



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.

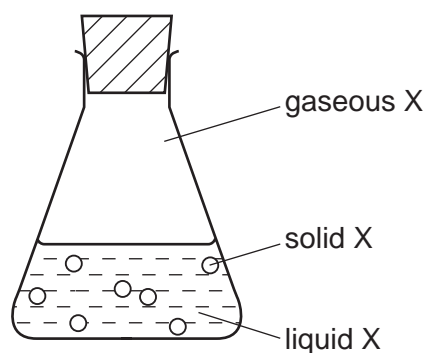
A copy of the Periodic Table is printed on page 16.

---

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



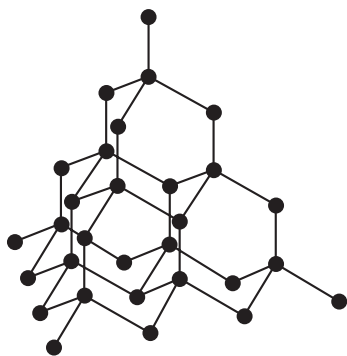
- 1 In which option do the three particles each have the same number of electrons?
- A** Cl Br I
- B** F Ne Na<sup>+</sup>
- C** K<sup>+</sup> Ca<sup>2+</sup> Br
- D** Li<sup>+</sup> Na<sup>+</sup> K<sup>+</sup>
- 2 Why does neon gas, Ne, diffuse faster than carbon dioxide gas, CO<sub>2</sub>?
- A** 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.



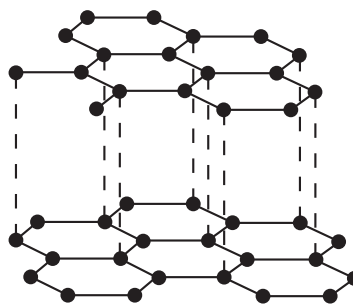
Which statement is correct?

- 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.



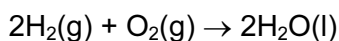
What is the total mass of the solution that remains when 40 g of calcium reacts with 100 g of water?

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

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

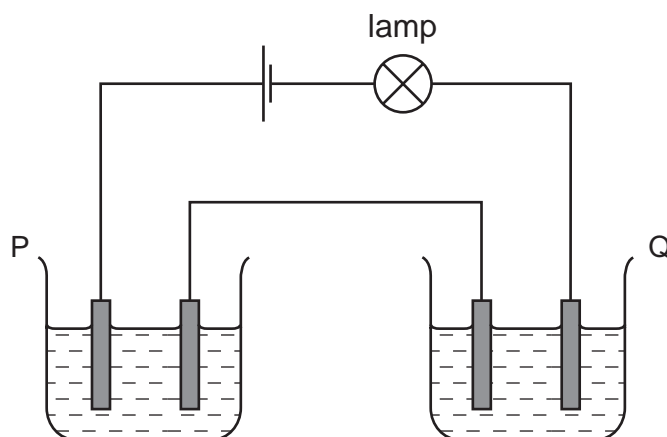
	at the anode (positive)	at the cathode (negative)
<b>A</b>	chlorine	hydrogen
<b>B</b>	chlorine	potassium
<b>C</b>	oxygen	hydrogen
<b>D</b>	oxygen	potassium

- 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?

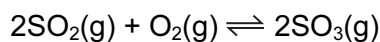
	in P	in Q
<b>A</b>	concentrated sodium chloride solution	concentrated sugar solution
<b>B</b>	copper(II) sulfate solution	propanol
<b>C</b>	ethanol	molten lead(II) bromide
<b>D</b>	mercury	dilute hydrochloric acid

- 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.

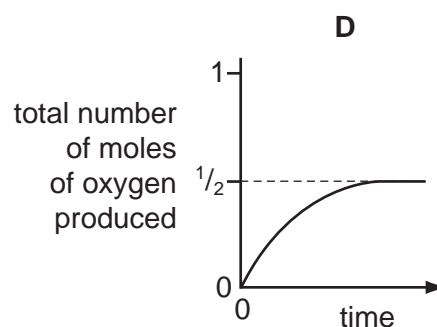
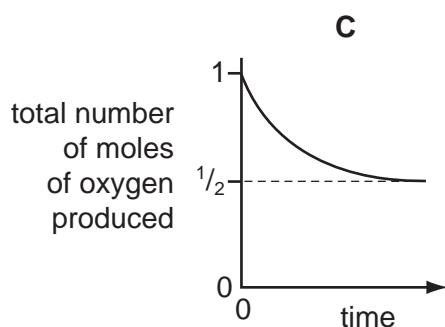
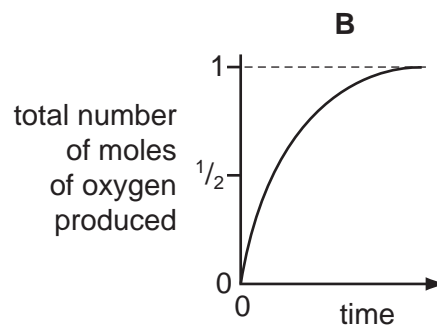
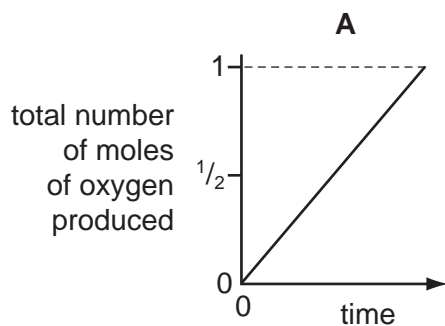
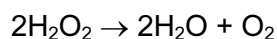
- 15 In the Contact process for making sulfuric acid, one step involves the oxidation of sulfur dioxide to sulfur trioxide.



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

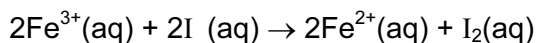
21 Which compound in a  $1 \text{ mol/dm}^3$  solution has the lowest pH value?

- 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.

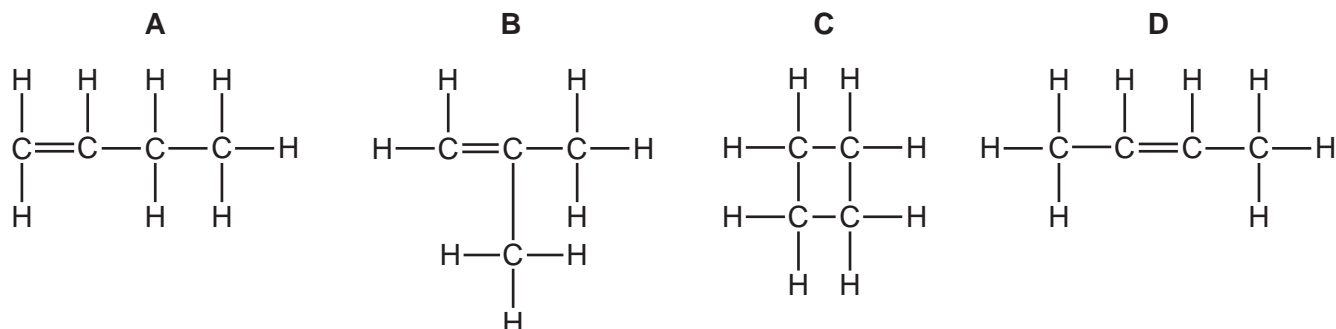
35 Cholesterol is an organic molecule that occurs in the blood stream.

What type of compound is cholesterol?

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

36 Substance X, molecular formula  $C_4H_8$ , does **not** react with hydrogen.

What is the structural formula of X?

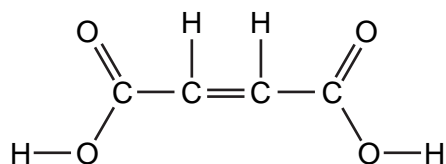


37 Natural gas, petroleum and diesel are all used as energy sources.

Which gas is **not** produced when these sources are burned?

- A carbon dioxide
- B carbon monoxide
- C hydrogen
- D water

38 The structural formula of butenedioic acid is shown.



Which statement about butenedioic acid is **not** correct?

- A It decolourises aqueous bromine.
- B Its aqueous solution reacts with sodium carbonate.
- C Its empirical formula is the same as its molecular formula.
- D Its relative molecular mass is 116.

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																																																																																						
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10	23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulfur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18	39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36	85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	106 <b>Pd</b> Palladium 46	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	131 <b>Xe</b> Xenon 54	133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89	232 <b>Th</b> Thorium 90	238 <b>U</b> Uranium 92	238 <b>Np</b> Neptunium 93	238 <b>Pu</b> Plutonium 94	238 <b>Am</b> Americium 95	238 <b>Cm</b> Curium 96	238 <b>Bk</b> Berkelium 97	238 <b>Cf</b> Californium 98	238 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	238 <b>Md</b> Mendelevium 101	238 <b>No</b> Nobelium 102	238 <b>Lr</b> Lawrencium 103	140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	159 <b>Tb</b> Terbium 65	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71

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

	a	X	b
Key	a = relative atomic mass	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.).

Permission to reproduce items where third party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.