

Name: _____ ()

Class: _____

CHIJ ST NICHOLAS GIRLS' SCHOOL

Secondary 4

Termly Assessment 1 (35 Marks)

Chemistry (6092)

2024

50 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, register number, and class on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

Do not use highlighters, glue, correction fluid or correction tape.

Answer **all** questions.

Write all answers on the question paper.

The use of a scientific calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

A copy of the Periodic Table is provided on Page 2.

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

The total number of marks for this paper is 35.

	Marks
Section A (5)	
Section B (20)	
Section C (10)	
Total	

This document consists of **12** printed pages.



圣尼各拉女校

CHIJ ST NICHOLAS GIRLS' SCHOOL

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[Turn over

The Periodic Table of Elements

Group																																					
1	2	Key										13	14	15	16	17	18																				
		1 H hydrogen 1																																			
		proton (atomic) number atomic symbol name relative atomic mass																																			
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	3	4	5	6	7	8	9	10	11	12																										
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 –	113 Nh nihonium –	114 Fl flerovium –	115 Lv livermorium –	116 Ts tennessine –	117 Og oganesson –	118 –

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
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 –

actinoids

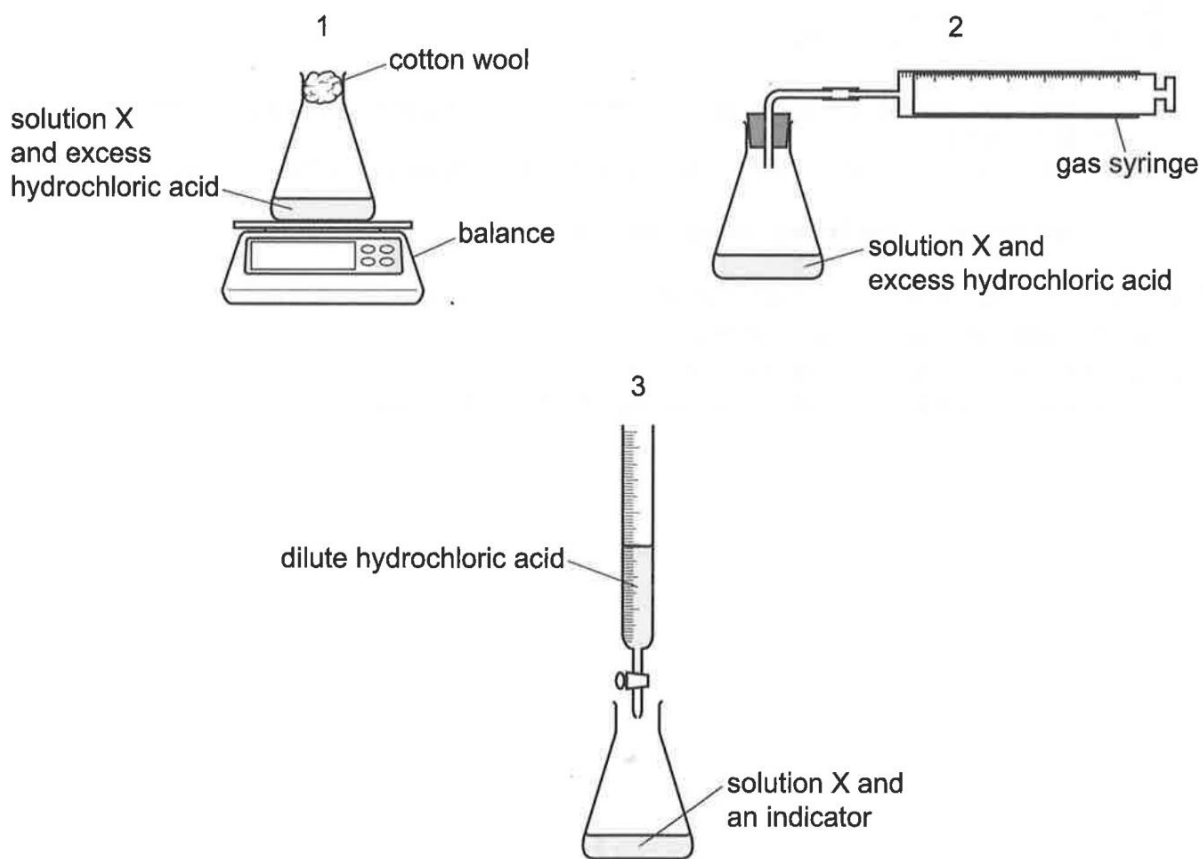
Topics tested: Experimental techniques, mole concept, metals and electric cells.

Section A : Multiple choice Questions (5 marks)

Answer all questions in this section. Circle the correct answers in the table provided on page 5.

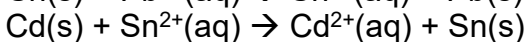
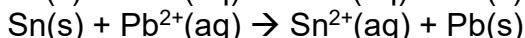
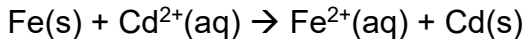
- 1 Solution X is a mixture of aqueous sodium hydroxide and aqueous sodium carbonate.

Which apparatus could be used on its own to determine the number of moles of sodium carbonate present in solution X?

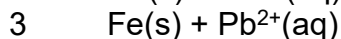
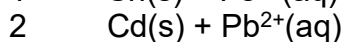
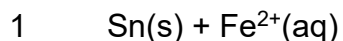


- A** 1 only
B 3 only
C 1 and 2
D 2 and 3

2 The ionic equations for some reactions are as follows:



Which of the following pairs will result in a reaction?



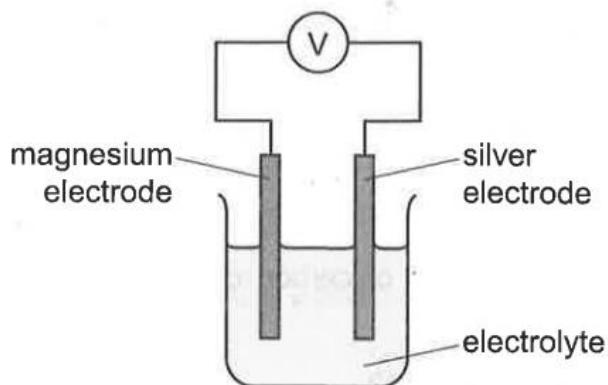
A 1 only

B 2 only

C 3 only

D 2 and 3 only

3 The diagram shows an electric cell.



The electrolyte contains dilute sulfuric acid. Which statement about the cell is correct?

A Electrons flow from magnesium to silver via the electrolyte.

B Magnesium gives away electrons and gets oxidised but silver takes in electrons and gets reduced.

C Magnesium gets smaller and silver remains unchanged in size.

D The concentration of magnesium ions increases in the electrolyte and the electrolyte becomes more positively charged.

- 4 Iron forms a few oxides, FeO , Fe_2O_3 and Fe_3O_4 . Fe_3O_4 contains both Fe^{2+} and Fe^{3+} . What is the ratio of Fe^{2+} and Fe^{3+} in Fe_3O_4 ?

- A 1 to 1
- B 1 to 2
- C 2 to 1
- D 3 to 4

- 5 A sample of brass was added to excess dilute hydrochloric acid. When the reaction has completed the mixture was filtered.

What ions would be present in the filtrate?

- 1. copper(II) ions
- 2. hydrogen ions
- 3. chloride ions
- 4. zinc ions

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

Answers to section A: Circle the most appropriate answer to each question.

1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D

Section B : Short structure Questions (20 marks)

- B1** Paper chromatography was used to analyse four unknown vitamins, **V1**, **V2**, **V3** and **V4**. Two solvents **S1** and **S2** were used for the analysis. The mixture of **V1** to **V4** was initially placed on the **V4** position and the chromatography paper was placed in solvent **S1**. The chromatogram was then dried, rotated anti-clockwise and placed in solvent **S2**.

The results are shown in the chromatogram below after treatment with a locating agent.

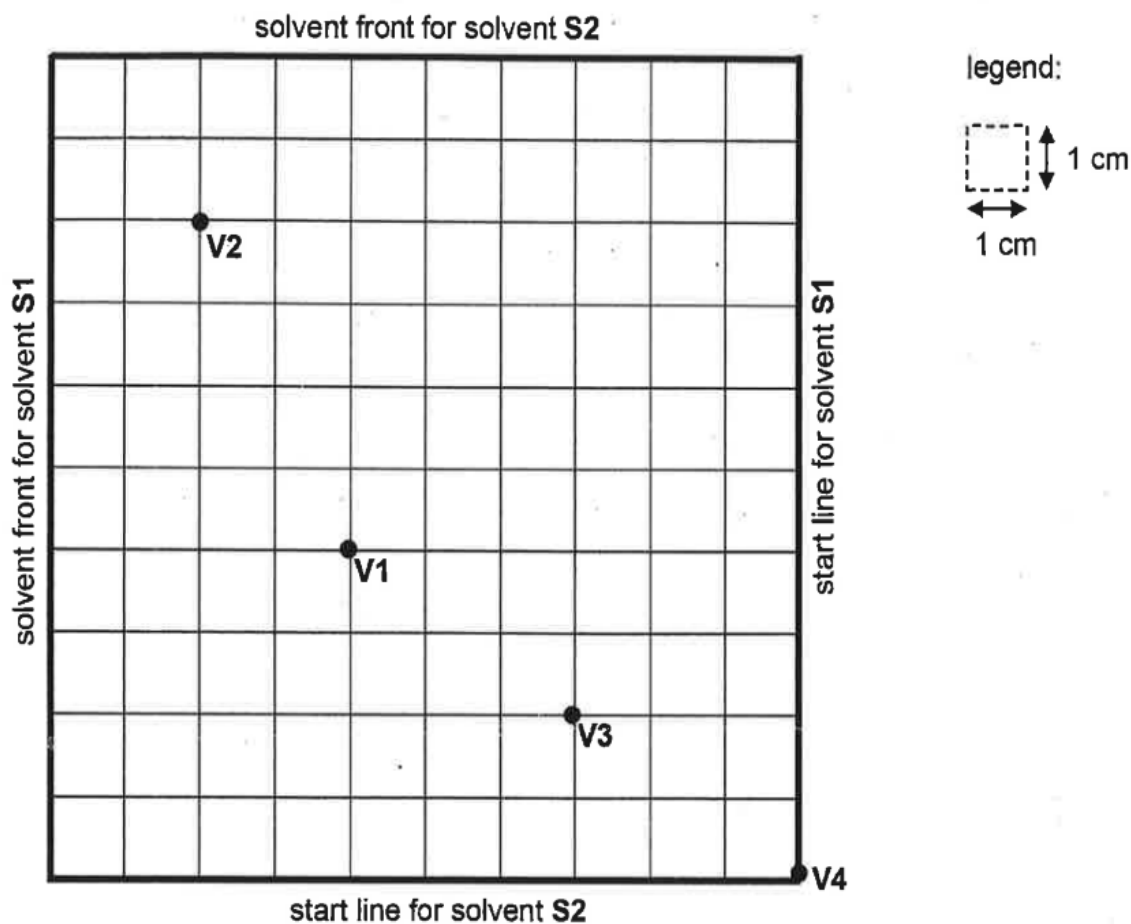


Table B1.1 shows the R_f values of some of the known vitamins, A, D, E and K, that are soluble in both solvents S1 and S2.

Table B1.1

vitamin	R_f value for solvent S1	R_f value for solvent S2
A	0.1	0.7
D	0.6	0.4
E	0.8	0.8
K	0.6	0.2

- (a) Explain why the spots in the chromatogram have to be treated with a locating agent.

.....
[1]

- (b) A student deduced that **V1** and **V3** each matches a vitamin in **Table B1.1**. Do you agree? Explain your reasoning.

.....

[2]

- (c) (i) Give a possible reason for the observation recorded for **V4** in the chromatogram.

.....[1]

- (ii) Hence, suggest a change to the experiment set-up that will make the identification of **V4** possible.

.....[1]

[Total: 5]

- B2** Some metals react with cold water and some metals react with steam. Calcium reacts with water as shown.



40 g of calcium reacts with 100 g of water in a beaker. The initial mass of the mixture is 140 g. At the end of the reaction, there is excess water left and the final mass of the solution obtained was recorded.

- (a)** Calculate the mass of hydrogen gas produced and hence calculate the final mass of the solution recorded.

[2]

- (b)** The experiment was repeated with 40 g of barium and 40 g of copper separately.

Deduce, without calculation, whether the final mass of solution obtained would be more or less than that in part **(a)** when the reaction has ended in each experiment. Note that the chemical reactivity of group 2 elements increases down the group.

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

- (c) Red hot iron reacts with steam. Construct an equation, with state symbols, for the reaction of iron with steam. The oxide formed is Fe_3O_4 .

.....[2]

[Total: 7]

B3 The apparatus shown in **Fig. B3.1** is used to heat a metal carbonate.

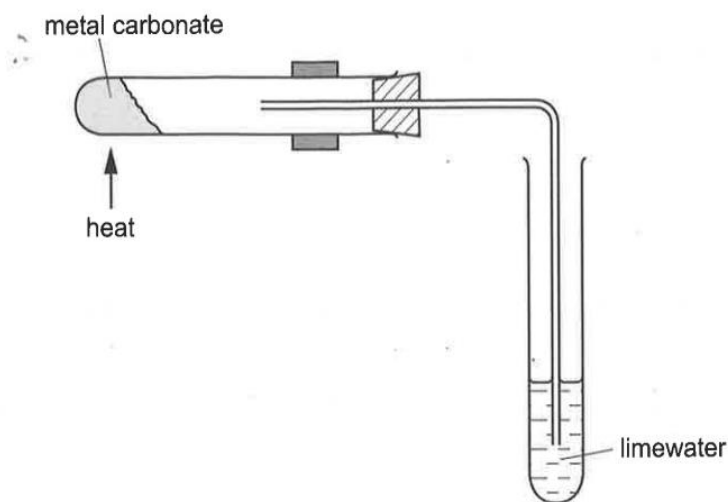


Figure B3.1

- (a) (i) The same amount of sodium carbonate, zinc carbonate and copper(II) carbonate are heated separately in the apparatus for one minute.

State and explain how you would expect the changes to limewater in each experiment to differ.

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.....

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.....

.....

.....[2]

- (ii) Construct an equation, with state symbols, for the reaction that occurs when zinc carbonate is decomposed by heat.

.....[2]

- (iii) Complete the table below. State the colours of the three carbonates and their residues formed during the process.

carbonate	colour	residue when hot	residue when cold
sodium	white		white
zinc	white		white
copper			black

[2]

- (b) A sample of copper(II) carbonate was contaminated with sodium carbonate. Describe how the two carbonates may be separated and be obtained as dry solid.

.....

.....

.....[2]

[Total:8]

Section C : Long structured questions (10 marks)

C1 (a) Batteries for electric cars can be made with an electrode of zinc and an electrode of carbon. During discharge, the zinc dissolves as ions, which migrate through the electrolyte to the carbon electrode, where they combine with oxygen from the air and water to form zinc hydroxide.

(i) Sketch a fully labelled diagram of the above electric cell. Your diagram should include

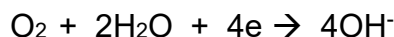
- the electrode that provides electrons to the external circuit by drawing an arrow in the wire
- the positive and negative electrodes

[2]

(ii) Construct the half ionic equation at the zinc electrode.

.....[1]

(iii) Given that the reaction occurring at the carbon electrode is as follows:



Construct the overall equation for the reaction in the electric cell.

.....[1]

(iv) Suggest a suitable alkaline solution to be used as an electrolyte.

.....[1]

- (v) The voltage for the zinc/carbon electric cell is 1.16 V. Name a suitable metal that could be used to replace zinc to provide a higher voltage.

.....[1]

- (b) Electric cars may be run with a hydrogen fuel cell in which hydrogen and oxygen are fed into the fuel cell to produce electricity.

Construct the overall equation for the reaction in hydrogen fuel cell.

.....[1]

- (c) Both reactions in the zinc/carbon electric cell and the hydrogen fuel cell are spontaneous. State **two** similarities and **one** difference between the two cells.

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.....

.....[3]

END OF PAPER