West Spring Secondary School
Science Department – Mid-Year Exam [2018]
Marking Scheme

Name of Setter(s): Joel Lee
Title of Assessment: Secondary 4 Express / 5 Normal (Academic)
Subject: Science (Chemistry) 5076/5078
Duration: 1hr 45mins

Section A [20 marks]									
1	2	3	4	5	6	7	8	9	10
A	C	A	A	B	B	B	C	A	B
11	12	13	14	15	16	17	18	19	20
C	B	B	C	D	D	D	D	A	B

Section B [45 marks]			
Q/No	**Answer**	**Comments/ Suggestions to Markers**	**Marks**
1(a)(i)	Oxides **C** and **E**	CAO	2
1(a)(ii)	Oxide **A**	CAO	1
1(a)(iii)	Oxide **B**	CAO	1
1(b)	lead(II)/aluminium/zinc oxide	CAO	1
1(c)	Any Group I oxide (sodium oxide, potassium oxide etc.)		1
2(a)	Oxygen	CAO	1
2(b)	It will be at approximately the 80cm^3 mark.	CAO	1
2(c)	Any 2: Nitrogen / Argon / Carbon dioxide / Water vapour	CAO	2
3(a)	The reaction is exothermic. It gives burns vigorously/may explode, signifying that a lot of heat is given out to the surroundings.	CAO OWTTE	1 1
3(b)	Zinc oxide is reduced. Zn gains 2 electrons from Zn^{2+} in ZnO to Zn. (Students need to specify no. of electrons to get the mark.)	CAO	1 1
4(a)	The nail will not rust in tubes **B** and **C**. There is no moisture/water in tube B, and There is no oxygen in tube C.	CAO OWTTE OWTTE	1 1 1

4(b)	Tube **D**.	CAO	1
5(a)	They have the same number of valence electrons.	CAO	1
5(b)	Lithium/sodium/potassium hydroxide and hydrogen gas.	CAO	2
5(c)	Rubidium/caesium/francium	CAO	1
5(d)	It is more reactive.	CAO	1
6(a)	The reaction is endothermic, because heat needs to be supplied/heat is taken in for the reaction to start	OWTTE	2
6(b)	Moles of oxygen = 2400 / 24000 = 0.10 mol. Moles of **M**NO_3 = 0.10 x 2 = 0.20 mol.	CAO	1 1
6(c)	Molar mass of one mol. of **M**NO_3 = 17.0 / 0.2 = 85 g/mol A_r of **M** = 85 – [14 + (3x16)] = 23 Therefore **M** is sodium.	CAO (ecf allowed)	1 1 1
6(d)	Insert a glowing splint into a test tube containing the gas. If it relights, the gas is oxygen.	CAO	1 1
7(a)	Halogens (Group VII) and noble gases (Group 0)	CAO	1
7(b)	They have a fully filled valence shell, which confers stability.	CAO	1
7(c)	Mix aqueous chlorine and aqueous potassium bromide. The mixture of solutions will turn from colourless to brown as bromine is displaced. 2 KBr + Cl_2 → 2 KCl + Br_2	CAO	1 1 1
8(a)	**A**: iron **B**: sulfuric acid **C**: iron(II) sulfate **D**: hydrogen **E**: barium sulfate **F**: iron(II) hydroxide	1m each	6
8(b)	Fe + H_2SO_4 → $FeSO_4$ + H_2 $FeSO_4$ + 2NaOH → Na_2SO_4 + $Fe(OH)_2$ $FeSO_4$ + $Ba(NO_3)_2$ → $Fe(NO_3)_2$ + $BaSO_4$ (Any one)	CAO 1m for correct formula, 1m for balanced equation.	2

Section C [20 marks]			
9(a)(i)	$Fe_2O_3 + 3\ CO \rightarrow 2\ Fe + 3CO_2$		1
9(a)(ii)	It is a redox reaction as Fe_2O_3 is reduced to Fe, and CO is oxidised to CO_2. Fe_2O_3 loses oxygen while CO gains oxygen.	1m for stating oxidised and reduced species 1m for explanation	2
9(a)(iii)	CO is the reducing agent.	CAO	1
9(b)	(Stainless) steel is one iron-based alloy. It is preferred as it is stronger / more corrosion resistant than pure iron.	CAO	1 1
9(c)	**Y** is slag. The limestone added to the furnace decomposes to form calcium oxide and carbon dioxide. The calcium oxide reacts with acidic impurities / silicon dioxide in the haematite to form slag. (1m can be given for the role of limestone in removing acidic impurities, without mention of its decomposition) $CaO + SiO_2 \rightarrow CaSiO_3$	CAO OWTTE CAO	1 1 1 1
10(a)	Moles of $Mg(NO_3)_2$ = 7.4 / 148 = 0.050 mol. Moles of HNO_3 = 0.050 x 2 = 0.10 mol. Conc. of HNO_3 = 0.10 / (200/1000) = 0.50 mol/dm^3	CAO	1 1 1
10(b)	The reagents used are nitric acid and zinc metal/carbonate/oxide. 1. Add excess zinc metal/carbonate/oxide to nitric acid. 2. After the reaction is complete, filter to obtain zinc nitrate solution as the filtrate. 3. Heat the solution to obtain a saturated solution. 4. Cool the saturated solution to crystallise zinc nitrate. 5. Filter to obtain crystals of zinc nitrate, wash with cold distilled water and dry.	OWTTE	1 1 1 1 1 1
10(c)	Sodium carbonate, the starting material, is soluble in water.	OWTTE	1