

CHEMISTRY

5070/11

Paper 1 Multiple Choice

May/June 2015

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, 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.

DO NOT WRITE IN ANY BARCODES.

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.

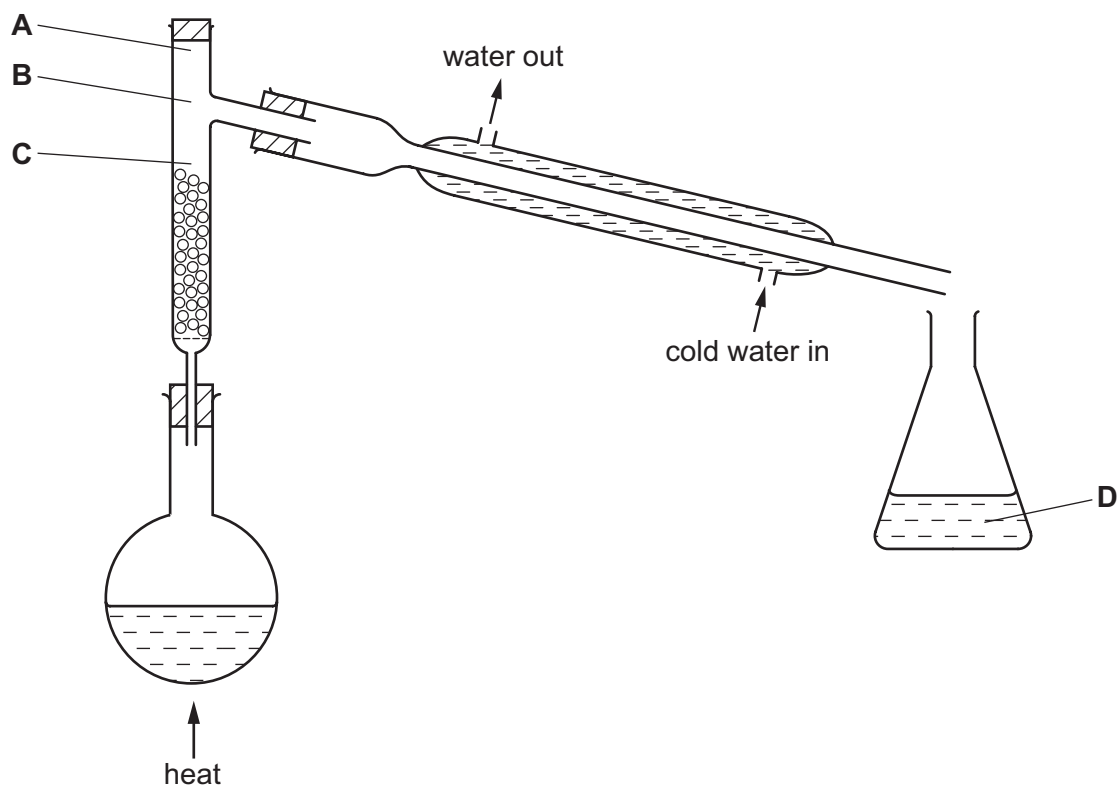
A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

This document consists of **13** printed pages and **3** blank pages.

- 1 The fractional distillation apparatus shown is being used to separate a mixture of two liquids. The thermometer is missing from the apparatus.

Where should the bulb of the thermometer be placed?



- 2 The table shows the results of two reactions of an aqueous solution of a salt.

reagents	final observation
excess aqueous sodium hydroxide	white precipitate
dilute nitric acid and aqueous silver nitrate	yellow precipitate

What is the name of the salt?

- A calcium chloride
- B calcium iodide
- C zinc nitrate
- D zinc sulfate

- 3 Limestone reacts with hydrochloric acid.

Changing which reaction condition does **not** affect the rate of reaction?

- A concentration of the acid
- B limestone particle size
- C pressure
- D temperature

- 4 A particle contains 34 protons, 45 neutrons and 36 electrons.

Which symbol is correct for this particle?

- A ${}_{34}^{79}\text{Se}$ B ${}_{34}^{79}\text{Se}^{-}$ C ${}_{34}^{79}\text{Se}^{2-}$ D ${}_{34}^{79}\text{Se}^{2+}$

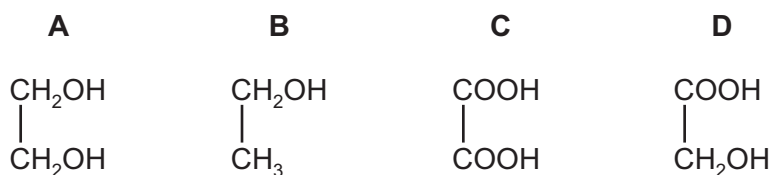
- 5 Which molecule contains **three** shared pairs of electrons between two of its atoms?

- A CO_2 B C_2H_4 C H_2O D N_2

- 6 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.

- 7 Which compound contains only eight covalent bonds?



8 Which substance has metallic bonding?

	conducts electricity		state of product formed on reaction with oxygen
	when solid	when liquid	
A	✓	✓	solid
B	✓	✓	gas
C	x	✓	no reaction
D	x	x	solid

9 A gas cylinder is placed in each of the four corners of a square room. Each cylinder contains a different gas stored under the same pressure. The gases are released at exactly the same time.

Which gas will reach the centre of the room first?

- A** ammonia, NH_3
- B** argon, Ar
- C** carbon monoxide, CO
- D** chlorine, Cl_2

10 Powdered calcium carbonate reacts with dilute hydrochloric acid to produce calcium chloride, water and carbon dioxide.

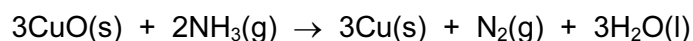
Which is the correct ionic equation, including state symbols, for this reaction?

- A** $\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- B** $\text{Ca}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- C** $\text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- D** $\text{CaCO}_3(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$

11 What is the relative molecular mass, M_r , of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?

- A** 127
- B** 160
- C** 178
- D** 250

12 1.00 dm^3 of ammonia gas is passed over heated copper(II) oxide.



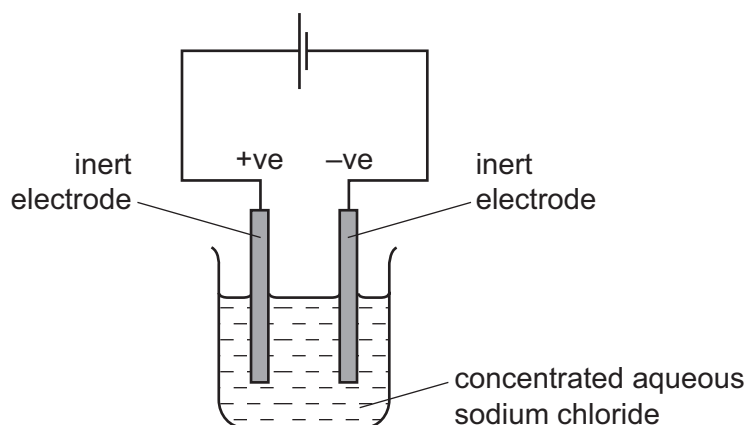
What is the volume of nitrogen formed when measured at the same temperature and pressure as the ammonia?

- A** 0.25 dm^3
- B** 0.50 dm^3
- C** 1.00 dm^3
- D** 2.00 dm^3

- 13 What are the correct anode (positive electrode) and cathode (negative electrode) products when concentrated aqueous copper(II) sulfate is electrolysed using copper electrodes?

	anode product	cathode product
A	aqueous copper(II) ions	copper metal
B	aqueous copper(II) ions	hydrogen gas
C	oxygen gas	copper metal
D	oxygen gas	hydrogen gas

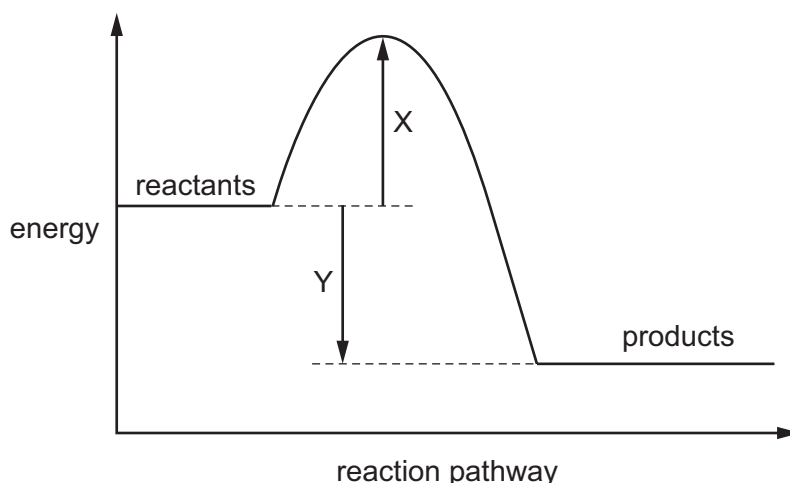
- 14 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.



Which statement about this electrolysis is correct?

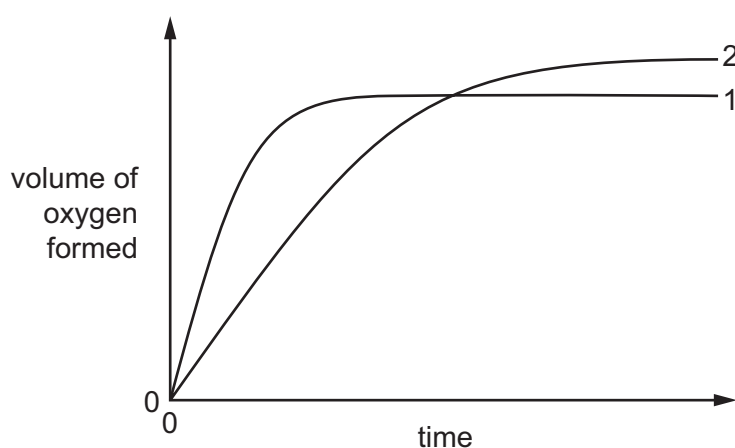
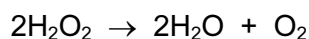
- A** Chloride ions travel through the solution to the negative electrode.
- B** Electrons travel through the solution to the sodium ions.
- C** Gases are given off at both electrodes.
- D** Sodium is formed at the negative electrode.

- 15 The diagram shows the energy profile of a chemical reaction. Two energy changes are marked, X and Y.



Which statement about the reaction is correct?

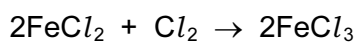
- A The activation energy of the reaction is $X + Y$.
 - B The enthalpy change of the reaction is X .
 - C The enthalpy change of the reaction is $X + Y$.
 - D The reaction is exothermic.
- 16 In the graph, curve 1 was obtained by observing the decomposition of 100 cm^3 of 1.0 mol/dm^3 hydrogen peroxide solution, catalysed by manganese(IV) oxide.



Which alteration to the original experimental conditions would produce curve 2?

- A adding some 0.1 mol/dm^3 hydrogen peroxide solution
- B lowering the temperature
- C using less manganese(IV) oxide
- D using a different catalyst

- 17 The equation shows a redox reaction between iron(II) chloride and chlorine gas.



Which equation describes the reduction process in this reaction?

- A $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
 B $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
 C $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$
 D $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$

- 18 Which row correctly describes the oxides?

	Al_2O_3	K_2O	MgO	SO_2
A	basic	acidic	acidic	amphoteric
B	acidic	basic	amphoteric	acidic
C	amphoteric	basic	amphoteric	acidic
D	amphoteric	basic	basic	acidic

- 19 Which substance is insoluble in water?

- A ammonium carbonate
 B ammonium nitrate
 C calcium carbonate
 D calcium nitrate

- 20 In which of these equilibria is the forward reaction favoured by an increase in pressure?

- A $2\text{HI}(\text{g}) \rightleftharpoons \text{H}_2(\text{g}) + \text{I}_2(\text{g})$
 B $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$
 C $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$
 D $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$

- 21 The Contact process, the Haber process and the hydrogenation of fats all involve catalyst.

Which row correctly describes whether the catalyst used in each process is an element or compound?

	Contact process	Haber process	hydrogenation of fats
A	compound	compound	compound
B	compound	element	element
C	element	element	compound
D	element	element	element

- 22 Which element is sodium?

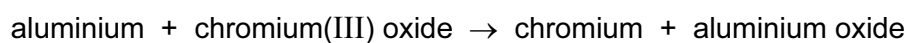
	melting point in °C	electrical conduction	density in g/cm ³
A	1535	good	7.86
B	1083	good	8.92
C	113	poor	2.07
D	98	good	0.97

- 23 A non-metal element forms oxides of the type XO_2 and XO_3 .

What is X?

- A** aluminium
- B** carbon
- C** hydrogen
- D** sulfur

- 24 Aluminium reacts with chromium(III) oxide as shown.



Which statements are correct?

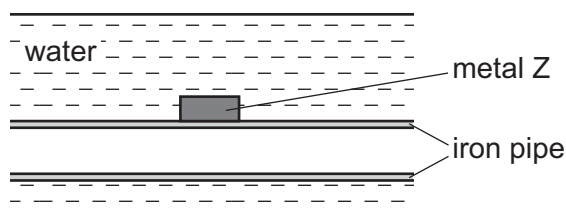
- 1 Aluminium is more reactive than chromium.
- 2 A similar reaction would also take place between aluminium and iron(III) oxide.
- 3 Iron(III) oxide is reduced by another metal in the blast furnace.

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

25 Using the Periodic Table for the relative atomic masses, which has the least mass?

- A 0.1 moles of silicon dioxide, SiO_2
- B 0.5 moles of oxygen, O_2
- C 0.5 moles of lithium, Li
- D 1.0 moles of ammonia, NH_3

26 The diagram shows how an underwater iron pipe can be protected from rusting.



Metal Z can be1..... because it is2..... reactive than iron.

Which words correctly complete gaps 1 and 2?

	1	2
A	copper	less
B	copper	more
C	magnesium	less
D	magnesium	more

27 Brass is an alloy.

Which statement about brass is correct?

- A It contains a sea of electrons.
- B It contains positive and negative ions which are free to move.
- C It is a compound of a metal and a non-metal.
- D It is a compound of two or more metals.

28 Which item is made from mild steel?

- A a car body
- B a container to store gas in a chemical plant
- C a scalpel for use in an operating theatre
- D a set of cutlery

- 29 The table shows the composition of exhaust gases from an internal combustion engine.

gas	% of the gas in the exhaust fumes
gas Y	71
carbon dioxide	14
water vapour	13
carbon monoxide	1
hydrocarbons	0.3
nitrogen oxides	0.2
sulfur dioxide	less than 0.003

What is gas Y?

- A ammonia
 - B argon
 - C chlorine
 - D nitrogen
- 30 Which two gases do **not** damage limestone buildings?
- A nitrogen and carbon monoxide
 - B nitrogen dioxide and carbon monoxide
 - C nitrogen dioxide and carbon dioxide
 - D sulfur dioxide and carbon dioxide
- 31 Iron(III) oxide can be reduced to iron by carbon.

Which other element can reduce iron(III) oxide to iron?

- A copper
 - B lead
 - C magnesium
 - D silver
- 32 An ammonium salt was added to excess hot aqueous sodium hydroxide. Ammonia gas was evolved. When no more ammonia was evolved, aluminium was added to the solution remaining and more ammonia gas was given off.

What was the ammonium salt?

- A NH_4Cl
- B NH_4NO_3
- C $(\text{NH}_4)_2\text{CO}_3$
- D $(\text{NH}_4)_2\text{SO}_4$

- 33 Two esters have the same molecular formula, $C_3H_6O_2$.

What are the names of these two esters?

- 1 methyl ethanoate
- 2 ethyl propanoate
- 3 ethyl methanoate
- 4 propyl methanoate

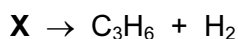
- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

- 34 Which statement is correct?

- A** Carboxylic acids contain the functional group $\begin{array}{c} \text{O} \\ \parallel \\ \text{—C—} \\ | \\ \text{H} \end{array}$.
- B** Ethanoic acid will react and fizz when copper is added.
- C** Ethanol will decolourise acidified potassium manganate(VII).

- D** The structure of ethyl ethanoate is $\begin{array}{c} \text{O} \\ \parallel \\ \text{H—C—O—C—H} \\ | \\ \text{H} \end{array}$.

- 35 When cracked, one mole of a compound, **X**, produces one mole of propene and one mole of hydrogen.



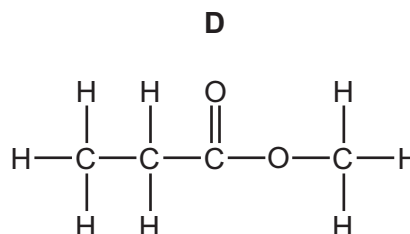
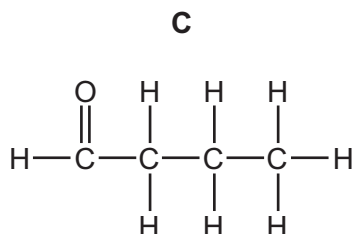
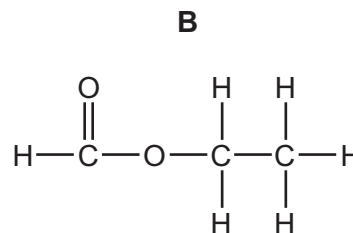
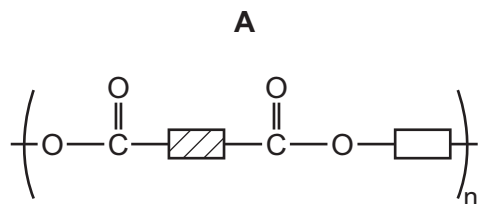
What type of compound is **X**?

- A** an alcohol
- B** an alkane
- C** an alkene
- D** a carboxylic acid

- 36 Which is a correct definition of isomers?

- A** atoms with the same relative atomic mass and different structures
- B** compounds with the same molecular formula and different structures
- C** compounds with the same molecular mass and different structures
- D** elements with the same molecular mass and the same structures

37 Which of the following has **not** been prepared by reacting a carboxylic acid with an alcohol?



38 Which of these polymers is a protein?

- A** $(C_2H_3Cl)_n$ **B** $(C_5H_8O_2)_n$ **C** $(C_6H_{10}O_5)_n$ **D** $(C_2H_3NO)_n$

39 In the addition polymer poly(propene), what is the simplest ratio of carbon atoms to hydrogen atoms?

	carbon atoms	hydrogen atoms
A	1	2
B	2	1
C	2	4
D	3	6

40 Which statement about vegetable oil and the margarine made from it is correct?

- A** Both are liquids at room temperature.
B Both occur naturally.
C Margarine has the higher melting point.
D Vegetable oil has fewer carbon-carbon double bonds than margarine.

Group

Key

a	X
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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.).