 1 18
- 2 19
- 3 20

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

- 10 Calcium reacts with water as shown.



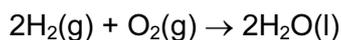
What is the total mass of the solution that remains when 40 g of calcium reacts with 100 g of water?

- A 58g
- B 74g
- C 138g
- D 140g

- 11 What products are formed when concentrated aqueous potassium chloride is electrolysed?

|          | at the anode (positive) | at the cathode (negative) |
|----------|-------------------------|---------------------------|
| <b>A</b> | chlorine                | hydrogen                  |
| <b>B</b> | chlorine                | potassium                 |
| <b>C</b> | oxygen                  | hydrogen                  |
| <b>D</b> | oxygen                  | potassium                 |

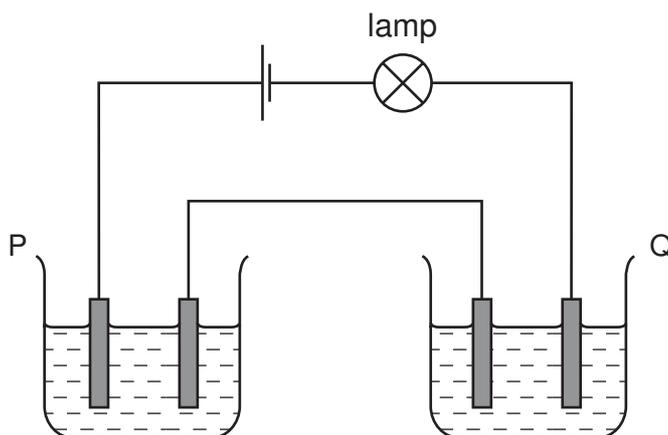
12 Hydrogen reacts with oxygen as shown in the equation below.



How much gas will remain if 2 dm<sup>3</sup> of hydrogen are reacted with 1 dm<sup>3</sup> of oxygen at room temperature?

- A** 0 dm<sup>3</sup>      **B** 1 dm<sup>3</sup>      **C** 2 dm<sup>3</sup>      **D** 3 dm<sup>3</sup>

13 Two cells, P and Q, containing different liquids, were connected in series with a battery, a suitable lamp and inert electrodes, as shown in the diagram.



For which pair of liquids did the lamp light up?

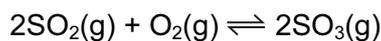
|          | in P                                  | in Q                        |
|----------|---------------------------------------|-----------------------------|
| <b>A</b> | concentrated sodium chloride solution | concentrated sugar solution |
| <b>B</b> | copper(II) sulfate solution           | propanol                    |
| <b>C</b> | ethanol                               | molten lead(II) bromide     |
| <b>D</b> | mercury                               | dilute hydrochloric acid    |

14 The burning of hydrogen is an exothermic reaction.

Which statement explains this?

- A** More bonds are broken than are formed.  
**B** More bonds are formed than are broken.  
**C** Overall, the bonds broken are stronger than those formed.  
**D** Overall, the bonds formed are stronger than those broken.

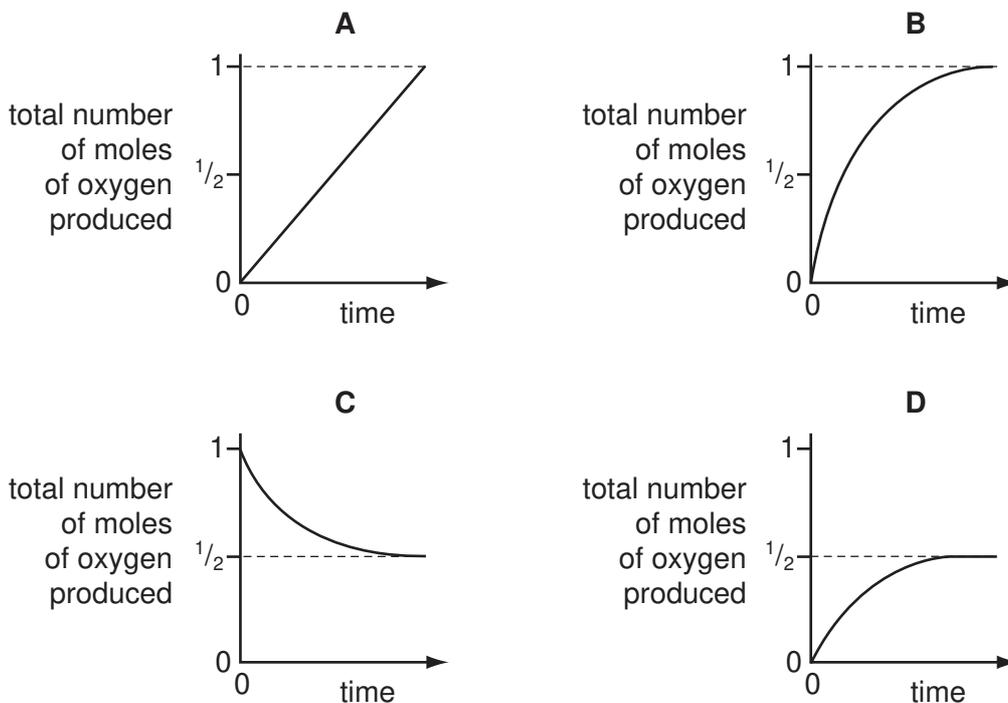
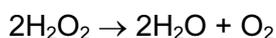
- 15 In the Contact process for making sulfuric acid, one step involves the oxidation of sulfur dioxide to sulfur trioxide.



The forward reaction is exothermic.

Which change would increase the amount of sulfur trioxide produced at equilibrium?

- A** adding a catalyst  
**B** decreasing the pressure  
**C** decreasing the temperature  
**D** increasing the temperature
- 16 Which graph corresponds to the catalytic decomposition of 1 mole of hydrogen peroxide?



- 17 Which row in the table describes the processes occurring at the electrodes when molten sodium chloride is electrolysed?

|          | anode (positive) | cathode (negative) |
|----------|------------------|--------------------|
| <b>A</b> | oxidation        | reduction          |
| <b>B</b> | reduction        | oxidation          |
| <b>C</b> | oxidation        | oxidation          |
| <b>D</b> | reduction        | reduction          |

18 Lithium and rubidium are both in Group I of the Periodic Table.

Which statement is correct?

- A Lithium atoms and rubidium atoms have the same number of electrons in their outer shell.
- B Lithium atoms are larger than rubidium ions.
- C Lithium ions and rubidium ions have the same number of electrons in their outer shell.
- D Rubidium ions are larger than rubidium atoms.

19 Which mixture would react with dilute sulfuric acid to form two **different** gases?

- A copper and magnesium carbonate
- B copper(II) carbonate and magnesium
- C copper(II) carbonate and magnesium oxide
- D copper(II) oxide and magnesium

20 Which salts are soluble in water?

- 1 ammonium carbonate,  $(\text{NH}_4)_2\text{CO}_3$
- 2 calcium carbonate,  $\text{CaCO}_3$
- 3 lead(II) carbonate,  $\text{PbCO}_3$
- 4 sodium carbonate,  $\text{Na}_2\text{CO}_3$

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

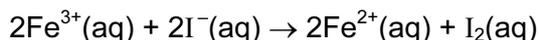
21 Which compound in a  $1 \text{ mol/dm}^3$  solution has the lowest pH value?

- A ethanoic acid
- B hydrogen chloride
- C sodium chloride
- D sodium hydroxide

22 In the Periodic Table, how many periods include the elements of atomic numbers 1-18?

- A 2                    B 3                    C 6                    D 8

23 The ionic equation shows the reaction between potassium iodide and iron(III) chloride.



Which terms describe the changes to the iron(III) ions and iodide ions?

|          | iron(III) ions | iodide ions |
|----------|----------------|-------------|
| <b>A</b> | oxidised       | reduced     |
| <b>B</b> | oxidised       | oxidised    |
| <b>C</b> | reduced        | oxidised    |
| <b>D</b> | reduced        | reduced     |

24 Element Z is in Group VI of the Periodic Table.

Which formula is **incorrect**?

- A**  $\text{Z}^{2-}$                       **B**  $\text{Z}_2\text{O}_3$                       **C**  $\text{ZO}_4^{2-}$                       **D**  $\text{ZO}_3$

25 Which is a property of aqueous potassium iodide?

- A** It does not conduct electricity.  
**B** It is a purple solution.  
**C** It is decolourised by chlorine.  
**D** It reacts with aqueous bromine to form iodine.

26 The carbonate of metal X is a white solid.

It decomposes when heated to form carbon dioxide and a yellow solid oxide.

What is metal X?

- A** copper  
**B** iron  
**C** lead  
**D** sodium

27 In which reaction do the products formed **not** include a salt?

- A** calcium(II) carbonate with hydrochloric acid  
**B** copper(II) oxide with hydrogen  
**C** copper(II) oxide with sulfuric acid  
**D** copper(II) sulfate with sodium hydroxide

- 28 In the manufacture of iron, using a blast furnace, which reaction generates heat?
- A  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
  - B  $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
  - C  $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
  - D  $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$
- 29 Which oxide is **most** readily reduced to the metal by heating in a stream of hydrogen?
- A calcium oxide
  - B lead(II) oxide
  - C sodium oxide
  - D zinc oxide
- 30 Which ionic equation represents the reaction taking place at the anode during the electrolysis of molten aluminium oxide?
- A  $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$
  - B  $2\text{Al}^{3+} + 3\text{O}_2 \rightarrow \text{Al}_2\text{O}_3$
  - C  $\text{O}^{2-} - 2\text{e}^- \rightarrow \text{O}_2$
  - D  $2\text{O}^{2-} - 4\text{e}^- \rightarrow \text{O}_2$
- 31 Which type of compound will liberate ammonia when heated with ammonium sulfate?
- A an acid
  - B an alkali
  - C a reducing agent
  - D a salt
- 32 What is the concentration of hydrogen ions in  $0.05 \text{ mol/dm}^3$  sulfuric acid?
- A  $0.025 \text{ g/dm}^3$     B  $0.05 \text{ g/dm}^3$     C  $0.10 \text{ g/dm}^3$     D  $2.0 \text{ g/dm}^3$

33 Four current problems in our atmosphere are listed.

- 1 acid rain
- 2 depletion of the ozone layer
- 3 presence of greenhouse gases
- 4 incomplete combustion of carbon compounds

Which atmospheric pollutant is responsible for each problem?

W chlorofluorocarbons

X sulfur dioxide

Y carbon monoxide

Z carbon dioxide

|   | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| A | W | X | Z | Y |
| B | X | W | Z | Y |
| C | X | Z | W | Y |
| D | Z | Y | X | W |

34 Which process takes place during photosynthesis?

- A Carbohydrate is decomposed and oxygen is formed.
- B Carbon dioxide is taken in and oxygen is formed.
- C Oxygen is taken in and carbohydrate is formed.
- D Oxygen is taken in and carbon dioxide is formed.

35 Cholesterol is an organic molecule that occurs in the blood stream.

What type of compound is cholesterol?

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



39 A mixture of four gases, methane, ethane, propane and butane is cooled until the first drop of liquid is formed.

What compound is most likely to be present in this drop?

- A butane
- B ethane
- C methane
- D propane

40 Which statement about *Terylene* is correct?

- A It is an addition polymer.
- B It is an alkene.
- C It is a polyamide.
- D It is a polyester.







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

|  |                                   | Group                              |                                |    |   |    |     |                                     |  |                                     |                                      |                                      |                                       |
|--|-----------------------------------|------------------------------------|--------------------------------|----|---|----|-----|-------------------------------------|--|-------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|
|  | I                                 | II                                 | III                            | IV | V | VI | VII | 0                                   |  |                                     |                                      |                                      |                                       |
|  |                                   |                                    | 1<br><b>H</b><br>Hydrogen<br>1 |    |   |    |     | 4<br><b>He</b><br>Helium<br>2       |  |                                     |                                      |                                      |                                       |
|  | 7<br><b>Li</b><br>Lithium<br>3    | 9<br><b>Be</b><br>Beryllium<br>4   |                                |    |   |    |     | 11<br><b>B</b><br>Boron<br>5        | 12<br><b>C</b><br>Carbon<br>6          | 14<br><b>N</b><br>Nitrogen<br>7     | 16<br><b>O</b><br>Oxygen<br>8        | 19<br><b>F</b><br>Fluorine<br>9      | 20<br><b>Ne</b><br>Neon<br>10         |
|  | 23<br><b>Na</b><br>Sodium<br>11   | 24<br><b>Mg</b><br>Magnesium<br>12 |                                |    |   |    |     | 27<br><b>Al</b><br>Aluminium<br>13  | 28<br><b>Si</b><br>Silicon<br>14       | 31<br><b>P</b><br>Phosphorus<br>15  | 32<br><b>S</b><br>Sulfur<br>16       | 35.5<br><b>Cl</b><br>Chlorine<br>17  | 40<br><b>Ar</b><br>Argon<br>18        |
|  | 39<br><b>K</b><br>Potassium<br>19 | 40<br><b>Ca</b><br>Calcium<br>20   |                                |    |   |    |     | 70<br><b>Ga</b><br>Gallium<br>31    | 73<br><b>Ge</b><br>Germanium<br>32     | 75<br><b>As</b><br>Arsenic<br>33    | 79<br><b>Se</b><br>Selenium<br>34    | 80<br><b>Br</b><br>Bromine<br>35     | 84<br><b>Kr</b><br>Krypton<br>36      |
|  | 85<br><b>Rb</b><br>Rubidium<br>37 | 88<br><b>Sr</b><br>Strontium<br>38 |                                |    |   |    |     | 115<br><b>In</b><br>Indium<br>49    | 119<br><b>Sn</b><br>Tin<br>50          | 122<br><b>Sb</b><br>Antimony<br>51  | 128<br><b>Te</b><br>Tellurium<br>52  | 127<br><b>I</b><br>Iodine<br>53      | 131<br><b>Xe</b><br>Xenon<br>54       |
|  | 133<br><b>Cs</b><br>Caesium<br>55 | 137<br><b>Ba</b><br>Barium<br>56   |                                |    |   |    |     | 204<br><b>Tl</b><br>Thallium<br>81  | 207<br><b>Pb</b><br>Lead<br>82         | 209<br><b>Bi</b><br>Bismuth<br>83   | 210<br><b>Po</b><br>Polonium<br>84   | 210<br><b>At</b><br>Astatine<br>85   | 222<br><b>Rn</b><br>Radon<br>86       |
|  | 226<br><b>Ra</b><br>Radium<br>88  | 227<br><b>Ac</b><br>Actinium<br>89 |                                |    |   |    |     | 65<br><b>Zn</b><br>Zinc<br>30       | 64<br><b>Cu</b><br>Copper<br>29        | 66<br><b>Ni</b><br>Nickel<br>28     | 68<br><b>Co</b><br>Cobalt<br>27      | 78<br><b>Pd</b><br>Palladium<br>46   | 80<br><b>Ag</b><br>Silver<br>47       |
|  |                                   |                                    |                                |    |   |    |     | 101<br><b>Ru</b><br>Ruthenium<br>44 | 106<br><b>Rh</b><br>Rhodium<br>45      | 108<br><b>Pd</b><br>Palladium<br>46 | 112<br><b>Cd</b><br>Cadmium<br>48    | 120<br><b>Hg</b><br>Mercury<br>80    | 201<br><b>Hg</b><br>Mercury<br>80     |
|  |                                   |                                    |                                |    |   |    |     | 55<br><b>Mn</b><br>Manganese<br>25  | 56<br><b>Fe</b><br>Iron<br>26          | 59<br><b>Co</b><br>Cobalt<br>27     | 59<br><b>Ni</b><br>Nickel<br>28      | 63<br><b>Cu</b><br>Copper<br>29      | 79<br><b>Au</b><br>Gold<br>79         |
|  |                                   |                                    |                                |    |   |    |     | 93<br><b>Nb</b><br>Niobium<br>41    | 96<br><b>Mo</b><br>Molybdenum<br>42    | 103<br><b>Rh</b><br>Rhodium<br>45   | 106<br><b>Pd</b><br>Palladium<br>46  | 112<br><b>Cd</b><br>Cadmium<br>48    | 201<br><b>Hg</b><br>Mercury<br>80     |
|  |                                   |                                    |                                |    |   |    |     | 181<br><b>Ta</b><br>Tantalum<br>73  | 184<br><b>W</b><br>Tungsten<br>74      | 192<br><b>Ir</b><br>Iridium<br>77   | 195<br><b>Pt</b><br>Platinum<br>78   | 201<br><b>Hg</b><br>Mercury<br>80    | 201<br><b>Hg</b><br>Mercury<br>80     |
|  |                                   |                                    |                                |    |   |    |     | 144<br><b>Nd</b><br>Neodymium<br>60 | 147<br><b>Sm</b><br>Samarium<br>62     | 150<br><b>Eu</b><br>Europium<br>63  | 157<br><b>Gd</b><br>Gadolinium<br>64 | 162<br><b>Dy</b><br>Dysprosium<br>66 | 163<br><b>Tb</b><br>Terbium<br>65     |
|  |                                   |                                    |                                |    |   |    |     | 140<br><b>Ce</b><br>Cerium<br>58    | 141<br><b>Pr</b><br>Praseodymium<br>59 | 150<br><b>Sm</b><br>Samarium<br>62  | 157<br><b>Gd</b><br>Gadolinium<br>64 | 162<br><b>Dy</b><br>Dysprosium<br>66 | 163<br><b>Tb</b><br>Terbium<br>65     |
|  |                                   |                                    |                                |    |   |    |     | 232<br><b>Th</b><br>Thorium<br>90   | 238<br><b>U</b><br>Uranium<br>92       | 244<br><b>Am</b><br>Americium<br>95 | 254<br><b>Cm</b><br>Curium<br>96     | 261<br><b>Bk</b><br>Berkelium<br>97  | 267<br><b>Lr</b><br>Lawrencium<br>103 |
|  |                                   |                                    |                                |    |   |    |     | 140<br><b>Ce</b><br>Cerium<br>58    | 141<br><b>Pr</b><br>Praseodymium<br>59 | 150<br><b>Sm</b><br>Samarium<br>62  | 157<br><b>Gd</b><br>Gadolinium<br>64 | 162<br><b>Dy</b><br>Dysprosium<br>66 | 163<br><b>Tb</b><br>Terbium<br>65     |
|  |                                   |                                    |                                |    |   |    |     | 232<br><b>Th</b><br>Thorium<br>90   | 238<br><b>U</b><br>Uranium<br>92       | 244<br><b>Am</b><br>Americium<br>95 | 254<br><b>Cm</b><br>Curium<br>96     | 261<br><b>Bk</b><br>Berkelium<br>97  | 267<br><b>Lr</b><br>Lawrencium<br>103 |

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

|   |          |                            |
|---|----------|----------------------------|
| a | <b>X</b> | a = relative atomic mass   |
| b | <b>X</b> | X = atomic symbol          |
|   |          | b = proton (atomic) number |

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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