Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Chemistry

Unit 3: Practical Skills

Practical Booklet B
Foundation Tier

GCM32

[GCM32]
WEDNESDAY 19 JUNE, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all five** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A Data Leaflet including a Periodic Table of the Elements is provided.
Quality of written communication will be assessed in Question **1(a)**.

1 25.0 cm^3 of sodium hydroxide solution were placed in a conical flask using a pipette. Three drops of methyl orange indicator were added to the conical flask. The sodium hydroxide was titrated against sulfuric acid. The sulfuric acid was added from a burette.

(a) Describe how

- the pipette was prepared for use and
- 25.0 cm^3 of sodium hydroxide solution were placed in the conical flask.

Include in your answer any safety precautions taken.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

(b) State two ways in which the end-point is determined accurately.

1. _____

_____

2. _____

_____ [2]

(c) A rough titration and two subsequent accurate titrations were carried out. The table below gives the results of the titrations and the average titre is recorded below the table.

	Initial burette reading (cm^3)	Final burette reading (cm^3)	Titre (cm^3)
Rough titration	0.0	21.2	21.2
First accurate titration	21.2	41.4	20.2
Second accurate titration	25.2	45.2	20.0

Average titre = 20.1 cm^3

(i) Why is a rough titration carried out?

_____

_____ [1]

(ii) State the colour change at the end-point.

From _____ to _____ [2]

(iii) Write a word equation for the reaction between sodium hydroxide and sulfuric acid.

_____ [2]

[Turn over

2 **(a)** A solution of an ionic compound, labelled A, was tested as shown in the table below.

Test	Observations
1. Place approximately 5 cm^3 of solution A in a test tube and add a few drops of sodium hydroxide solution	white precipitate
2. Add excess sodium hydroxide solution to the test tube from test 1	white precipitate is soluble forming a colourless solution
3. Place approximately 5 cm^3 of solution A in a test tube and add a few drops of silver nitrate solution	cream precipitate
4. Place approximately 5 cm^3 of solution A in a test tube and add a few drops of ammonia solution	white precipitate
5. Add excess ammonia solution to the test tube from test 4	white precipitate is soluble forming a colourless solution

(i) Circle the formula of the cation present in solution A.

Cu^{2+} Fe^{2+} Mg^{2+} Zn^{2+} [1]

(ii) Circle the formula of the anion present in solution A.

Br^- Cl^- F^- I^- [1]

(iii) Write the name and formula of the ionic compound dissolved in solution A.

Name: _____

Formula: _____ [2]

(iv) Name the white precipitate formed in test 4.

_____ [1]

(b) An unknown solid is thought to be potassium sulfate.

(i) Describe how a flame test is carried out on the solid to prove that potassium ions are present.

_____

_____

_____

_____ [4]

(ii) Describe the procedure you would use to prove that the solid contains sulfate ions.

_____

_____

_____

_____ [3]

[Turn over

3 0.5 g of zinc were reacted with 25.0 cm^3 of hydrochloric acid in a conical flask at 25 °C. The volume of gas produced was recorded every 10 seconds using a gas syringe.

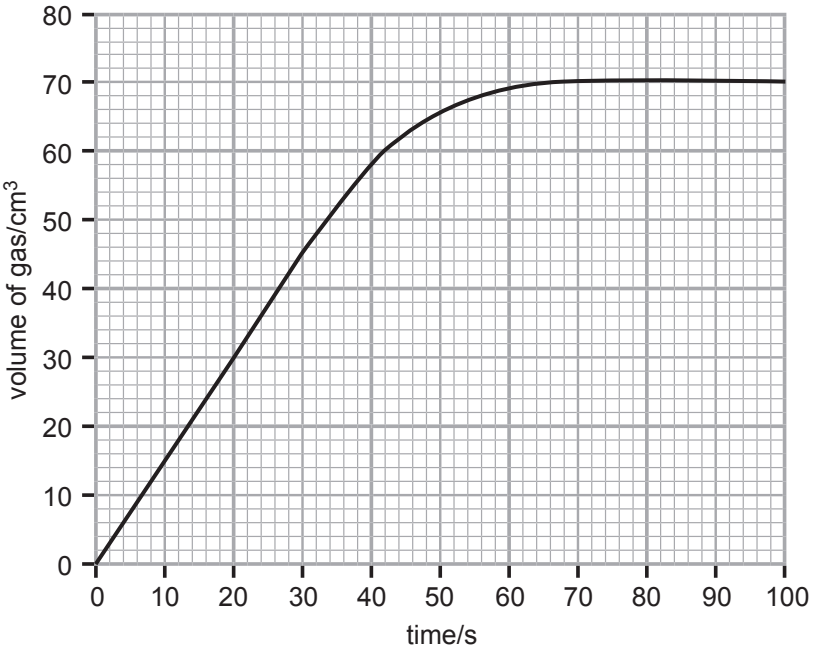
(a) (i) Draw a labelled diagram of the assembled apparatus which would be used to carry out the experiment and measure the volume of gas produced.

[4]

(ii) Write a balanced symbol equation for the reaction between zinc and hydrochloric acid.

_____ [3]

(b) The volume of gas produced was plotted against time as shown below.



(i) Explain why the graph levelled off.

_____

_____ [1]

(ii) The experiment was repeated at 40 °C. Sketch a graph on the axes above which would be obtained at 40 °C with all other factors being the same.

[1]

(iii) What was the total volume of gas produced during the experiment?

_____ [1]

(iv) At what time did the reaction finish?

_____ [1]

[Turn over

4 The reactivity of metals varies greatly. Many different reactions of metals may be used to determine a reactivity series.

(a) Five metals were reacted with dilute nitric acid. The initial temperature of the nitric acid was recorded before the metal was added. The highest temperature during the reaction was also recorded. The results are shown in the table below.

Metal	Initial temperature (°C)	Highest temperature (°C)	Temperature change (°C)
zinc	20	25	5
copper	20	20	0
magnesium	20	39	
iron	20	23	
tin	20	21	

(i) Complete the table. [1]

(ii) The reactivity series of four of the metals is given below. Place tin in this reactivity series.

Most reactive: magnesium

zinc

iron

Least reactive: copper

[1]

(iii) Explain how the data in the table shows that the reaction of magnesium and nitric acid is exothermic.

_____

_____ [1]

(iv) State two factors which should be kept the same during this experiment.

1. _____

2. _____ [2]

(v) Write a balanced symbol equation for the reaction of magnesium with nitric acid.

_____ [3]

[Turn over

(b) A series of displacement reactions was carried out with two other metals, chromium and cobalt. The results are shown in the table below. A tick (✓) indicates that a reaction occurs.

Metal	magnesium nitrate	zinc nitrate	iron(II) nitrate	copper(II) nitrate	tin(II) nitrate	chromium(III) nitrate	cobalt(II) nitrate
chromium	×	×	✓	✓	✓		✓
cobalt	×	×	×	✓	✓	×	

(i) Place a tick (✓) in the right hand box for the correct statements below.

Chromium is more reactive than cobalt	
Cobalt is more reactive than chromium	
Cobalt is more reactive than copper and tin	
Chromium is more reactive than iron and less reactive than zinc	

[2]

(ii) Name the two products of the reaction of cobalt and copper(II) nitrate.

_____ [2]

(iii) Write the formula for chromium(III) nitrate.

_____ [1]

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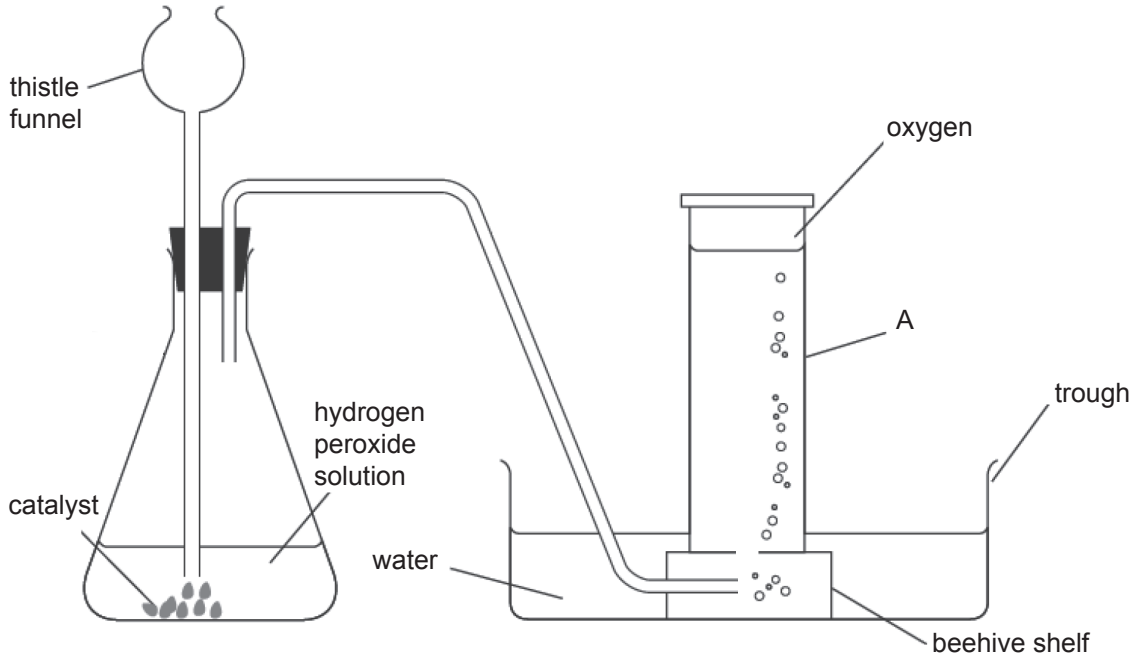
(Questions continue overleaf)

[Turn over

5 Oxygen, ammonia and carbon dioxide are gases at room temperature and pressure.

(a) The apparatus below is used to prepare and collect oxygen gas from the catalytic decomposition of hydrogen peroxide solution. The gas is collected over water.



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(i) Name the piece of apparatus labelled A.

_____ [1]

(ii) Explain why the bottom of the thistle funnel has to be below the level of the hydrogen peroxide solution in the conical flask.

_____

_____ [1]

(iii) State one physical property of oxygen which allows it to be collected in this way.

_____ [1]

(iv) The symbol equation below is for the decomposition of hydrogen peroxide. Balance the equation and add the missing state symbols.

$$H_2O_2 \longrightarrow H_2O + O_2(g)$$ [2]

(v) Name the catalyst used for the decomposition of hydrogen peroxide.

_____ [1]

(vi) What is meant by the term catalyst?

_____

_____

_____ [2]

(vii) Describe how you would test for oxygen gas.

_____

_____ [2]

[Turn over

(b) Ammonia gas is pungent and very soluble in water.

(i) Complete the passage below which describes the test for ammonia gas. Use the terms given in the box.

blue	hydrochloric acid	white
smoke	precipitate	sulfuric acid

Hold a glass rod which has been dipped in concentrated

_____ close to the gas. If ammonia

is present a _____ _____ is observed. [3]

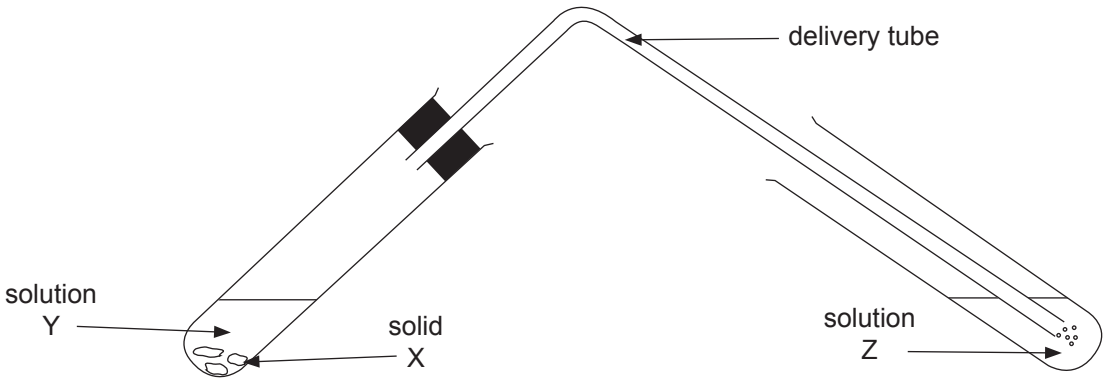
(ii) Ammonia solution is an alkali. Describe how you would test the solution to prove it is an alkali.

_____

_____

_____ [2]

(c) The following apparatus may be used to produce carbon dioxide in test tube 1 and test for carbon dioxide in test tube 2.



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(i) Solid X and solution Y can be used to produce carbon dioxide in test tube 1. Circle the correct name of solid X and of solution Y.

Solid X is: calcium calcium carbonate calcium oxide

Solution Y is: hydrochloric acid sodium hydroxide sodium chloride

[2]

(ii) Name solution Z which is used to test for carbon dioxide.

_____ [1]

(iii) State what is observed when carbon dioxide is bubbled through solution Z.

_____

_____ [2]

(iv) Write the formula for carbon dioxide.

_____ [1]

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Question Number	**Marks**
1	
2	
3	
4	
5	
Total Marks	

Examiner Number

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SYMBOLS OF SELECTED IONS

Positive ions

Name	Symbol
Ammonium	NH_4^+
Chromium(III)	Cr^{3+}
Copper(II)	Cu^{2+}
Iron(II)	Fe^{2+}
Iron(III)	Fe^{3+}
Lead(II)	Pb^{2+}
Silver	Ag^+
Zinc	Zn^{2+}

Negative ions

Name	Symbol
Butanoate	$C_3H_7COO^-$
Carbonate	CO_3^{2-}
Dichromate	$Cr_2O_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	$HCOO^-$
Nitrate	NO_3^-
Propanoate	$C_2H_5COO^-$
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

SOLUBILITY IN COLD WATER OF COMMON SALTS, HYDROXIDES AND OXIDES

Soluble
All sodium, potassium and ammonium salts
All nitrates
Most chlorides, bromides and iodides EXCEPT silver and lead chlorides, bromides and iodides
Most sulfates EXCEPT lead and barium sulfates Calcium sulfate is slightly soluble

Insoluble
Most carbonates EXCEPT sodium, potassium and ammonium carbonates
Most hydroxides EXCEPT sodium, potassium and ammonium hydroxides
Most oxides EXCEPT sodium, potassium and calcium oxides which react with water

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Data Leaflet

Including the Periodic Table of the Elements

For the use of candidates taking
Science: Chemistry,
Science: Double Award
or Science: Single Award

Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations

gcse examinations

chemistry

For first teaching from September 2017

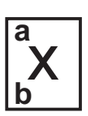
THE PERIODIC TABLE OF ELEMENTS

Group

1	2											3	4	5	6	7	0
1 **H** Hydrogen 1																	4 **He** Helium 2
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	98 **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	210 **Po** Polonium 84	210 **At** Astatine 85	222 **Rn** Radon 86
223 **Fr** Francium 87	226 **Ra** Radium 88	227 **Ac†** Actinium 89	261 **Rf** Rutherfordium 104	262 **Db** Dubnium 105	266 **Sg** Seaborgium 106	264 **Bh** Bohrium 107	277 **Hs** Hassium 108	268 **Mt** Meitnerium 109	271 **Ds** Darmstadtium 110	272 **Rg** Roentgenium 111	285 **Cn** Copernicium 112						

* 58 – 71 Lanthanum series
† 90 – 103 Actinium series

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	145 **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	231 **Pa** Protactinium 91	238 **U** Uranium 92	237 **Np** Neptunium 93	242 **Pu** Plutonium 94	243 **Am** Americium 95	247 **Cm** Curium 96	245 **Bk** Berkelium 97	251 **Cf** Californium 98	254 **Es** Einsteinium 99	253 **Fm** Fermium 100	256 **Md** Mendelevium 101	254 **No** Nobelium 102	257 **Lr** Lawrencium 103



a = relative atomic mass (approx)
x = atomic symbol
b = atomic number