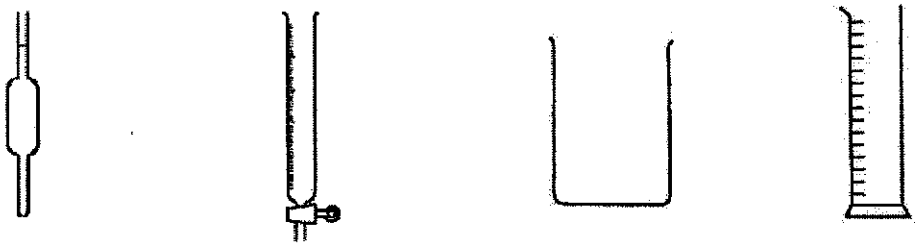
21 Which of the following apparatus is most suitable to measure exactly 25.40 cm^3 of aqueous sodium hydroxide into a beaker?



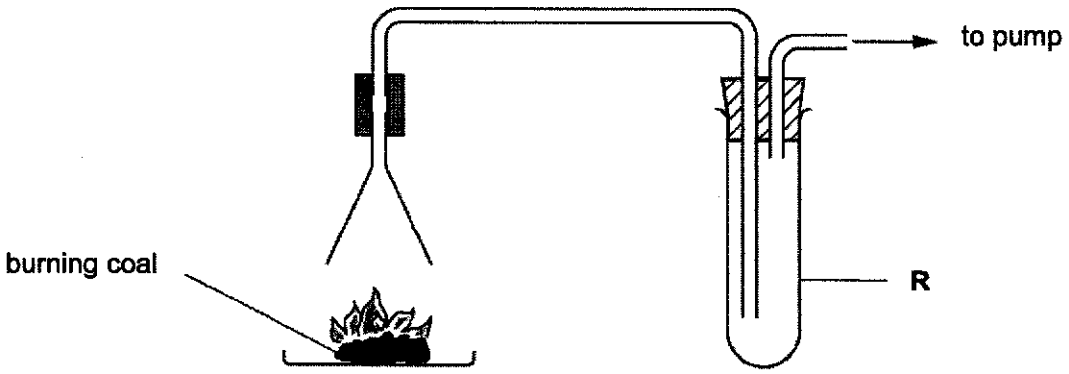
A **B** **C** **D**

22 Mercury is a liquid at 25 °C.

What is the melting point and the boiling point for mercury?

	melting point/ °C	boiling point/°C
A	45	108
B	- 5	- 90
C	- 89	- 4
D	-39	357

23 The diagram shows the apparatus used to test for the gases produced by burning coal.



Which reagent should be placed in test tube **R** to show that sulfur dioxide is formed?

A aqueous potassium iodide

B acidified potassium manganate(VII)

C aqueous calcium hydroxide

D aqueous sodium hydroxide

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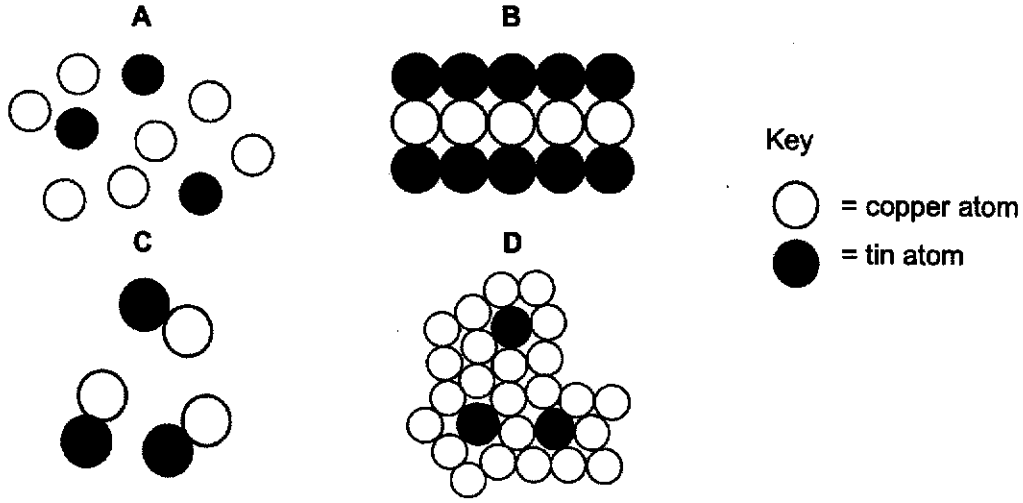
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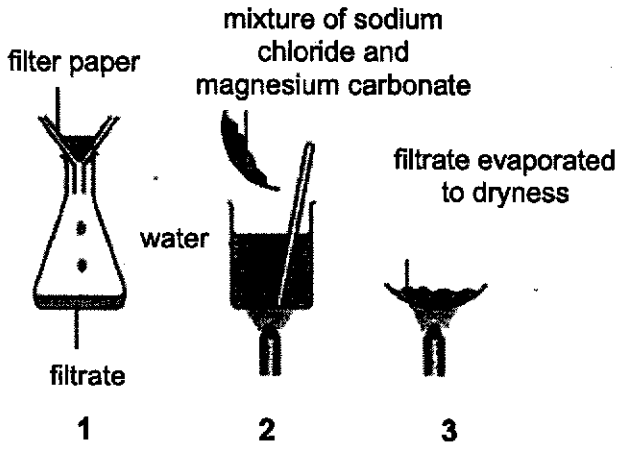
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24 Which diagram best shows the arrangement of atoms in bronze at room temperature?



25 A solid mixture of sodium chloride and magnesium carbonate is separated using the steps shown below.



In which order should the steps be carried out to separate the two chemicals?

A 2 → 1 → 3
B 1 → 2 → 3
C 3 → 1 → 2
D 2 → 3 → 1

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26 Two naturally occurring isotopes of uranium can be represented as $^{235}_{92}U$ and $^{238}_{92}U$.

Which of the following statements is correct?

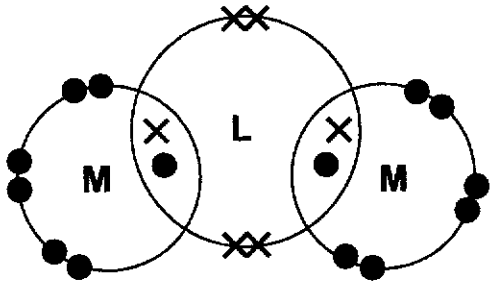
A They have the same number of electrons and protons.

B They have the same number of neutrons and protons.

C They have the same number of neutrons and electrons

D They have the same number of nucleons and electrons.

27 The diagram shows the arrangement of electrons in the valence shell of the atoms in the compound $\mathbf{LM_2}$.



×: electrons of **L**
●: electrons of **M**

Which of the following pairs of elements could **L** and **M** be?

	L	M
A	carbon	fluorine
B	fluorine	sulfur
C	sulfur	hydrogen
D	oxygen	chlorine

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28 Metal **P** and non-metal **Q** react together to form an ionic compound P_3Q_2.

Which of the following correctly describes the electrons gained and lost by each atom?

	electrons lost by each atom of P	electrons gained by each atom of Q
A	1	3
B	2	3
C	3	2
D	2	1

29 Sodium, aluminium and sulfur are in the same period of the Periodic Table.

Which trend in types of oxides occur across this period?

	left	⟶	right
A	acidic	amphoteric	basic
B	amphoteric	basic	acidic
C	basic	amphoteric	acidic
D	basic	acidic	amphoteric

30 Four aqueous solutions, **J**, **K**, **L** and **M** have the pH values as shown in the table.

solution	**J**	**K**	**L**	**M**
pH	2	6	8	10

Which pair produces an alkaline solution when mixed?

A J and K
B J and M
C K and L
D L and M

31 Which of the following salts can be prepared using titration?

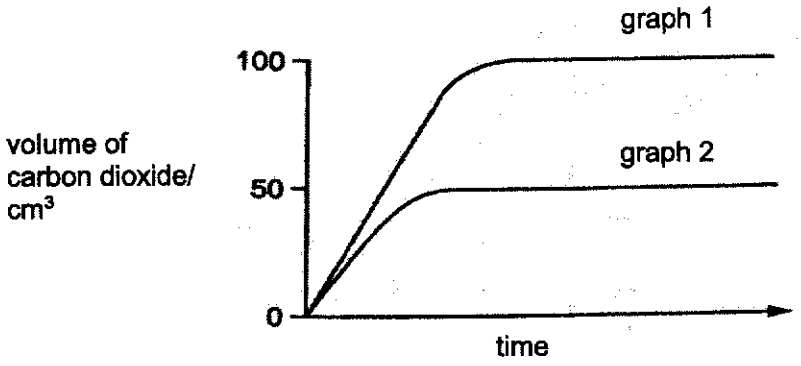
A potassium chloride
B copper (II) chloride
C calcium sulfate
D silver nitrate

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32 Some crystals of zinc carbonate were added to an excess of sulfuric acid at room temperature.

The volume of carbon dioxide produced was measured over a period of time. The results are shown in graph 1.

The experiment was repeated and graph 2 was obtained.



Which change was used to obtain the results shown in graph 2?

A Acid of the same volume and half the original concentration was used.

B Larger pieces of zinc carbonate was used in the reaction.

C The mass of zinc carbonate used was decreased by half.

D A lower temperature was used.

33 Element **G** can form an ion G^+ which has an electronic structure of 2,8,8.

Which of the following statements about element **G** are correct?

I **G** can be cut with a knife.
II **G** is a strong oxidising agent.
III **G** is in Period 4 of the Periodic Table.
IV **G** reacts with cold water.

A I and II only
B I and III only
C I, III and IV only
D II, III and IV only

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34 The results of three halogen displacement experiments are shown in the table.

experiment	halogen added	halide solution		
		Q^-	R^-	S^-
1	Q_2	-	R_2 displaced	S_2 displaced
2	R_2	no reaction	-	no reaction
3	S_2	no reaction	R_2 displaced	-

Which row correctly shows the identity of halogens **Q**, **R** and **S**?

	Q	R	S
A	Cl	I	Br
B	Cl	Br	I
C	Br	Cl	I
D	I	Br	Cl

35 Steel is an alloy of iron and carbon.

Which of the following statements is correct?

A Steel cannot conduct electricity.

B The iron in steel can react with hydrochloric acid.

C Steel can be represented with a chemical formula.

D Steel is formed by a chemical reaction between iron and carbon.

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36 The table shows some reactions of metals **P**, **Q**, **R** and **S**.

metal	action of hydrochloric acid on metal	action of carbon on heated metal oxide	action of hydrogen gas on heated metal oxide
P	a lot of effervescence seen immediately	reduced	not reduced
Q	a lot of effervescence seen immediately	not reduced	not reduced
R	some effervescence after a long time	reduced	reduced
S	no reaction	reduced	reduced

What is the order of reactivity for metals **P**, **Q**, **R** and **S**?

	least reactive → most reactive			
A	P	Q	R	S
B	Q	P	R	S
C	S	R	P	Q
D	S	R	Q	P

37 The following passage describes some reactions that take place during the extraction of iron in the blast furnace.

"An ore of iron, **W**, is mixed with coke and limestone, and added into a blast furnace.

Hot **X** is blasted in through a ring of pipes from the bottom of the furnace.

The coke burns, producing gas **Y**, which is reduced by reaction with more coke to give gas **Z**. Gas **Z** then reduces the iron ore to iron."

Which row correctly shows the identity of substances **W**, **X**, **Y** and **Z**?

	W	X	Y	Z
A	haematite	air	carbon monoxide	carbon dioxide
B	haematite	air	carbon dioxide	carbon monoxide
C	carbon	carbon monoxide	carbon dioxide	oxygen
D	carbon	carbon monoxide	oxygen	carbon dioxide

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38 Which statement is not a reason for recycling copper?

A Recycling decreases the energy requirement to obtain metals.

B Recycling decreases the environmental damage due to mining.

C Recycling decreases the amount of natural resources available.

D Recycling decreases the amount of scrap metal accumulating in the environment.

39 The reaction between iron (III) ions and calcium metal is represented by the equation.

$$2\ Fe^{3+}\ (aq) + 3\ Ca\ (s) \rightarrow 3\ Ca^{2+}\ (aq) + 2\ Fe\ (s)$$

Which statement is correct?

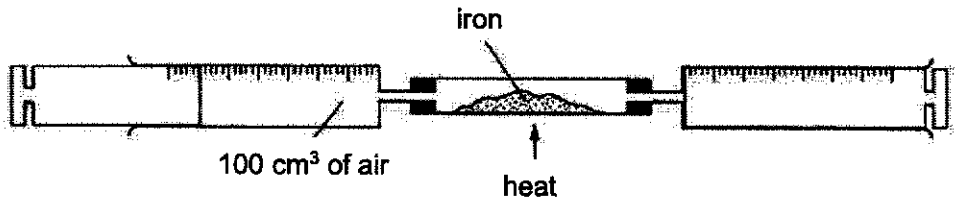
A Fe^{3+} ions are oxidised by loss of electrons.

B Fe^{3+} ions are reduced by gain of electrons.

C Calcium metal is reduced by loss of electrons.

D Calcium metal is oxidised by gain of electrons.

40 A 100 cm^3 sample of air is trapped in a syringe. The air is slowly passed over heated iron in a tube until there is no further decrease in volume.



When cooled to the original temperature, what is the volume of gas that remains in the syringe?

A 1 cm^3 **B** 21 cm^3 **C** 78 cm^3 **D** 100 cm^3

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East Spring Secondary School

Towards Excellence and Success

Name: _____ ( )

Class: _____

Preliminary Examinations 2020
Secondary 4 Express / 5 Normal Academic

Science (Chemistry) **5076/03**
Paper 3 **5078/03**

Monday
31 August 2020

1 hour 15 minutes
0800 - 0915

READ THESE INSTRUCTIONS FIRST

1. Write your name, class and register number on the Question paper.

2. This paper consists of 2 sections:

   Section A [45 marks]
   Answer **ALL** questions in the spaces provided on pages 2 to 8.

   Section B [20 marks]
   Answer **ALL** questions in the spaces provided on pages 9 to 11.

3. The use of a calculator is allowed.

4. A copy of the colours of common metal hydroxides is given on page 12.

5. A copy of the Periodic Table is given on page 13.

6. The number of marks is given in brackets [ ] at the end of each question or part question.

Section	Marks
Section A	45
Section B	20
Total	65

This question paper consists of **13** printed pages including the cover page.

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Section A [45 marks]
Answer **all** questions in the spaces provided.

1 Fig. 1.1 shows a few types of reactions.

complete combustion	precipitation	displacement	neutralisation
incomplete combustion	decomposition	reduction	

Fig. 1.1

With reference to Fig. 1.1, state the reaction that best describes the following changes:

(a) silver nitrate + potassium chloride → silver chloride + potassium nitrate

..... **[1]**

(b) calcium carbonate → calcium oxide + carbon dioxide

..... **[1]**

(c) magnesium hydroxide + sulfuric acid → magnesium sulfate + water

..... **[1]**

(d) copper (II) sulfate + zinc → zinc sulfate + copper

..... **[1]**

(e) methane + oxygen → carbon monoxide + water

..... **[1]**

[Total : 5]

2 Complete Table 2.1 to describe the composition and electron arrangement of the following particles.

symbol of particle	number of protons	number of neutrons	electron arrangement
$^{23}_{11}Na$		12	2.8.1
$^{19}_{9}F^-$			

Table 2.1

[Total : 4]

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3 A student is asked to obtain water from aqueous iron (II) nitrate, using the following set-up as shown in Fig. 3.1.

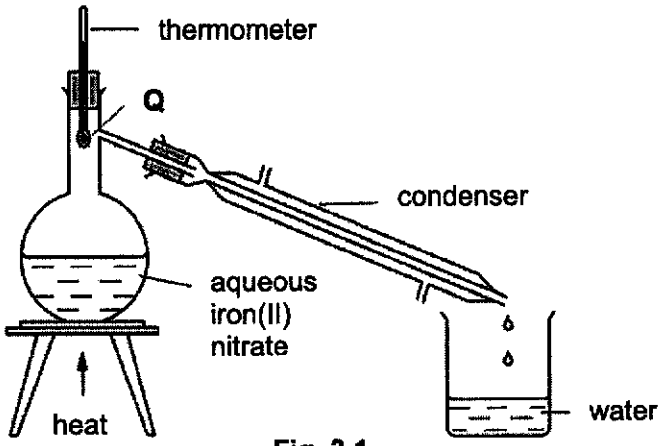


Fig. 3.1

(a) State the name for this method of separation.

..... [1]

(b) Explain why the thermometer is placed next to the opening of the condenser.

..... [1]

(c) Explain why the thermometer shows a range of temperatures rather than at a single temperature as separation takes place.

..... [1]

(d) Describe the arrangement and movement of particles at point **Q**.

.....

.....

..... [2]

(e) Describe how water can be obtained from the above set-up.

.....

.....

.....

..... [2]

[Total : 7]

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4 Calcium metal reacts with chlorine to form calcium chloride, $CaCl_2$.

Calcium chloride exists as a solid at room temperature and pressure, and is able to conduct electricity when molten.

(a) Name the type of chemical bonding present in calcium chloride.

..... **[1]**

(b) Draw a 'dot-and-cross' diagram to show the arrangement of the outer shell electrons in $CaCl_2$.

[3]

(c) Explain why calcium chloride is able to conduct electricity when molten.

.....

..... **[1]**

(d) Chlorine exists as a gas at room temperature and pressure. The chloride ion, Cl^-, is formed from a chlorine atom.

(i) Write an ionic equation for the formation of a chloride ion, Cl^-, from a chlorine atom. State symbols are **not** required.

..... **[1]**

(ii) Chlorine has a relative atomic mass of 35.5.

Explain why the relative atomic mass of chlorine is not a whole number.

.....

..... **[1]**

[Total : 7]

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5 Antacid tablets containing magnesium carbonate are used to relieve the stomach indigestion symptoms caused by excess hydrochloric acid in the stomach as shown in the following equation:

$$MgCO_3 + 2HCl \rightarrow MgCl_2 + H_2O + CO_2$$

One may often experience some burping after consuming the antacid tablets containing magnesium carbonate.

(a) A girl took some antacid tablets to relieve her stomach indigestion. Each tablet contains 0.21 g of magnesium carbonate.

It was discovered that her stomach contains 100 cm^3 of excess hydrochloric acid with a concentration of 0.15 mol/dm^3.

(i) Calculate how many moles of hydrochloric acid are present in 100 cm^3 of hydrochloric acid with a concentration of 0.15 mol/dm^3.

number of moles of hydrochloric acid = ... **[1]**

(ii) Calculate how many moles of magnesium carbonate are needed to neutralise the acid.

number of moles of magnesium carbonate = ... **[1]**

(iii) Calculate the number of antacid tablets that the girl needs to take to neutralise the acid.

number of antacid tablets = ... **[1]**

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(b) Explain why one may experience some burping after consuming the antacid tablets containing magnesium carbonate.

.....

..... **[1]**

[Total : 4]

6 When lead (II) oxide is heated with carbon, the following reaction takes place.

$$2PbO + C \rightarrow 2Pb + CO_2$$

(a) State, with a reason, which substance acts as the reducing agent.

reducing agent : .....

reason : .....

..... **[2]**

(b) In the above reaction, lead is extracted from its oxide when heated with carbon.

(i) Explain why carbon can be used to extract lead from lead (II) oxide, but not to extract magnesium from magnesium oxide.

.....

.....

..... **[2]**

(ii) Suggest how magnesium is extracted from its compounds.

..... **[1]**

[Total : 5]

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7 Emissions from coal fired power stations contain sulfur dioxide which causes acid rain.

(a) Suggest how sulfur dioxide gas is formed.

.....

..... **[1]**

(b) Acid rain causes soil to be acidic, and affects the growth of crops.

(i) Explain how the excess acidity in the soil can be removed, and how the pH of the soil changes during this removal.

.....

..... **[2]**

(ii) State one other effect of acid rain.

..... **[1]**

(c) Another air pollutant that can be produced from coal fired power stations is carbon monoxide. Explain why carbon monoxide can be dangerous to people.

.....

..... **[2]**

[Total : 6]

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8 Fig. 8.1 shows a series of experiments carried out on green solid **T**.

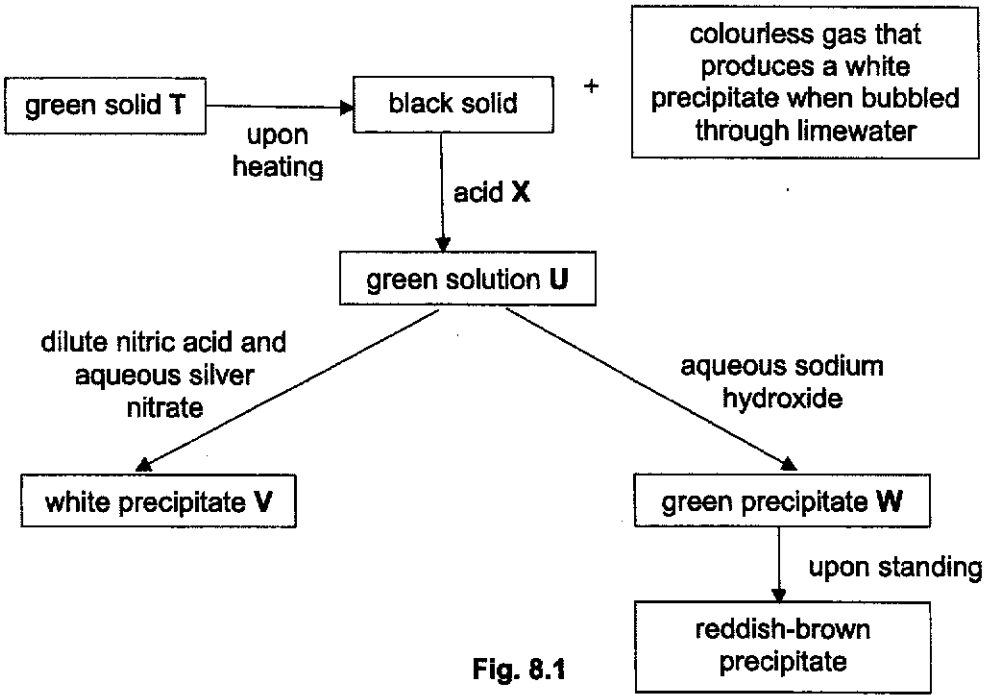


Fig. 8.1

(a) Name substances **T**, **U**, **V**, **W** and **X**.

(i) **T :** .....

(ii) **U :** .....

(iii) **V :** .....

(iv) **W :** .....

(v) **X :** ..... **[5]**

(b) Write an equation for any **one** of the reactions that are described within Fig. 8.1. State symbols are **not** required.

..... **[2]**

[Total : 7]

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Section B [20 marks]
Answer **all** questions in this section in the spaces provided.

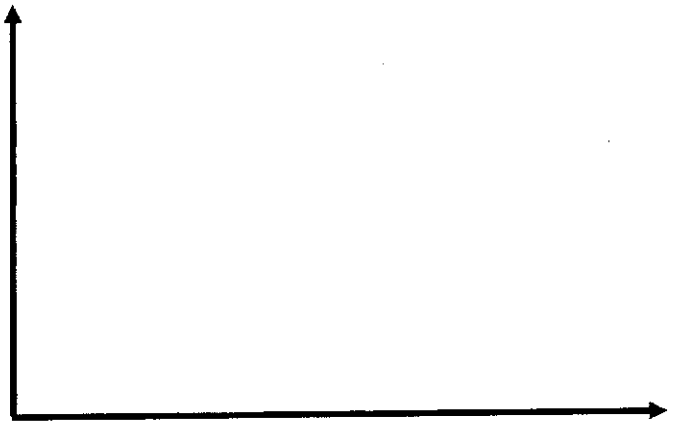
9 Pieces of magnesium ribbon was added to excess dilute nitric acid to produce a gas. This reaction completes in five minutes.

(a) **(i)** List the measurements that you would make to determine the speed of this reaction.

.....

..... **[2]**

(ii) On the axes below, label the axes and draw a graph for the measurements made in **(a)(i)** that would show how the speed of the reaction changes.



[2]

(iii) Describe how you would use your graph in **(a)(ii)** to determine the speed of reaction at two minutes.

.....

.....

.....

..... **[2]**

(b) On the same set of axes in the above graph, sketch another graph when the experiment is repeated at a lower temperature. Label your graph as "**B**". **[1]**

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(c) Using the Collision Theory, explain how and why the rate of reaction changed when nitric acid of a higher concentration was used.

.....

.....

.....

..... [2]

(d) An increase in temperature of the resulting solution was also recorded.

Explain what this indicates about the reaction.

..... [1]

[Total : 10]

10 (a) Sodium and the element of proton number 18 are in the same period of the Periodic Table, but have very different chemical properties.

(i) Explain why when moving across the Periodic Table from sodium to the element of proton number 18, the character of these elements changes from being metallic to non-metallic.

.....

..... [1]

(ii) Explain why these two elements are placed in the same period of the Periodic Table.

.....

..... [1]

(iii) Sodium and the element of proton number 18 have very different chemical properties. Use their electronic structures to explain this difference.

.....

.....

.....

..... [3]

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(b) Metals can be placed in a reactivity series. Magnesium and zinc are listed in the reactivity series.

(i) Magnesium and zinc require different conditions to react with water. By referring to these reaction conditions, justify the relative positions of magnesium and zinc in the reactivity series.

.....

.....

.....

.....

..... **[3]**

(ii) Brass is an alloy made of zinc and copper.

Explain why brass is harder than either of the pure metals.

.....

.....

.....

..... **[2]**

[Total : 10]

- End of Paper -

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Data Sheet

Colours of Some Common Metal Hydroxides

calcium hydroxide	white
copper (II) hydroxide	light blue
iron (II) hydroxide	green
iron (III) hydroxide	red-brown
lead (II) hydroxide	white
zinc hydroxide	white

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The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
		Key proton (atomic) number atomic symbol name relative atomic mass					1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89 – 103 actinoids	104 Rf Rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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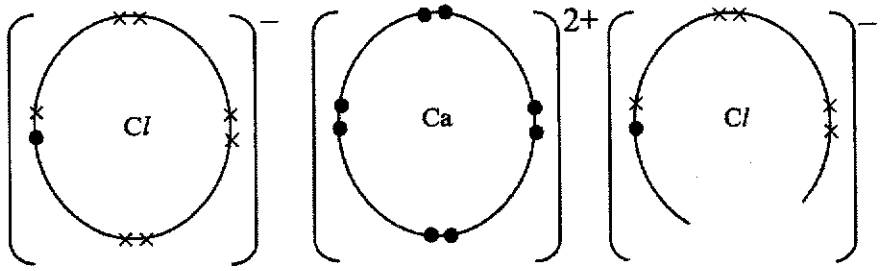
Paper 1 (20M)

21	22	23	24	25	26	27	28	29	30
B	D	B	D	A	A	D	B	C	D
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
A	C	C	A	B	C	B	C	B	C

Paper 3 Section A (45m)

Qn. No	Answer	Marks
1a	Precipitation	1
1b	Decomposition	1
1c	Neutralisation	1
1d	Displacement REJECT: Reduction as reaction is a REDOX reaction. Reduction does not BEST describes the chemical change.	1
1e	Incomplete combustion REJECT: Reduction as reaction is a REDOX reaction. Reduction does not BEST describes the chemical change.	1
2	**symbol of particle** / **number of protons** / **number of neutrons** / **electron arrangement** $^{23}_{11}Na$ / **11** / 12 / 2.8.1 $^{19}_{9}F^-$ / **9** / **10** / **2.8**	1M each Total 4M
3a	Simple **Distillation/ Distillation**	1
3b	To ensure that the thermometer measures the **boiling point** of the substance being distilled.	1
3c	It is a **mixture/ not pure.**	1
3d	Particles are **far apart** in a random manner; And are moving at a **high speed** in **random** directions	3c –2M 1 – 2c – 1M
3e	Aqueous iron (II) nitrate / solution is heated. At 100°C, water **boils**; **Hot** water **vapour/steam** enters the condenser;	3c – 2M 1 – 2c – 1M

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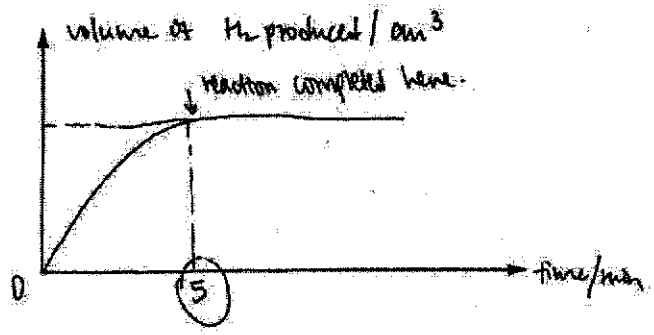
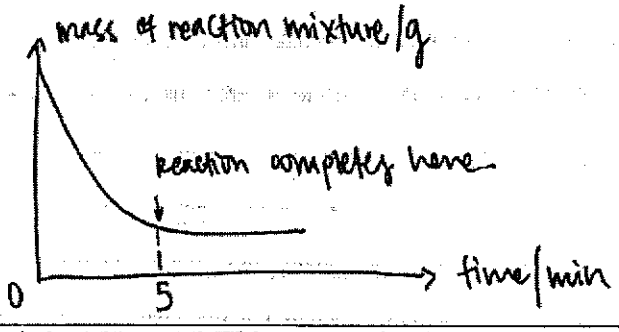
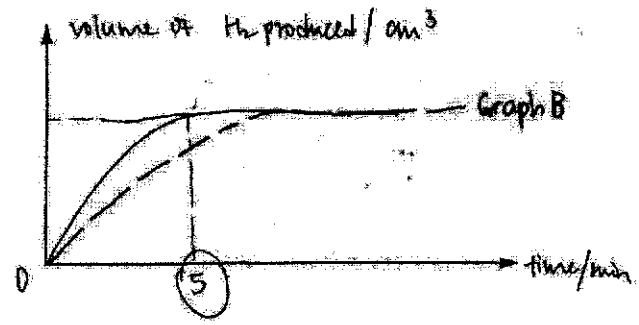
	Hot water vapour/steam is **cooled** / **condenses** into pure water, which is collected as the distillate.	
4a	Ionic bonding	1
4b	 Key ● Electrons of Ca X Electrons of Cl Penalise 1m if chloride ion has a repeated error (instead of 2m). Penalise 1m if charge for ions are written wrongly.	Each ion – 1m Total 3M
4c	Giant ionic lattice structure breaks down, hence there are **presence of free moving / mobile ions** to carry electrical charges. REJECT: Charge carriers	1
4di	$Cl + e^- \rightarrow Cl^-$	1
4dii	There are presence of **isotopes** in different relative abundance.	1
5ai	No. of mol. of HCl/H^+ = (100/1000) x 0.15 = **0.015 mol**	1
5aii	No. of mol. of $MgCO_3$ required = 0.015 / 2 = **0.0075 mol**	1
5aiii	No. of mol. of $MgCO_3$ in one tablet = 0.21 / 84 = **0.0025 mol** No. of tablets = 0.0075 / 0.0025 = **3**	1
5b	The magnesium carbonate / antacid reacts with the acid to **produce carbon dioxide gas**, thus leading to the burping.	1
6a	Reducing agent : **carbon/C**	1

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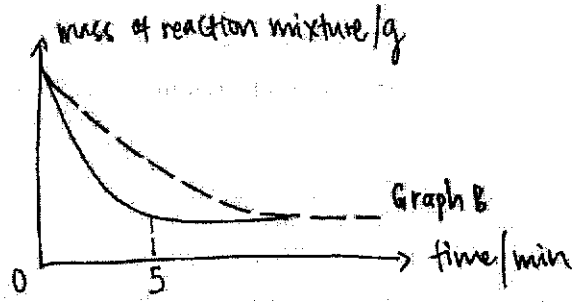
	Reason : It is **oxidized** as it **gains oxygen** to **form carbon dioxide** / The **oxidation state** of **carbon increased from 0 to +4** in carbon dioxide / **Lead (II) oxide is reduced** as it **loses oxygen** to **form lead** / The **oxidation state** of **lead decreased from +2 in lead (II) oxide to 0.** / Lead (II) ion **gained two electrons** to form lead metal.	1
6b	**Carbon is more reactive than lead**, hence it can **reduce lead (II) oxide to lead**; whereas **carbon is less reactive than magnesium**, hence it **cannot reduce magnesium oxide.**	4c – 2M 2 – 3c – 1M 1c – 0M
6bii	**Electrolysis / By using electricity/By using a more reactive metal to displace the less reactive metal from its metal ore.**	1
7a	Coal contains **sulfur** as an impurity, hence when coal is burnt, **sulfur reacts with oxygen** to form sulfur dioxide. Also accept: Volcanic eruptions	1
7bi	**Add slaked lime / calcium hydroxide** to **neutralize** the **acidic soil/ neutralize acid in soil;** **pH** of soil **increases** Also accept: quicklime / calcium oxide.	1 1
7bii	**Corrodes marble/limestone buildings** OR Lakes become acidic, **killing** the **fishes/marine life**	Any 1 - 1
7c	Carbon monoxide is **poisonous/toxic**; **reacts with haemoglobin** in the blood to form **carboxyhaemoglobin,** a stable compound which reduces the ability of blood to carry oxygen.	1 1
8ai	Iron (II) carbonate	1
8aii	Iron (II) chloride	1
8aiii	Silver chloride	1
8aiv	Iron (II) hydroxide	1
8av	Hydrochloric acid	1
8b	$FeCO_3 \rightarrow FeO + CO_2$ / $FeO + 2HCl \rightarrow FeCl_2 + H_2O$ / $FeCl_2 + 2AgNO_3 \rightarrow Fe(NO_3)_2 + 2AgCl$ / $FeCl_2 + 2NaOH \rightarrow 2NaCl + Fe(OH)_2$ $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$	corr. chemical formulas – 1M Balanced – 1M

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Section B (20 M)

Qn. No	Answer	Marks
9ai	- **volume** of hydrogen **gas** produced over fixed intervals of time / **mass of reaction mixture** over fixed intervals of time - **time taken** for the reaction to complete	1 1
9aii	volume of gas produced method:  OR mass of reaction mixture method:  	1 – corr axes with units 1 – corr shape of graph
9aiii	**Draw** a **tangent** to the curve **at 2 minutes**. **Measure/calculate** the **gradient/slope** of the tangent to determine the speed of reaction.	1 1
9b	volume of gas produced method:  OR	1

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	mass of reaction mixture method:  	
9c	Speed of reaction **increases / is higher**; Because **concentration** of hydrochloric acid **increases / is higher**, therefore there are **more reactant particles per unit volume**; And thus there is a **higher rate of** collision and **effective collisions** between reactant particles.	3c – 2M 1 – 2c – 1M
9d	Reaction is **exothermic/reaction produce heat/gives out heat.**	1
10ai	Moving from sodium to element with proton number 18 (argon), the atoms **change from losing electrons to gaining electrons** to **achieve the stable noble gas electronic configuration**.	1
10aii	Both have **3 electron shells.**	1
10aiii	The element with proton number 18 is chemically inert/ unreactive and potassium is reactive. This is because the element with proton number 18 has an electronic structure of **2.8.8**, hence it has a **completely filled valence shell**. It **does not need to lose, gain or share electrons** with other elements. However, sodium has an electronic structure of **2.8.1/1 valence electron** and it **needs to lose 1 electron to achieve a stable electronic configuration of noble gas /need to lose 1 electron to achieve a completely filled valence shell.** 1m for e.c of both elements. 1m for discussing how argon has a completely filled shell. 1m for discussing how sodium needs to lose 1 electron.	1 1 1
10bi	Zinc **does not react with cold water** but **reacts with steam**; Magnesium **reacts** (slowly) **with cold water**; As zinc requires a higher temperature to react with water compared to magnesium; **therefore magnesium is above zinc / zinc is below magnesium in the reactivity series**;	1 1 1

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10bii	In brass, the **atoms are of different sizes.** This disrupts the **orderly arrangement of the zinc/pure metal atoms** and it is **difficult for the layers of atoms to slide over each other** when a force is applied. This makes brass harder than pure zinc and pure copper.	3c – 2m 2c – 1m 0-1c -0m

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