



Established in 1879

Raffles Girls' School

(SECONDARY)

Name: _____

Class: 4 /

Register No: _____

CHEMISTRY

RAFFLES PROGRAMME/RAFFLES ACADEMY (STANDARD)

YEAR FOUR

Pen-and-Paper Assessment 1

Tuesday

27 March 2018

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.

For examiners' use

Question/ Section	Marks Obtained
Section A (10 marks)	
1-10	
Section B (30 marks)	
1 (5 marks)	
2 (12 marks)	
3 (9 marks)	
4 (4 marks)	
Units	
Statements	
Significant Figures	
Total	40

Parents'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 Table 1.1 shows the colours of two indicators, methyl red and methyl orange, at different pH values.

Table 1.1

pH	2	3	4	5	6
color of methyl red	Red		Yellow		
color of methyl orange	Red				Yellow

Table 1.2 shows the pH of four solutions.

Table 1.2

solution	A	B	C	D
pH	2	3	4	5

In which solution will both indicators be red?

- A A and B only
- B A and C only
- C B and C only
- D B, C and D only

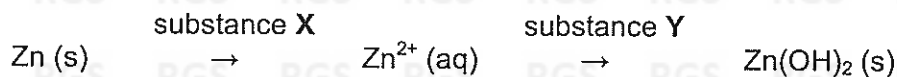
- 2 Which of the following substances **cannot** dissolve in aqueous sodium hydroxide?

- A zinc oxide
- B lead(II) hydroxide
- C ammonium nitrate
- D carbon monoxide

- 3 A beaker contains a mixture of two salts. Which of the following mixtures **cannot** be separated by adding excess distilled water, thorough stirring and then filtering the mixture?

- A barium sulfate and sodium sulfate
- B sodium carbonate and calcium carbonate
- C rubidium carbonate and zinc chloride
- D lead(II) chloride and copper(II) chloride

- 4 What is the number of sodium ions present in 1 dm^3 of 0.100 mol/dm^3 sodium carbonate solution?
- A 3.01×10^{22}
B 6.02×10^{22}
C 3.01×10^{23}
D 1.20×10^{23}
- 5 Which of the following contains 2 moles of the stated particles?
- A chlorine molecules in 35.5 g of chlorine gas
B oxygen molecules in 24 dm^3 of oxygen gas
C helium atoms in 24 dm^3 of helium gas
D aluminium atoms in 54 g of pure aluminium metal
- 6 A mixture of 10 cm^3 of oxygen and 50 cm^3 of hydrogen is sparked continuously to produce water as the only product. What is the volume of gas which remained at r.t.p after the complete combustion?
- A 10 cm^3
B 20 cm^3
C 30 cm^3
D 40 cm^3
- 7 Which of the following does **not** produce a gas that forms a white precipitate with limewater upon heating?
- A zinc carbonate
B lead(II) carbonate
C copper(II) carbonate
D potassium carbonate
- 8 A reaction scheme is outlined below. A few drops of each substance were used for each conversion.



Which substances are most suitable for the conversions indicated?

- | | substance X | substance Y |
|---|------------------|--------------------|
| A | sodium hydroxide | hydrochloric acid |
| B | sodium sulfate | aqueous ammonia |
| C | nitric acid | sodium hydroxide |
| D | ethanoic acid | iron(II) hydroxide |

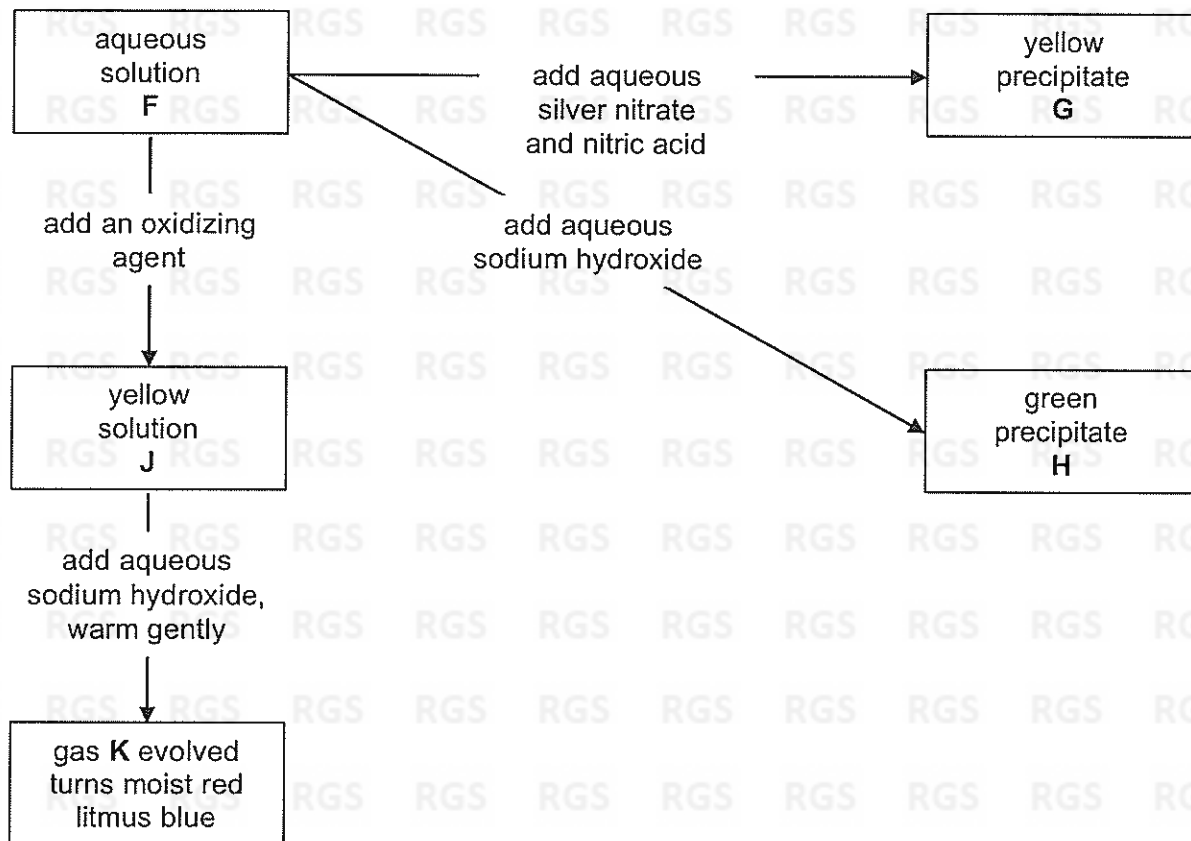
- 9 Which of the following processes is **not** a redox process?
- A formation of zinc from zinc sulfide
 - B formation of sulfuric acid from sulfur
 - C formation of nitrogen monoxide from ammonia
 - D formation of potassium sulfate from potassium hydroxide and sulfuric acid
- 10 The steel bodies of cars can be protected from rusting by spraying them with zinc. Why does this method prevent rusting?
- I. Zinc forms a stable compound with iron.
 - II. Zinc forms a physical barrier from air and water.
 - III. Zinc does not react with acidic exhaust fumes.
 - IV. Zinc is higher in the reactivity series than iron.
- A II only
 - B I and II
 - C II and IV
 - D II, III and IV

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

Section B (30 Marks)

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

- B1** The reaction scheme below describes some of the reactions of an aqueous solution, F, that contains two cations and an anion.



- (a) Identify the following:

- (i) yellow precipitate G
- (ii) green precipitate H
- (iii) gas K

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.....

.....

- (b) State the cations present in yellow solution J.

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[3]

[2]

(a) Aqueous ammonia is a weak base.

RGS RGS RGS RGS RGS RGS RGS RGS

RGS RGS RGS RGS RGS RGS RGS RGS

RGS RGS RGS RGS RGS RGS RGS RGS

RGS RGS RGS RGS RGS RGS RGS RGS

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1411421532637485161718192021222324252627282930313233343536373839404142434445464748495051525354555657585960616263646566676869707172737475767778798081828384858687888990919293949596979899100
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$$2\text{NH}_3 (\text{aq}) + \text{H}_2\text{SO}_4 (\text{aq}) \rightarrow (\text{NH}_4)_2\text{SO}_4 (\text{aq})$$

(ii) Calculate the amount of NH_3 in 25.0 cm^3 sample of solution.

[1]

(iii) Calculate the mass of NH_3 in 500 cm^3 of ammonia solution.

[2]

(iv) Calculate the percentage by mass of NH_3 in Windex.

[1]

B3

- (a) Small pieces of different metals were added to solutions of metal ions.

solution	metal added			
	copper	nickel	zinc	chromium
copper(II) chloride	-	copper displaced	copper displaced	copper displaced
nickel(II) nitrate	no reaction	-	nickel displaced	nickel displaced
zinc chloride	no reaction	no reaction	-	no reaction
chromium(III) nitrate	no reaction	no reaction	chromium displaced	-

- (i) Arrange the four metals in order of **increasing** chemical reactivity.

[1]

- (ii) Excess zinc was added to copper(II) chloride. State **two** changes you would observe.

[2]

- (iii) From the results of the experiment, suggest what method would be suitable to make nickel from nickel(II) oxide.

[1]

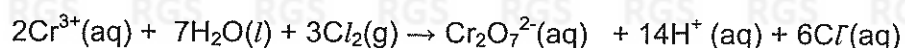
- (b) Two examples of chromium-containing compounds are shown below:

compound	chemical formula
sodium chromate	Na_2CrO_4
potassium dichromate(VI)	$\text{K}_2\text{Cr}_2\text{O}_7$

Calculate the oxidation state of chromium in sodium chromate.

[1]

- (c) The following reaction involving chromium(III) ions took place in a galvanic cell.



Identify the reducing agent in the reaction and explain your answer in terms of oxidation state.

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.....

.....

[2]

- (d) 2.82 g of an oxide of chromium was found to contain 2.34 g of chromium. What is the empirical formula of chromium oxide?

[2]

B4 Sulfuric acid is a strong acid. The ionisation of sulfuric acid can be shown by two equations.



When dilute sulfuric acid and sodium hydroxide react, sodium hydrogen sulfate, NaHSO_4 is first formed.



If more sodium hydroxide is added, sodium sulfate, Na_2SO_4 , can be formed.



Similarly, diammonium hydrogenphosphate, $(\text{NH}_4)_2\text{HPO}_4$, can be prepared in the laboratory by the reaction between aqueous ammonia, NH_3 , and phosphoric acid, H_3PO_4 .

- (a) Name the method used to prepare this salt from aqueous ammonia and phosphoric acid and explain why this method is used.

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

- (b) Write the ionic equation for the reaction between aqueous ammonia and phosphoric acid.

..... [1]

- (c) Give the formulae of **one** other salt that could be formed in the reaction between aqueous ammonia and phosphoric acid.

..... [1]

— End of Section B —

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The Periodic Table of Elements

Group																		
I	II	Key										III	IV	V	VI	VII	0	
		proton (atomic) number atomic symbol name relative atomic mass																
3 Li lithium 7	4 Be beryllium 9											1 H hydrogen 1						2 He helium 4
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 -			

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).