UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **May/June 2012**

1 hour

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.

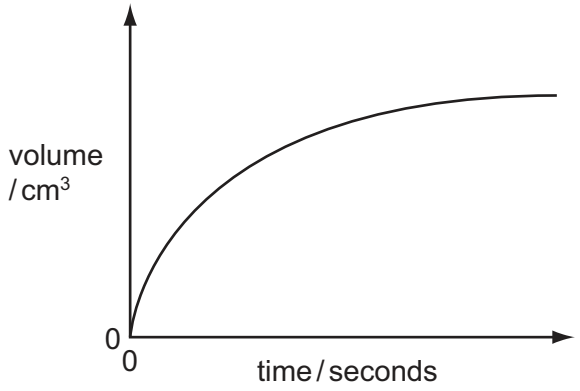
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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.

This document consists of **14** printed pages and **2** blank pages.

1 A student measured the rate of reaction between calcium carbonate and dilute hydrochloric acid. A graph showing the volume of gas produced against time is shown.



Which apparatus was used to measure the variables shown on the graph?

A balance and gas syringe

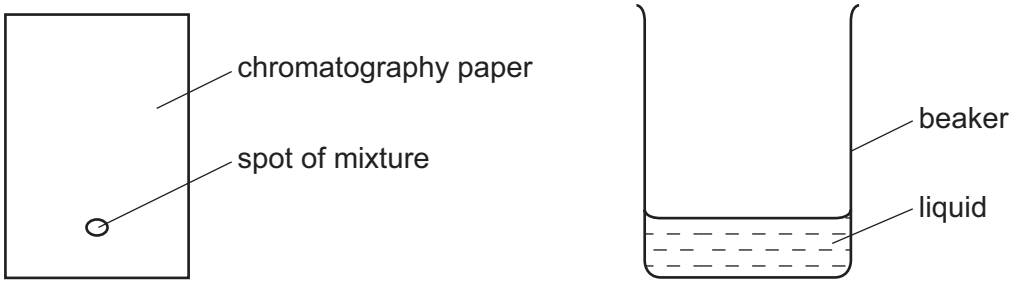
B burette and pipette

C gas syringe and stop watch

D pipette and stop watch

2 A mixture of two substances is spotted onto a piece of chromatography paper.

The paper is inserted into a beaker containing a liquid.



For separation of the substances to occur the spot of mixture must

A be placed so that the spot is just below the level of the liquid.

B be soluble in the liquid.

C contain substances of the same R_f values.

D contain substances that are coloured.

3 Which molecule contains a total of three covalent bonds?

A C_2H_4

B H_2

C H_2O

D N_2

4 The addition of dilute acid to a solution containing the anion Q and the subsequent use of limewater can be used to identify the anion Q.

What is Q?

A a carbonate

B a chloride

C an iodide

D a sulfate

5 Four substances have the following electrical properties.

substance	property
W	does not conduct under any conditions
X	conducts only in aqueous solution
Y	conducts in both the molten and solid states
Z	conducts in both the molten and aqueous states

What are these four substances?

	W	X	Y	Z
A	HC*l*	S	NaC*l*	Pb
B	Pb	HC*l*	NaC*l*	S
C	S	HC*l*	Pb	NaC*l*
D	S	NaC*l*	HC*l*	Pb

6 The proton number of element X is 6. The proton number of element Y is 9.

What is the formula of a compound of these elements?

A X_2Y_3 **B** X_3Y_2 **C** XY_3 **D** XY_4

7 Which ion reacts with aqueous ammonia to give a precipitate that dissolves in an excess of ammonia?

A $Al^{3+}(aq)$ **B** $Fe^{2+}(aq)$ **C** $Fe^{3+}(aq)$ **D** $Zn^{2+}(aq)$

8 Which statement about aqueous sodium chloride is correct?

A It contains sodium atoms.

B It contains two different types of molecules.

C It does not conduct electricity.

D It forms a white precipitate when added to aqueous silver nitrate.

9 15.0 cm^3 of 1.0 mol/dm^3 potassium hydroxide just neutralise 20.0 cm^3 of a solution of nitric acid.

What is the concentration of the acid?

A 0.75 mol/dm^3

B 1.0 mol/dm^3

C 1.5 mol/dm^3

D 7.5 mol/dm^3

10 An atom, X, contains 16 protons.

Which statement about X is correct?

A It cannot form an ion.

B It contains 6 electrons in the outer shell.

C It contains 6 neutrons.

D It has relative atomic mass of 16.

11 The equation for the burning of hydrogen in oxygen is shown.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$$

What does this equation indicate?

A 2 atoms of hydrogen combine with 2 atoms of oxygen.

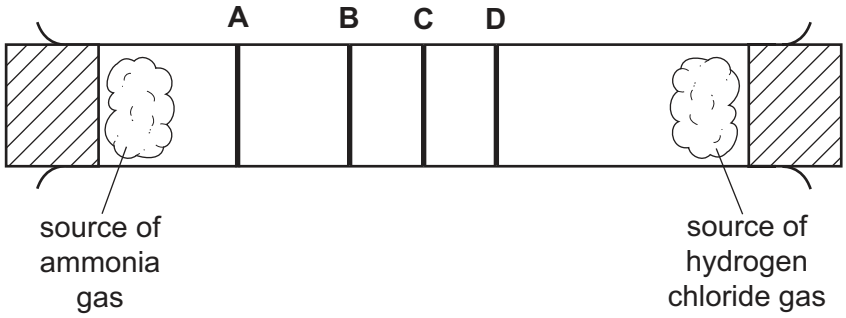
B 2 g of hydrogen combine with 1 g of oxygen.

C 2 moles of steam can be obtained from 0.5 mole of oxygen.

D 2 moles of steam can be obtained from 1 mole of oxygen.

12 The diagram shows an apparatus used to compare rates of diffusion.

At which labelled position did a white deposit of ammonium chloride form?



13 Which statement about conduction of electricity is correct?

A Electricity is conducted in aqueous solution by electrons.

B Electricity is conducted in a metal wire by ions.

C Electricity is conducted in a molten electrolyte by electrons.

D Electricity is conducted in an acid solution by ions.

14 In terms of electrons, what happens when potassium combines with iodine to form a compound?

A The atoms of both elements each lose one electron.

B The atoms of both elements each gain one electron.

C The potassium atoms each lose one electron and the iodine atoms each gain one electron.

D The potassium atoms each gain one electron and the iodine atoms each lose one electron.

15 Aqueous copper(II) sulfate is electrolysed using copper electrodes.

Which equation represents the reaction taking place at the anode (positive electrode) in this electrolysis?

A $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$

B $SO_4^{2-}(aq) \rightarrow SO_2(g) + O_2(g) + 2e^-$

C $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

D $4OH^-(aq) \rightarrow 2H_2O(l) + O_2(g) + 4e^-$

16 The combustion of methane is exothermic. The equation is given below.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

What can be deduced from the fact that the reaction is exothermic?

A Fewer bonds are broken than are made.

B Less energy is involved in breaking bonds than is involved in making bonds.

C More bonds are broken than are made.

D More energy is involved in breaking bonds than is involved in making bonds.

17 How does a catalyst increase the speed of a reaction?

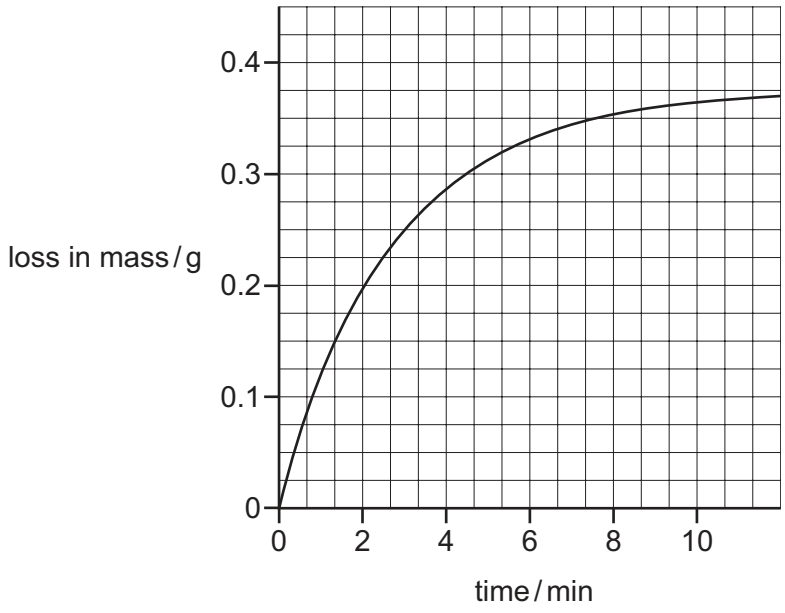
A by increasing the collision frequency of particles

B by increasing the speed of the particles

C by increasing the temperature of the reaction

D by lowering the activation energy

18 Copper(II) carbonate powder was heated. The loss in mass was plotted against time as shown on the graph.



During which time interval is the reaction fastest?

A 0 to 2 min **B** 2 to 4 min **C** 6 to 8 min **D** 8 to 10 min

19 In which equation is the underlined element reduced?

A $\underline{Cu}SO_4(aq) + Mg(s) \rightarrow Cu(s) + MgSO_4(aq)$

B $2\underline{Fe}Cl_2(s) + Cl_2(g) \rightarrow 2FeCl_3(s)$

C $2\underline{S}O_2(g) + O_2(g) \rightarrow 2SO_3(g)$

D $\underline{Zn}(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

20 A sample of air was bubbled into water. The pH of the water slowly changed from 7 to 6.

Which gas in the sample caused this change?

A carbon dioxide

B carbon monoxide

C nitrogen

D oxygen

21 Which compound is insoluble in water?

A lead sulfate

B silver nitrate

C sodium carbonate

D zinc chloride

22 The following statements about dilute sulfuric acid are **all** correct.

1 Addition of Universal Indicator shows that the solution has a pH value of less than 7.0.

2 A white precipitate is formed when aqueous barium nitrate is added.

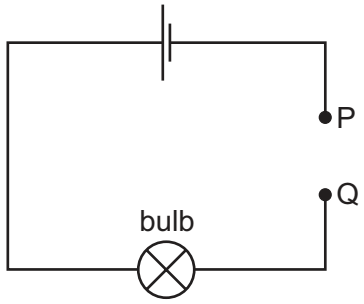
3 The solution reacts with copper(II) oxide, forming a blue solution.

4 The solution turns anhydrous copper(II) sulfate from white to blue.

Which two statements confirm the acidic nature of the solution?

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

23 Pieces of material are placed in turn between P and Q in the incomplete electrical circuit shown.



Which material would **not** cause the bulb to light?

A aluminium

B diamond

C magnesium

D zinc

24 Which of the following pairs of compounds react together to produce ammonia?

1. ammonium nitrate and calcium carbonate
2. ammonium nitrate and calcium oxide
3. ammonium sulfate and calcium hydroxide
4. ammonium sulfate and calcium nitrate

A 1 and 2 only

B 1 and 4 only

C 2 and 3 only

D 3 and 4 only

25 Which reaction occurring in the blast furnace is an acid base reaction?

A $C + CO_2 \rightarrow 2CO$

B $C + O_2 \rightarrow CO_2$

C $CaO + SiO_2 \rightarrow CaSiO_3$

D $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

26 An atom of which element gains three electrons when it forms an ion?

A aluminium

B iron

C nitrogen

D silicon

27 A metal **X** forms oxides with the formulae XO and X_2O_3.

Where is **X** in the Periodic Table?

A in Group II

B in Group III

C the second Period

D in the transition elements

28 Which pair of metals are not oxidised when added to water?

1. calcium 2. copper 3. potassium 4. silver

A 1 and 2

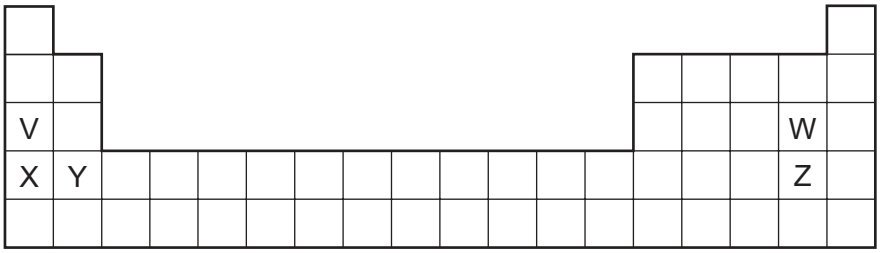
B 1 and 3

C 2 and 4

D 3 and 4

29 Part of the Periodic Table is shown.

The letters are not the symbols of the elements.



Which statement about the elements is correct?

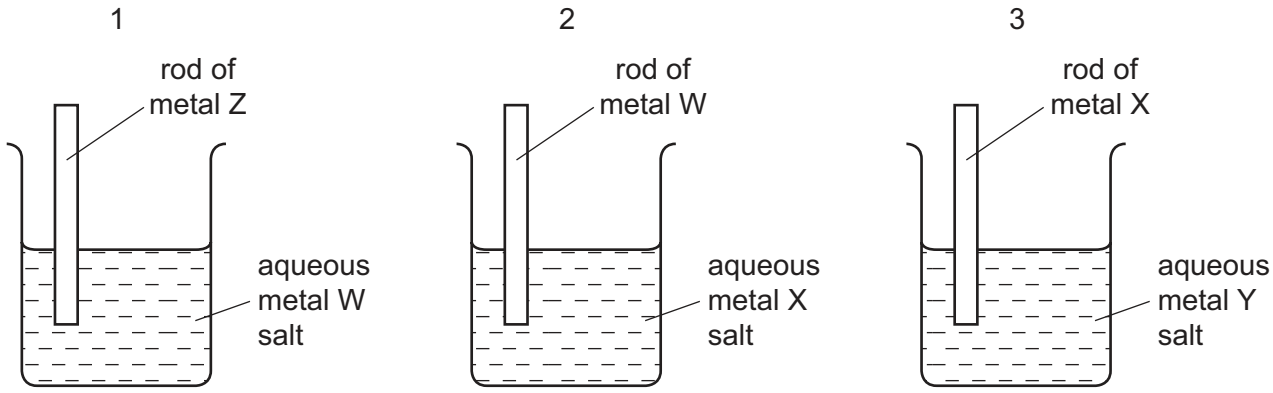
A V is more reactive than X.

B W is more reactive than Z.

C Y is in the same Group as X.

D Z has a lower melting point than W.

30 Three different beakers are set up as shown.



In beaker 1 metal W is displaced from solution.
In beaker 2 metal X is displaced from solution.
In beaker 3 metal Y is displaced from solution.

What is the order of **decreasing** reactivity of the four metals?

	most reactive →			least reactive
A	W	X	Y	Z
B	X	Y	W	Z
C	Z	W	X	Y
D	Z	X	W	Y

31 Which gases are formed during the production of aluminium by electrolysis of molten aluminium oxide?

A carbon dioxide, carbon monoxide, oxygen

B carbon dioxide, carbon monoxide, sulfur dioxide

C carbon dioxide, oxygen, sulfur dioxide

D carbon monoxide, oxygen, sulfur dioxide

32 Which pair of gases could be removed from the atmosphere using calcium carbonate?

A CO_2 and O_3

B CO and SO_2

C CH_4 and NO_2

D NO_2 and SO_2

33 In which parts of a motor car do the reactions, shown in the equations, take place?

	$N_2 + O_2 \rightarrow 2NO$	$2CO + 2NO \rightarrow 2CO_2 + N_2$
A	engine	engine
B	engine	exhaust
C	exhaust	engine
D	exhaust	exhaust

34 The diagrams show four monomers.

How many of these monomers would react with the molecule below to form a polymer?

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

35 For which molecules are the empirical and molecular formulae the same?

1. methanoic acid, HCO_2H
2. ethanoic acid, CH_3CO_2H
3. propanoic acid, $C_2H_5CO_2H$
4. butanoic acid, $C_3H_7CO_2H$

A 1, 2 and 3 only

B 1 and 3 only

C 2 and 3 only

D 2, 3 and 4 only

36 A compound Y is thought to be an organic acid.

Which reaction shows that Y is an **organic** acid?

A It reacts with an alcohol to form an ester.

B It reacts with magnesium to form hydrogen.

C It reacts with sodium carbonate to form carbon dioxide.

D It turns litmus red.

37 A 10 cm^3 sample of a gaseous hydrocarbon is completely burnt in oxygen. The total volume of the products is 70 cm^3. All gas volumes are measured at room temperature and pressure.

Which equation represents the combustion of the hydrocarbon?

A $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

B $C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)$

C $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$

D $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$

38 The boiling points of the alcohols increase as their relative molecular mass increases.

Which alcohol has the highest boiling point?

A butanol

B ethanol

C methanol

D propanol

39 Which of the following is a type of naturally occurring polymer?

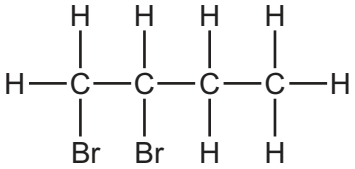
A paraffin

B polyethene

C protein

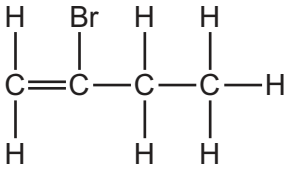
D sugar

40 Compound Q reacts with bromine to form the compound shown.

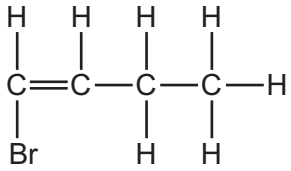


Which is compound Q?

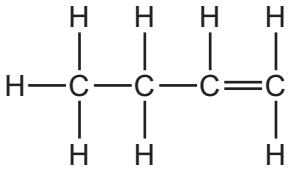
A



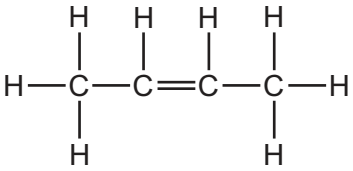
B



C



D



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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.).