UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

**CHEMISTRY** **5070/11**

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.

**1** 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.

**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

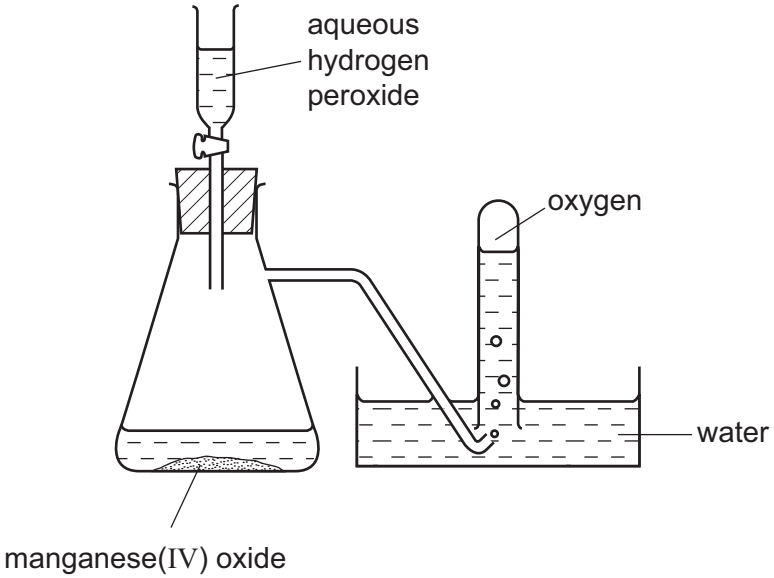
**B** hydrochloric acid

**C** lead(II) nitrate

**D** sodium hydroxide

**3** 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.

**4** 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+

**5** 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

**6** 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

**7** 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.

**8** 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.

**9** Which compound contains three elements?

**A** aluminium chloride

**B** iron(III) oxide

**C** potassium oxide

**D** sodium carbonate

**10** 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.

**11** 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

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

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

**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 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.

**15** 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 |

**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

**17** 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

**18** 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 |

**19** 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

**20** 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 |

**21** 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

**22** 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

**23** 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.

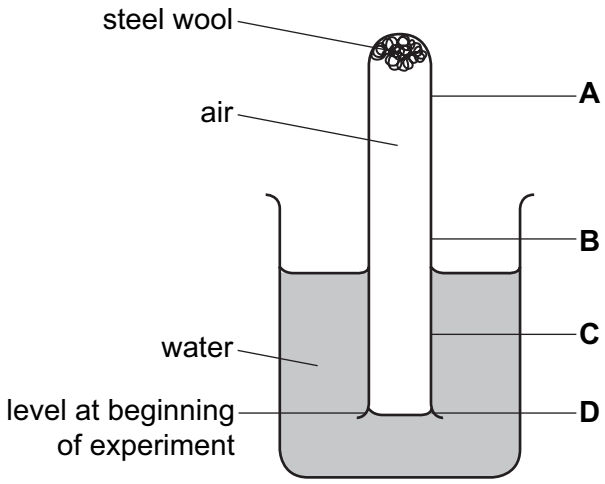




**[Turn over**

**24** 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?




**25** 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

**26** 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.

**27** 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 |

**28** 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

**29** 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** $ZnO + H_2 \rightarrow H_2O + Zn$

**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** 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.

**32** 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.





**[Turn over**

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

**A** argon

**B** helium

**C** krypton

**D** neon

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

Which element forms the **most** hydrides?

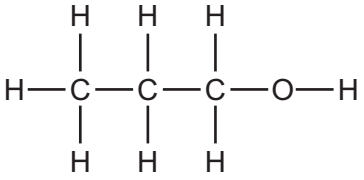
**A** carbon

**B** chlorine

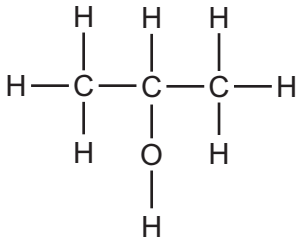
**C** nitrogen

**D** oxygen

**35** The structural formulae of some organic compounds are shown below.



1



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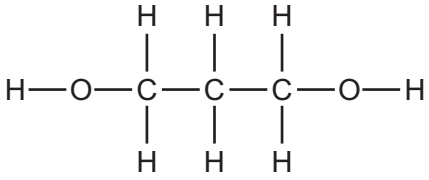

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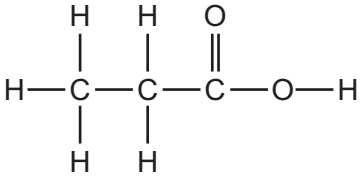


4

Which compounds are alcohols?

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

**36** 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** $C_4H_9OH$

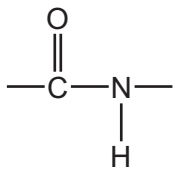
**37** A hydrocarbon, $C_3H_y$, burns in air to form carbon dioxide and water.

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

What is the value of y?

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

**38** 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

**39** 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** $CH_2Cl_2$

**40** 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

**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 | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 19 F Fluorine 9 | 20 Ne Neon 10 |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | | 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 |
| 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 |
| 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 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 |
| 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 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 |
| 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 | | | | | | |
| | 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.).