



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.

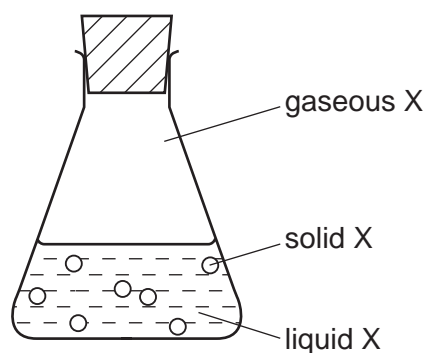
Any rough working should be done in this booklet.

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.



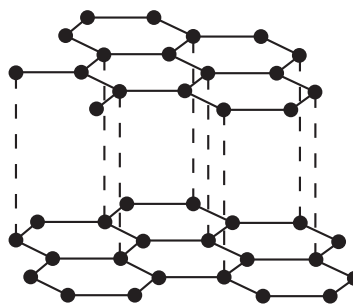
Which statement is correct?

- 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 Ca^{2+} and P^{3-}
- B Ca^{2+} and P^{5-}
- C Ca^{2-} and P^{3+}
- D Ca^{2-} and 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.



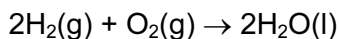
What is the total mass of the solution that remains when 40 g of calcium reacts with 100 g of water?

- 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)
A	chlorine	hydrogen
B	chlorine	potassium
C	oxygen	hydrogen
D	oxygen	potassium

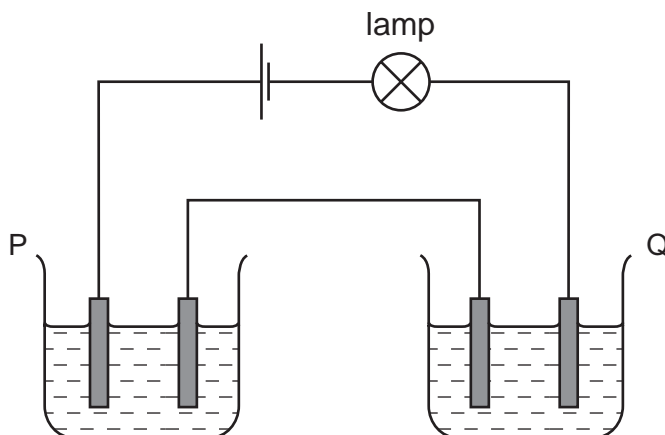
12 Hydrogen reacts with oxygen as shown in the equation below.



How much gas will remain if 2 dm³ of hydrogen are reacted with 1 dm³ of oxygen at room temperature?

- A** 0 dm³ **B** 1 dm³ **C** 2 dm³ **D** 3 dm³

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?

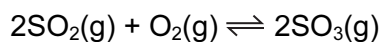
	in P	in Q
A	concentrated sodium chloride solution	concentrated sugar solution
B	copper(II) sulfate solution	propanol
C	ethanol	molten lead(II) bromide
D	mercury	dilute hydrochloric acid

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.

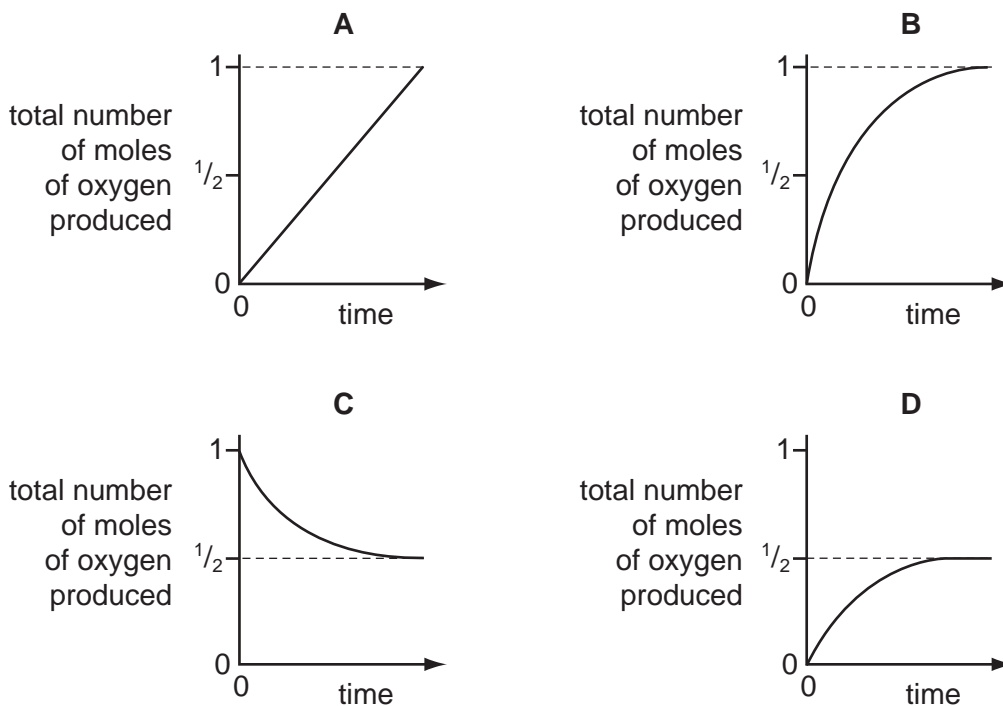
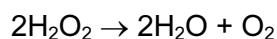
- 15 In the Contact process for making sulfuric acid, one step involves the oxidation of sulfur dioxide to sulfur trioxide.



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)
A	oxidation	reduction
B	reduction	oxidation
C	oxidation	oxidation
D	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, CaCO_3
- 3 lead(II) carbonate, PbCO_3
- 4 sodium carbonate, Na_2CO_3

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

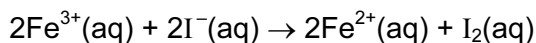
21 Which compound in a 1 mol/dm^3 solution has the lowest pH value?

- 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
A	oxidised	reduced
B	oxidised	oxidised
C	reduced	oxidised
D	reduced	reduced

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

Which formula is **incorrect**?

- A** Z^{2-} **B** Z_2O_3 **C** ZO_4^{2-} **D** 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 mol/dm^3 sulfuric acid?
- A 0.025 g/dm^3 B 0.05 g/dm^3 C 0.10 g/dm^3 D 2.0 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.

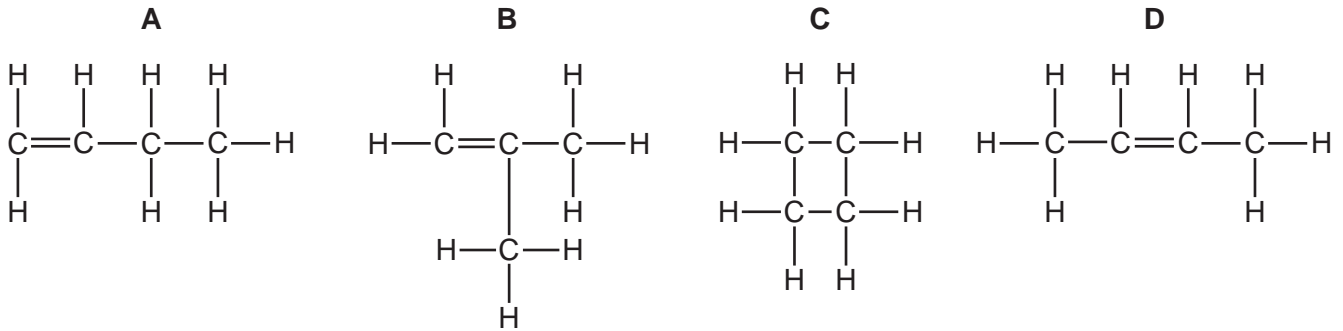
35 Cholesterol is an organic molecule that occurs in the blood stream.

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?

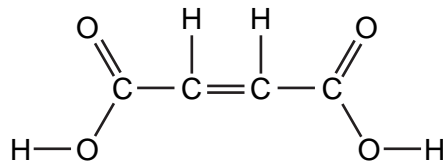


37 Natural gas, petroleum and diesel are all used as energy sources.

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			
			1 H Hydrogen 1					4 He Helium 2			
7 Li Lithium 3	9 Be Beryllium 4							19 F Fluorine 9	20 Ne Neon 10		
23 Na Sodium 11	24 Mg Magnesium 12		5 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	17 Cl Chlorine 17	35.5 Ar Argon 18			
39 K Potassium 19	40 Ca Calcium 20		11 B Boron 5	27 Al Aluminium 13	31 P Phosphorus 15	32 S Sulfur 16	79 Se Selenium 34	84 Kr Krypton 36			
85 Rb Rubidium 37	88 Sr Strontium 38		65 Zn Zinc 30	70 Ga Gallium 31	75 As Arsenic 33	112 Cd Cadmium 48	122 Sb Antimony 51	131 Xe Xenon 54			
133 Cs Caesium 55	137 Ba Barium 56		59 Ni Nickel 28	64 Cu Copper 29	73 Ge Germanium 32	106 Pd Palladium 46	127 I Iodine 53	86 Rn Radon 86			
226 Ra Radium 88	227 Ac Actinium 89		56 Fe Iron 26	59 Co Cobalt 27	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			55 Mn Manganese 25	56 Fe Iron 26	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			52 Cr Chromium 24	55 Mn Manganese 25	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			51 V Vanadium 23	52 Cr Chromium 24	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			48 Ti Titanium 22	51 V Vanadium 23	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			45 Sc Scandium 21	48 Ti Titanium 22	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			89 Y Yttrium 39	45 Sc Scandium 21	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			91 Zr Zirconium 40	89 Y Yttrium 39	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			178 Hf Hafnium 72	91 Zr Zirconium 40	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			184 W Tungsten 74	178 Hf Hafnium 72	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			186 Re Rhenium 75	184 W Tungsten 74	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			144 Nd Neodymium 60	186 Re Rhenium 75	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			141 Pr Praseodymium 59	144 Nd Neodymium 60	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			140 Ce Cerium 58	141 Pr Praseodymium 59	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			232 Th Thorium 90	140 Ce Cerium 58	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			238 U Uranium 92	232 Th Thorium 90	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			93 Np Neptunium 93	238 U Uranium 92	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			94 Pu Plutonium 94	93 Np Neptunium 93	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			95 Am Americium 95	94 Pu Plutonium 94	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			96 Cm Curium 96	95 Am Americium 95	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			97 Bk Berkelium 97	96 Cm Curium 96	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			65 Tb Terbium 65	97 Bk Berkelium 97	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			66 Dy Dysprosium 66	65 Tb Terbium 65	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			67 Ho Holmium 67	66 Dy Dysprosium 66	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			68 Er Erbium 68	67 Ho Holmium 67	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			69 Tm Thulium 69	68 Er Erbium 68	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			70 Yb Ytterbium 70	69 Tm Thulium 69	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			71 Lu Lutetium 71	70 Yb Ytterbium 70	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			100 Fm Fermium 100	71 Lu Lutetium 71	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			101 Md Mendelevium 101	100 Fm Fermium 100	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			102 No Nobelium 102	101 Md Mendelevium 101	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				
			103 Lr Lawrencium 103	102 No Nobelium 102	78 Pt Platinum 78	197 Au Gold 79	209 Po Polonium 84				

*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 dm³ at room temperature and pressure (r.t.p.).

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