



Established in 1879

Raffles Girls' School

(SECONDARY)

Name: _____

Class: 4 / _____

Register No: _____

CHEMISTRY YEAR FOUR

Pen-and-Paper Assessment 2 (Formative)

Wednesday

10 June 2020

1 hour

INSTRUCTIONS TO CANDIDATES

This question paper contains two sections.

Section A - Answer **ALL** the questions and record your answers on the OMR answer sheet.

Section B - Answer **ALL** the questions and write your answers in the spaces provided.

Use only a black or dark blue pen.

Do not use correction tape or fluid.

Omission of essential working or units, or expressing answers with incorrect significant figures will result in a loss of marks.

INFORMATION FOR CANDIDATES

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 40.

A copy of the Periodic Table on page 12 is provided for your reference.

The weightage for this paper is 0%.

For examiners' use	
Section / Question	Marks Obtained
A	10
B1	4
B2	6
B3	8
B4	12
Working Statement	
Units	
Significant Figures	
Total marks	40

Parent's / Guardian's Name: _____

Signature: _____ Date: _____

Section A – Multiple Choice Questions [10 marks]

There are 10 questions in this section. Answer all questions. For each question, there are four possible answers (**A**, **B**, **C**, and **D**). Choose the most appropriate answer and record your choice on the OMR answer sheet.

- 1 Statement 1: Hydrogen is used as a fuel.

Statement 2: When hydrogen burns in the air to form water, heat energy is produced.

Which of the following is correct?

- A Both statements are correct and statement 2 explains statement 1.
- B Both statements are correct but statement 2 does not explain statement 1.
- C Statement 1 is correct but statement 2 is incorrect.
- D Statement 2 is correct but statement 1 is incorrect.

- 2 A sample of nitrogen gas contains the same number of atoms as found in 2.00 g of helium gas. What is the mass of the sample of nitrogen gas?

- A 2.00 g
- B 7.00 g
- C 14.0 g
- D 28.0 g

- 3 A metal M forms a chloride salt of formula MCl . What is the formula of the oxide of M?

- A MO
- B M_2O
- C MO_2
- D M_2O_3

- 4 The diagram shows a match.



By striking the match, a chemical reaction takes place.

Which row describes this chemical reaction?

	type of reaction	reason
A	endothermic	Energy is taken in as the match burns.
B	endothermic	Energy is given out to strike the match.
C	exothermic	Energy is given out as the match burns.
D	exothermic	Energy is taken in to strike the match.

5 Which of the following equations does **not** represent a redox reaction?

- A $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$
- B $\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2 + \text{MgSO}_4$
- C $\text{CaO} + 2\text{HCl} \rightarrow 2\text{H}_2\text{O} + \text{CaCl}_2$
- D $\text{Cu} + 4\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$

6 Chlorine reacts with cold dilute aqueous sodium hydroxide solution according to the following equation.



Which of the following statement is correct?

- A Chlorine is both reduced and oxidised.
- B Sodium hydroxide is both reduced and oxidised.
- C Chlorine is reduced and sodium hydroxide is oxidised.
- D Chlorine is oxidised and sodium hydroxide is reduced.

7 Acidified aqueous potassium iodide was added dropwise to a test tube of aqueous iron(II) chloride.

Which of the following describes the observation?

- A Brown solution turns colourless.
- B Colourless solution turns brown.
- C Pale green solution turns yellow.
- D No observable reaction seen.

8 Limestone can be converted into slaked lime, $\text{Ca}(\text{OH})_2$, in two steps.

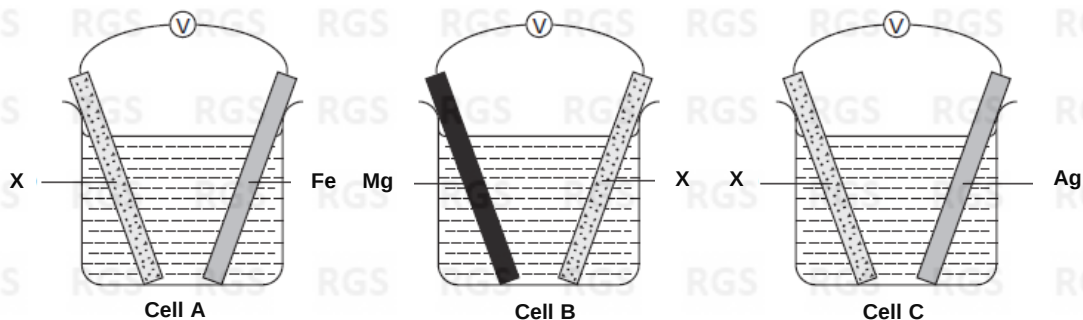
- 1 When limestone, CaCO_3 , is heated, it decomposes into lime, CaO .
- 2 Water is slowly dripped onto the cooled lime. The lime appears to expand and steam is produced. $\text{Ca}(\text{OH})_2$ is formed.

Which row shows the correct description of the steps above?

	reaction 1	reaction 2
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

- 9 Metal rods of iron, magnesium, silver and metal X were placed in beakers containing aqueous sodium chloride as electrolyte as shown in the diagrams below. The voltages recorded for each cell is given.

Cell	A	B	C
Voltage / V	- 0.31	2.25	0.93



Which is a possible identity of metal X?

- A Sodium
 B Zinc
 C Lead
 D Calcium
- 10 The same quantity of electricity is passed through two separate electrolytic cells, one containing dilute sulfuric acid, and the other containing an aqueous solution of a salt, Y_2SO_4 . If the volume of hydrogen gas liberated from the sulfuric acid under room conditions is 2.40 dm^3 , what is the number of moles of Y deposited?

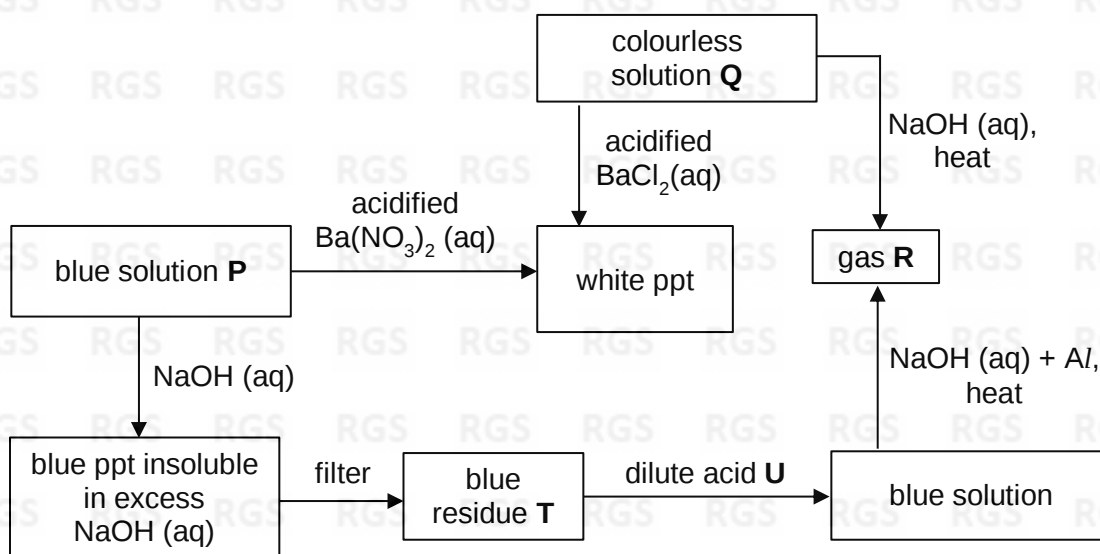
- A 0.0500
 B 0.100
 C 0.200
 D 0.250

----- End of Section A -----

Section B – Structured Questions [30 Marks]

Answer **ALL** questions and write your answers in the spaces provided.

B1 The diagram shows some reactions of solutions **Q** and **P**.



Based on the information given above, identify the following substances.

Q :

R :

T :

U :

[4]

B2 Four metals, **E**, **G**, **J** and **L**, were immersed in a beaker of lead(II) nitrate solution separately. The four metals do not react with cold water.

The table below shows the results obtained.

Metal	E	G	J	L
Initial Mass / g	10.0	10.0	10.0	10.0
Final Mass / g	10.0	9.1	10.0	8.5

(a) Using information from the table above,

(i) state and explain which metals (**E**, **G**, **J** or **L**) are more reactive than lead.

[3]

(ii) suggest the identity of the metals identified in (a)(i).

[1]

(b) Identify the oxidising agent in the reaction between metal **G** and lead(II) nitrate solution and explain your answer in terms of oxidation state.

[2]

- B3** The table below shows the temperature changes when 20 cm³ of concentrated sulfuric acid was added to 1.00 dm³ of water.

	temperature of solution / °C
before adding sulfuric acid	25.0
after adding sulfuric acid	32.0

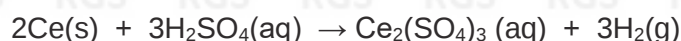
- (a) State and explain if the above process is exothermic or endothermic.

[2]

- (b) The concentrated acid has a concentration of 15.0 mol/dm³.
Calculate the concentration of the diluted acid.

[1]

- (c) Cerium is a soft and ductile metal with a relative atomic mass of 140.
To prepare cerium sulfate salt, 25.0 cm³ of diluted acid in (b) was used to react with 1.50 g of cerium metal.



- (i) Identify the limiting reagent in this reaction.

[1]

- (ii) Calculate the volume of hydrogen gas produced at room temperature and pressure.

[2]

- (d) The reaction of cerium with sulfuric acid is exothermic.

Complete the energy profile diagram to show the enthalpy change for this reaction.
Label the diagram clearly.

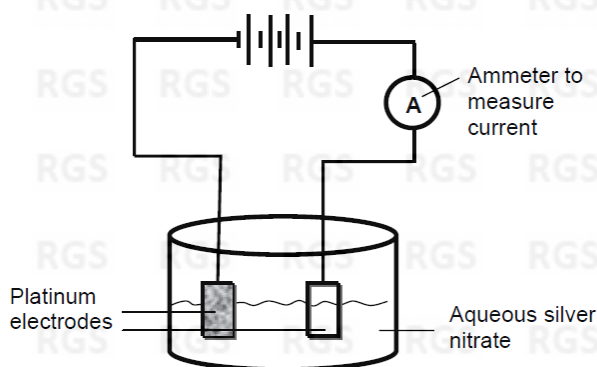
Energy / kJ



Progress of reaction

[2]

- B4** A student electrolyses 2.00 dm^3 of dilute silver nitrate solution using platinum electrodes as shown in the diagram.



A current of 1.0 ampere was passed and the increase in mass of the cathode was weighed at 5-min intervals. The experiment was repeated by increasing the current to 1.2 ampere, keeping all other factors constant. The results are shown below.

time / min		5	10	15	20	25	30	35	40	45	50
current 1.0 Amp	mass of silver deposited / g	0.34	0.67	1.01	1.34	1.68	2.01	2.35	2.68	2.68	2.68
current 1.2 Amp	mass of silver deposited / g	0.40	0.81	1.21	1.61	2.01	2.41	2.68	2.68	2.68	2.68

- (a) Write the half equation, with state symbols, for the reaction occurring at the cathode.

[2]

- (b) Explain the reaction occurring at the cathode.

[2]

- (c) Based on the information given, describe how the mass of silver deposited changes with time when different current strength were used.

[2]

- (d) State the change in pH of the solution after 50 minutes.

[1]

(e) Calculate the concentration of the aqueous silver nitrate solution.

[1]

(f) The electrolyte was replaced with 2.00 dm^3 of 0.0100 mol/dm^3 aqueous copper(II) sulfate and the current of 1.0 ampere was passed.

(i) Calculate the number of moles of copper deposited at the end of the 40 minutes.

[2]

(ii) Hence, calculate the concentration, in mol/dm^3 , of aqueous copper(II) sulfate at the end of the 40 minutes.

[2]

----- End of Section B -----

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The Periodic Table of Elements

Group																		
I	II											III	IV	V	VI	VII	0	
3 Li lithium 7	4 Be beryllium 9	Key proton (atomic) number atomic symbol name relative atomic mass										1 H hydrogen 1						2 He helium 4
11 Na sodium 23	12 Mg magnesium 24											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20	
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 Uu unseptennium -	118 Og oganeson -	
lanthanoids																		
actinoids																		

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