



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Ordinary Level

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CHEMISTRY 5070/01

Paper 1 Multiple Choice May/June 2009

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.

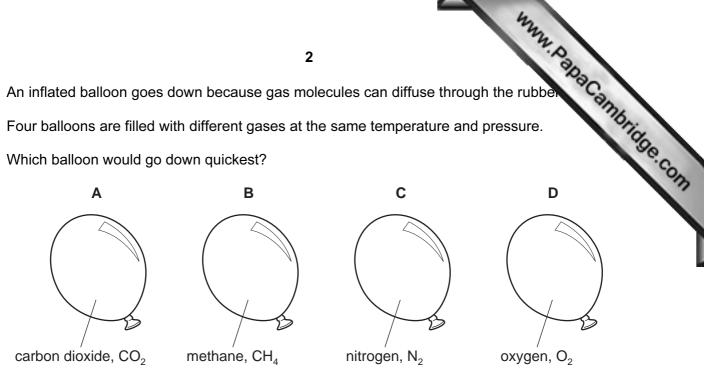
A copy of the Periodic Table is printed on page 16.



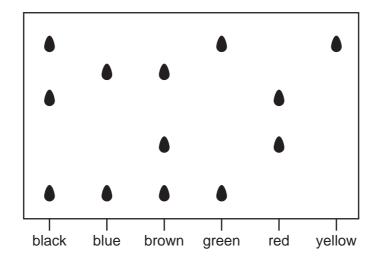
1 An inflated balloon goes down because gas molecules can diffuse through the rubbe

Four balloons are filled with different gases at the same temperature and pressure.

Which balloon would go down quickest?



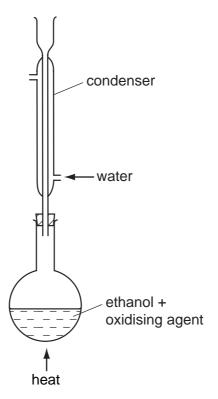
2 The diagram shows a chromatogram of several inks.



Which statement is correct?

- Black ink can be made by mixing green, red and yellow inks. Α
- В Brown ink can be made by mixing blue and red inks.
- C Yellow ink can be used to make brown ink.
- D Yellow ink may be present in green ink.

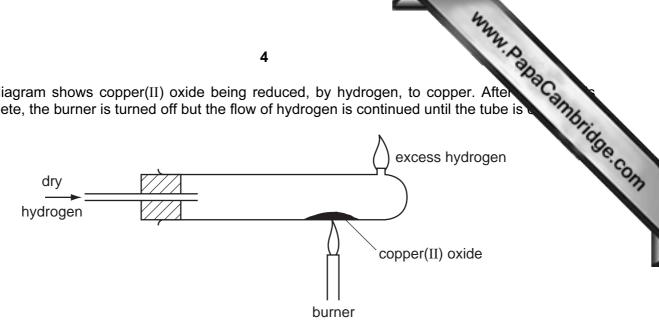
www.PapaCambridge.com 3 The oxidation of ethanol to ethanoic acid is often carried out in the apparatus shown.



What is the purpose of the condenser?

- to prevent air reacting with the ethanoic acid Α
- В to prevent any ethanol from escaping
- to prevent the ethanoic acid changing back to ethanol C
- D to prevent the ethanoic acid reacting with the ethanol

4 The diagram shows copper(II) oxide being reduced, by hydrogen, to copper. After complete, the burner is turned off but the flow of hydrogen is continued until the tube is



Why is the hydrogen allowed to flow through the tube during cooling?

- A to allow the tube to cool slowly
- В to lessen the risk of explosion in the hot tube
- C to prevent the copper from reacting with the air
- D to remove any traces of water left in the tube
- 5 A coin is analysed by dissolving it in nitric acid. To the resulting solution an excess of aqueous ammonia is added and the mixture is filtered.

A brown precipitate remains in the filter paper and a deep blue solution is obtained as the filtrate.

Which metals does the coin contain?

- aluminium and copper
- В copper and iron
- C iron and lead
- lead and zinc D
- An element X forms a positive ion with the electronic structure 2,8,8. 6

What is the proton (atomic) number of X?

- Α 16
- В 17
- 18
- 19
- 7 Which two substances are elements with a giant molecular structure?
 - A diamond and graphite
 - diamond and sand В
 - methane and iodine C
 - methane and sand

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- 8 Which compound has both ionic and covalent bonds?
 - A ammonium chloride
 - B carbon dioxide
 - C ethyl ethanoate
 - **D** sodium chloride
- **9** Which statement about the numbers of particles in atoms is correct?

Apart from hydrogen, most atoms contain

- A more neutrons than protons.
- **B** more protons than neutrons.
- **C** more electrons than protons.
- **D** more protons than electrons.
- 10 Which gas contains the same number of molecules as 9 g of water?
 - A 2g of hydrogen
 - B 14g of nitrogen
 - C 32g of oxygen
 - D 44 g of carbon dioxide
- 11 The equation for the reaction between copper and nitric acid is shown.

$$vCu + wHNO_3 \rightarrow xCu(NO_3)_2 + yNO + zH_2O$$

v, w, x, y and z are whole numbers.

Which values of *v*, *w*, *x*, *y* and *z* balance the equation?

| | V | W | X | У | Z |
|---|---|---|---|---|---|
| Α | 1 | 2 | 1 | 1 | 1 |
| В | 1 | 4 | 1 | 2 | 2 |
| С | 3 | 4 | 3 | 2 | 2 |
| D | 3 | 8 | 3 | 2 | 4 |

12 The mass of one mole of a chloride formed by a metal Y is 74.5 g.

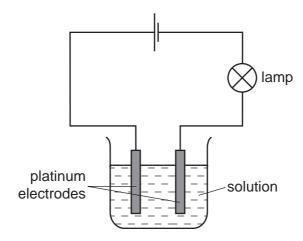
What is the formula of the chloride?

- A Y_3Cl
- **B** Y_2Cl
- **C** YCl
- **D** YCl_2

www.papaCambridge.com 13 Which reactions take place during the electrolysis of aqueous copper(II) sulfate electrodes?

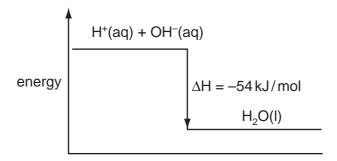
| | reaction at positive electrode | reaction at negative electrode |
|---|--|---|
| Α | $Cu^{2+} + 2e^- \rightarrow Cu$ | $Cu \rightarrow Cu^{2+} + 2e^{-}$ |
| В | $4OH^{-} \rightarrow 2H_{2}O + O_{2} + 4e^{-}$ | Cu ²⁺ + 2e ⁻ → Cu |
| С | $Cu \rightarrow Cu^{2+} + 2e^{-}$ | $2H^{+} + 2e^{-} \rightarrow H_{2}$ |
| D | $Cu \rightarrow Cu^{2+} + 2e^{-}$ | Cu ²⁺ + 2e ⁻ → Cu |

14 The diagram shows apparatus used to investigate the conductivity of different solutions.



Which substance, in aqueous solution of concentration 1 mol/dm³, would cause the lamp to give the brightest light?

- ammonia
- ethanoic acid В
- C ethanol
- sulfuric acid
- 15 The energy diagram for the reaction between sodium hydroxide and hydrochloric acid is shown.



Which quantity of heat is liberated when 100 cm³ of 1 mol/dm³ hydrochloric acid reacts with 100 cm³ of 1 mol/dm³ sodium hydroxide?

- 0.54 kJ
- **B** 2.70 kJ
- **C** 5.40 kJ
- **D** 10.8 kJ

16 The equation shows a reversible reaction.

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

The forward reaction is endothermic.

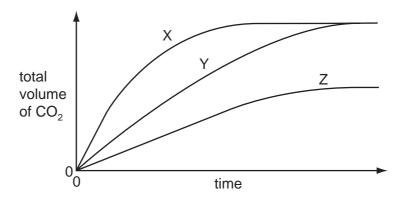
Which of these changes will increase the yield of NO₂?

| | pressure | temperature | | |
|---|---------------------|-------------|--|--|
| Α | decreased decreased | | | |
| В | decreased | increased | | |
| С | increased | decreased | | |
| D | increased | increased | | |

17 In experiment 1, an excess of finely powdered marble is added to 20 cm³ of dilute hydrochloric acid.

In experiment 2, carried out under the same conditions of temperature and pressure, an excess of marble chips is added to 20 cm³ of dilute hydrochloric acid of the same concentration.

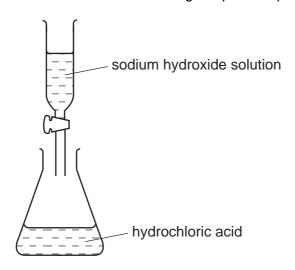
The total volumes of carbon dioxide given off are determined at intervals and plotted against time.



Which pair of curves is obtained in the two experiments?

| | experiment 1 | experiment 2 | | |
|---|--------------|--------------|--|--|
| Α | Х | Z | | |
| В | X | Y | | |
| С | Υ | z | | |
| D | Υ | Х | | |

- 18 What is **not** an example of oxidation?
 - A converting iron(III) salts into iron(II) salts
 - B converting magnesium atoms into magnesium ions
 - C dissolving of a copper anode during electrolysis
 - **D** liberating chlorine from a chloride
- 19 Which metal has a soluble carbonate, chloride and sulfate?
 - A barium
 - **B** calcium
 - C copper
 - **D** potassium
- **20** Sodium hydroxide solution was added to dilute hydrochloric acid. The pH of the solution in the flask was measured at intervals until no further change of pH took place.



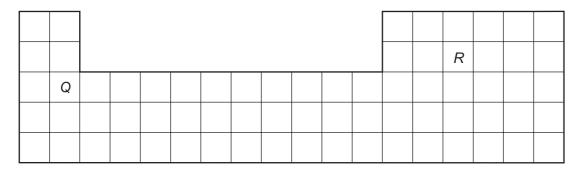
What would be the pH change in this reaction?

- A decrease to 1
- B decrease to 7
- C increase to 7
- **D** increase to 12
- 21 Why is nickel used in the addition of hydrogen to alkenes?
 - A It increases the yield of products.
 - **B** It lowers the activation energy of the reaction.
 - **C** It makes the reaction more exothermic.
 - **D** It prevents a reverse reaction from occurring.

22 Caesium, Cs, is an element in Group I of the Periodic Table.

Which statements about Caesium are true?

- www.PapaCambridge.com 1 Caesium conducts electricity both when solid and when molten.
- 2 Caesium reacts explosively with water.
- Caesium reacts with water and forms a solution of pH<7.
- A 1 and 2 only
- **B** 1 and 3 only
- C 2 and 3 only
- **D** 1, 2 and 3
- 23 Elements with the code letters Q and R occupy the positions shown in the outline of the Periodic Table.



What is the formula of the compound formed between them?

- \mathbf{A} QR_2
- **B** Q_2R
- Q_2R_3
- Q_3R_2

- The list shows some properties of metals.
 - 1 Metals are good conductors of electricity.
 - 2 Metals form ions by the loss of electrons.
 - 3 Metals have high melting points.

Mercury is a metallic element.

Which of these statements do **not** apply to mercury?

A 1 only

B 1 and 2

С 2 and 3 3 only

25 In the electrolysis of aluminium oxide to extract pure aluminium a compound called a added to the oxide.

What is the reason for adding the cryolite?

- A to reduce the corrosion of the carbon electrodes by oxygen
- B to reduce energy costs
- c to enable the aluminium ions and oxygen ions to move to the electrodes
- **D** to prevent the aluminium formed from being oxidised back to aluminium oxide
- 26 Iron is extracted from its ore haematite, Fe₂O₃, by a reduction process in the blast furnace.

Which equation for reactions in the blast furnace shows the formation of the reducing agent?

- A $CaCO_3 \rightarrow CaO + CO_2$
- **B** CaO + SiO₂ \rightarrow CaSiO₃
- \mathbf{C} $CO_2 + C \rightarrow 2CO$
- **D** $C + O_2 \rightarrow CO_2$
- 27 The steel bodies of cars can be protected from rusting by spraying them with zinc.

Why is zinc used?

- A Zinc does not react with acidic exhaust fumes.
- **B** Zinc forms a stable compound with iron.
- **C** Zinc has a high melting point.
- **D** Zinc is higher in the reactivity series than iron.
- **28** Solid Y is insoluble in water. It gives off a gas when heated and also when reacted with dilute sulfuric acid.

What is Y?

- A copper(II) carbonate
- B sodium carbonate
- C sodium nitrate
- **D** zinc oxide

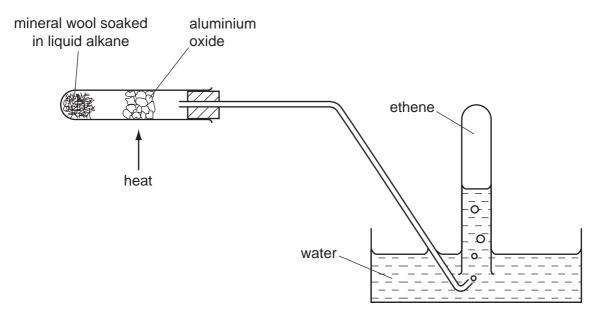
- 29 What is the ionic equation for the reaction between zinc and aqueous copper(II) sulfa-
 - **A** $Zn^{2+}(aq) + Cu(s) \rightarrow Zn(s) + Cu^{2+}(aq)$
 - **B** $Zn^{2+}(aq) + SO_4^{2-}(aq) \rightarrow ZnSO_4(s)$
 - **C** $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$
 - **D** $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$
- 30 Which gas reacts with sulfuric acid to form a fertiliser?
 - A ammonia, NH₃
 - B carbon dioxide, CO₂
 - C hydrogen, H₂
 - **D** nitrogen, N₂
- 31 In the Contact process, the sulfur trioxide formed is
 - A passed into concentrated sulfuric acid.
 - **B** passed into dilute sulfuric acid.
 - **C** passed into oleum $(H_2S_2O_7)$.
 - **D** passed into water.
- 32 Which gas, present in pond water, decreases in concentration during eutrophication?
 - A carbon dioxide
 - **B** methane
 - C nitrogen
 - **D** oxygen
- **33** Methane is a greenhouse gas.

Which process releases methane into the air?

- A combustion of petrol
- B decay of vegetable matter
- C photosynthesis
- **D** volcanic activity

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- 34 Carbon dioxide and carbon monoxide are both
 - **A** absorbed by sodium hydroxide.
 - B colourless.
 - **C** inflammable in air.
 - **D** lighter than air.
- **35** Which hydrocarbon will burn completely in oxygen to give equal numbers of moles of carbon dioxide and water?
 - A C_2H_6
- **B** C₃H₆
- $\mathbf{C} \quad C_4 H_{10}$
- **D** C_5H_{12}
- **36** The diagram shows the breakdown of an alkane to ethene.



The ethene is then tested with aqueous bromine.

Which information about ethene is correct?

| | solubility of ethene gas | action on aqueous bromine | | |
|---|--------------------------|---------------------------|--|--|
| Α | insoluble | decolourised | | |
| В | insoluble | ole no reaction | | |
| С | soluble | decolourised | | |
| D | soluble | no reaction | | |

37 Carbohydrates, proteins, fats and *Terylene* are macromolecules.

Which element is found in only one of these macromolecules?

- A carbon
- **B** hydrogen
- C nitrogen
- **D** oxygen
- 38 Which structure is **not** an isomer of the structure shown?

$$\mathsf{CH}_3 \mathbf{-\!CH}_2 \mathbf{-\!CH}_2 \mathbf{-\!CH}_3$$

$$\begin{array}{ccc} & CH_3 \\ | & \\ | & \\ CH_3 - C - CH_3 \\ | & \\ CH_3 \end{array}$$

$$\begin{array}{cccc} \mathbf{C} & \mathrm{CH_3}\mathrm{\longleftarrow}\mathrm{CH_2}\mathrm{\longleftarrow}\mathrm{CH_2}\mathrm{\longleftarrow}\mathrm{CH_2}\\ & & \mathrm{CH_3} \end{array}$$

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39 Alcohols can be oxidised to form another homologous series of compounds.

What would be the product of the oxidation of propanol?

40 A polymer X is hydrolysed and the two products are

H H H

What can be deduced about X?

- **A** It is a condensation polymer.
- **B** It is made by addition polymerisation.
- **C** It is starch.
- **D** It is *Terylene*.

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The Periodic Table of the Elements DATA SHEET

| | | | | 16 | | mm. | Dana Cambridge.com |
|-------|----------|-----------------|---|--|---------------------------------------|---|--|
| | 0 | 4 He ium | 20 Neon 10 A 40 A 7 A 7 | 84 Krypton 36 Xenon 54 | Radon 86 | Lutetium 71 Luterium 71 Luterium 103 | Pacambr. |
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| | I | | 16 Oxygen 8 32 S | 79 Selenium 34 128 Tellurium 52 | Polonium 84 | Thullum 69 Thullum 69 Mendelevium 101 | |
| | > | | Nitrogen 7 7 31 9 Phosphorus 15 | 75 Asenic 33 Arsenic 33 Arsenic Sb Antimony 51 209 | Bismuth 83 | 167 Erbium 68 Fm Frmium | |
| | <u> </u> | | Carbon 6 Carbon 8 Silicon 14 | 73 Ge Germanium 32 119 Sn Tin 50 | Lead 82 | Holmium 67 Es Es Einsteinium 99 | (r.t.p.). |
| | ≡ | | 11 B Boron 5 27 A 1 Aluminium | 70 Ga 31 115 In Indium 49 | Thailium 81 | 162 Dysprosium 66 Cf Californium 98 | The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.). |
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| | _ | | 7 Lithium 3 23 Na Sodium 11 | 39 Potrassium 19 85 Rubidium 37 133 | Caesium 55 Fr Francium 87 | *58-71 L 190-103 Key | |

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