UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **October/November 2011**

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 12.

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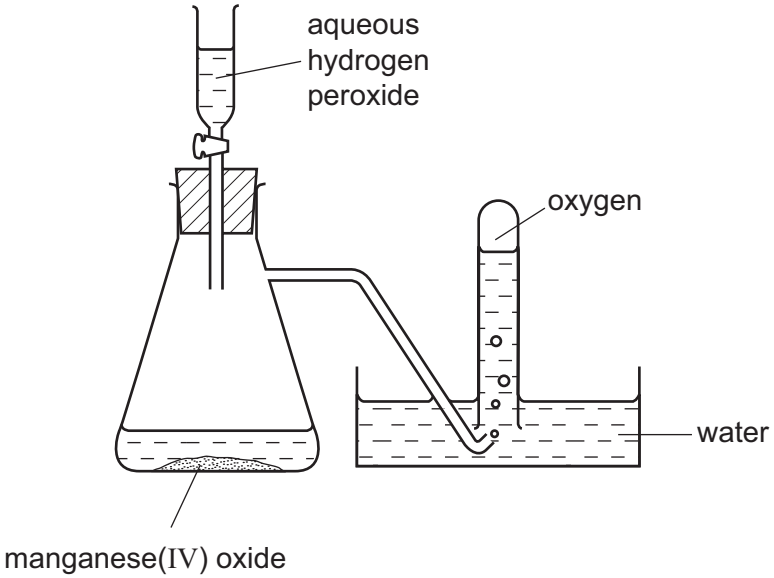
UNIVERSITY of CAMBRIDGE International Examinations

1 Oxygen was prepared from hydrogen peroxide, with manganese(IV) oxide as catalyst. The oxygen was collected as shown in the diagram.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$



The first few tubes of gas were rejected because the gas was contaminated by

A hydrogen.

B hydrogen peroxide.

C nitrogen.

D water vapour.

2 The labels fell off two bottles each containing a colourless solution, one of which was sodium carbonate solution and the other was sodium chloride solution.

The addition of which solution to a sample from each bottle would **most** readily enable the bottles to be correctly relabelled?

A ammonia

B hydrochloric acid

C lead(II) nitrate

D sodium hydroxide

3 In a titration between an acid (in the burette) and an alkali, you may need to re-use the same titration flask.

Which is the best procedure for rinsing the flask?

A Rinse with distilled water and then with the alkali.

B Rinse with tap water and then with distilled water.

C Rinse with tap water and then with the acid.

D Rinse with the alkali.

4 In which pair is each substance a mixture?

A air and water

B limewater and water

C quicklime and limewater

D sea water and air

5 A researcher notices that atoms of an element are releasing energy.

Why are the atoms releasing energy?

A The atoms are absorbing light.

B The atoms are evaporating.

C The atoms are radioactive.

D The atoms react with argon in the air.

6 Radium (Ra) is in the same group of the Periodic Table as magnesium.

What is the charge on a radium ion?

A 2– **B** 1– **C** 1+ **D** 2+

7 How many of the molecules shown contain only one covalent bond?

Cl_2 H_2 HCl N_2 O_2

A 2 **B** 3 **C** 4 **D** 5

[Turn over

8 Below are two statements about metals.

1 Metals contain a lattice of negative ions in a 'sea of electrons'.

2 The electrical conductivity of metals is related to the mobility of the electrons in the structure.

Which is correct?

A Both statements are correct and statement 1 explains statement 2.

B Both statements are correct but statement 1 does not explain statement 2.

C Statement 1 is correct and statement 2 is incorrect.

D Statement 2 is correct and statement 1 is incorrect.

9 Which compound contains three elements?

A aluminium chloride

B iron(III) oxide

C potassium oxide

D sodium carbonate

10 What happens when sodium chloride melts?

A Covalent bonds in a giant lattice are broken.

B Electrons are released from atoms.

C Electrostatic forces of attraction between ions are overcome.

D Molecules are separated into ions.

11 What is the relative molecular mass M_r of $CuSO_4.5H_2O$?

A 160 **B** 178 **C** 186 **D** 250

12 What is the ratio of the number of molecules in 71 g of gaseous chlorine to the number of molecules in 2 g of gaseous hydrogen? [Relative atomic masses A_r (atomic weights): H, 1: C*l*, 35.5]

A 1 : 1 **B** 1 : 2 **C** 2 : 1 **D** 71 : 2

13 How can sodium be manufactured?

A by electrolysing aqueous sodium chloride

B by electrolysing aqueous sodium hydroxide

C by electrolysing molten sodium chloride

D by heating sodium oxide with carbon

14 Which pair of statements about the combustion of a carbohydrate and its formation by photosynthesis is **not** correct?

	combustion	photosynthesis
A	chemical energy converted to heat energy	chemical energy converted to light energy
B	no catalyst needed	catalyst needed
C	oxygen used up	oxygen released
D	reaction exothermic	reaction endothermic

15 Which statement about the electrolysis of an aqueous solution of copper(II) sulfate with platinum electrodes is correct?

A Oxygen is given off at the positive electrode.

B The mass of the negative electrode remains constant.

C The mass of the positive electrode decreases.

D There is no change in the colour of the solution.

16 The following reversible reaction takes place in a closed vessel at constant temperature.

$$P(g) + Q(g) + R(g) \rightleftharpoons S(g) + T(g)$$

When the system has reached equilibrium, more T is added.

Which increases in concentration occur?

A P, Q, R and S

B P and Q only

C P, Q and R only

D S only

[Turn over

17 An excess of calcium hydroxide is added to an acidic soil.

What happens to the pH of the soil?

	change in pH	final pH
A	decrease	5
B	decrease	7
C	increase	7
D	increase	10

18 A lump of element **X** can be cut by a knife.

During its reaction with water, **X** floats and melts.

What is X?

A calcium

B copper

C magnesium

D potassium

19 The table gives the formulae of the catalysts used in some industrial processes.

process	catalyst
Haber process	Fe + Mo
Contact process	V_2O_5
cracking of alkanes	Al_2O_3 + SiO_2
polymerisation of ethene	$Al(C_2H_5)_3$ + $TiCl_4$
manufacture of silicones	$CuCl$

How many different transition metals are included, as elements or as compounds, in the list of catalysts?

A 3 **B** 4 **C** 5 **D** 6

20 Which statement about the elements chlorine, bromine and iodine is correct?

A They are all gases at room temperature and pressure.

B They are in the same period of the Periodic Table.

C They become darker in colour from chlorine to bromine to iodine.

D They possess one electron in the outermost shell.

21 Ammonium sulfate and potassium sulfate are salts which can be found in fertilisers. A sample of a fertiliser is warmed with aqueous sodium hydroxide and a gas with pH10 is given off.

Which salt must be in the fertiliser and which gas is given off?

	salt in fertiliser	name of gas
A	ammonium sulfate	ammonia
B	ammonium sulfate	sulfur dioxide
C	potassium sulfate	ammonia
D	potassium sulfate	sulfur dioxide

22 Sulfur dioxide reacts with aqueous bromine according to the following equation.

$$SO_2(g) + Br_2(aq) + 2H_2O(l) \rightarrow H_2SO_4(aq) + 2HBr(aq)$$

Which element has been oxidised?

A bromine

B hydrogen

C oxygen

D sulfur

23 Which substance would **not** be used for preparing a pure sample of crystalline magnesium sulfate by reaction with dilute sulfuric acid?

A magnesium carbonate

B magnesium hydroxide

C magnesium nitrate

D magnesium oxide

24 Which carbonate decomposes on heating to give a black solid and a colourless gas?

A calcium carbonate

B copper(II) carbonate

C sodium carbonate

D zinc carbonate

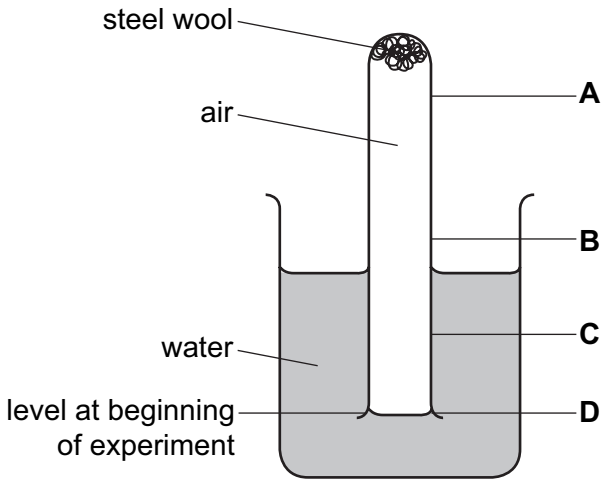
[Turn over

25 Which row shows the three metals in the correct order of decreasing reactivity?

	most active →		least active
A	copper	zinc	iron
B	iron	copper	zinc
C	iron	zinc	copper
D	zinc	iron	copper

26 The diagram shows steel wool inside a test-tube. The test-tube is inverted in water, trapping air inside.

What will be the water level inside the tube after several days?



27 Iron is manufactured in the blast furnace.

Which statement about iron and its manufacture is **not** true?

A Iron ore is readily abundant.

B It is a continuous process.

C Pure iron is produced.

D The reducing agent is cheap.

28 Which equation shows a reaction that would actually take place?

A $2MgO + C \rightarrow CO_2 + Mg$

B $MgO + Cu \rightarrow CuO + Mg$

C $PbO + Zn \rightarrow ZnO + Pb$

D $ZnO + H_2 \rightarrow H_2O + Zn$

29 Which gas **cannot** be removed from the exhaust gases of a petrol-powered car by its catalytic converter?

A carbon dioxide

B carbon monoxide

C hydrocarbons

D nitrogen dioxide

30 Which statement shows that diamond and graphite are different forms of the element carbon?

A Both have giant molecular structures.

B Complete combustion of equal masses of each produces equal masses of carbon dioxide as the only product.

C Graphite conducts electricity, whereas diamond does not.

D Under suitable conditions, graphite can be converted into diamond.

31 A sample of tap water gave a white precipitate with acidified silver nitrate.

What does this show about the tap water?

A It contained chloride.

B It contained harmful microbes.

C It contained nitrates.

D It had not been filtered.

32 Which noble gas is present in the largest percentage by volume in air?

A argon

B helium

C krypton

D neon

33 What is the purpose of vanadium(V) oxide in the Contact Process?

A It oxidises sulfur to sulfur dioxide.

B It oxidises sulfur to sulfur trioxide.

C It speeds up the conversion of sulfur dioxide into sulfur trioxide.

D It speeds up the conversion of sulfur trioxide into sulfuric acid.

[Turn over

34 Shown below are some properties of compound X.

- reacts with potassium carbonate to produce carbon dioxide
- reacts with ethanol to produce a sweet-smelling liquid
- reacts with sodium hydroxide to produce a salt

What is X?

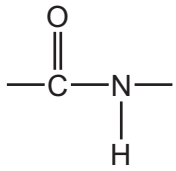
A ethanol

B ethanoic acid

C ethyl ethanoate

D ethyl methanoate

35 Which pair of macromolecules both contain the linkage shown?



A fats and proteins

B nylon and proteins

C starch and sugars

D *Terylene* and sugars

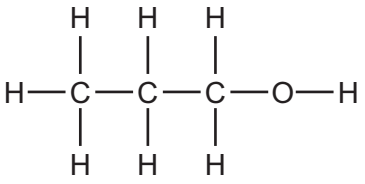
36 A hydrocarbon, C_3H_y, burns in air to form carbon dioxide and water.

$$C_3H_y(g) + 5O_2(g) \rightarrow 3CO_2(g) + \frac{y}{2}H_2O(g)$$

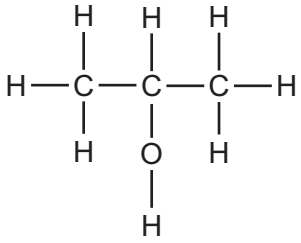
What is the value of y?

A 4 **B** 6 **C** 7 **D** 8

37 The structural formulae of some organic compounds are shown below.



1



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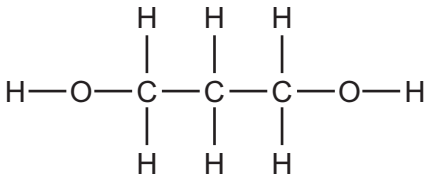

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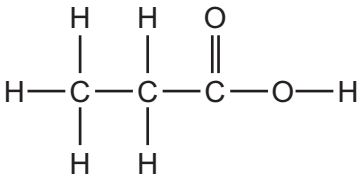

4

Which compounds are alcohols?

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

38 A hydride is a compound containing only two elements, one of which is hydrogen.

Which element forms the **most** hydrides?

A carbon

B chlorine

C nitrogen

D oxygen

39 Which compound is manufactured by reacting ethene with steam in the presence of a heated catalyst?

A C_2H_6 **B** C_2H_5OH **C** C_4H_8 **D** C_4H_9OH

40 Under certain conditions 1 mole of ethane reacts with 2 moles of chlorine in a substitution reaction.

What is the formula of the organic product in this reaction?

A C_2H_5Cl **B** $C_2H_4Cl_2$ **C** $C_2H_2Cl_4$ **D** CH_2Cl_2

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	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	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.).