ST ANDREW'S SECONDARY SCHOOL
MID-YEAR EXAMINATION 2021
SECONDARY 4 EXPRESS

GD

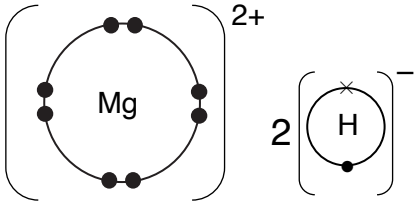
Updated: 07/05/2023

CHEMISTRY
Paper 2

6092/2
80 Marks

MARKING SCHEME

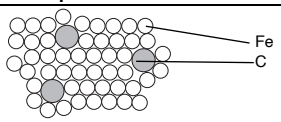
SECTION A [50 Marks]

Qn	Answer	Mark	Remarks
1(a)(i)	G	1	
1(a)(ii)	F	1	
1(a)(iii)	H	1	
1(a)(iv)	F	1	
1(b)	test tube 1 – D test tube 2 – G	1 1	
2(a)(i)	same element forming different structures / different forms of the same element	1	
2(a)(ii)	octasulfur larger relative molecular mass (M_r) for a larger intermolecular force of attraction, requiring more heat energy to overcome	1 1	Relation must be evident
2(b)(i)	contains different number of neutrons	1	
2(b)(ii)	(0.9401 × 32.0) + (0.0076 × 33.0) + (0.0523 × 34.0) = 32.11	M1 A1	Rej. for wrong sig.fig.
2(b)(iii)	difference in the abundance / %composition of isotopes	1	
3(a)(i)	B does not attain / have / acquire stable noble gas electronic configuration	1	Accept if mentioned of only 6 outershell e^- instead of 8 for EC
3(a)(ii)	gas simple covalent structure weak intermolecular forces of attraction present	1 1 1	Rej. explanations if incorrect physical state provided
3(b)(i)	Mg atom does not share electrons with H Mg atom loses two valence electrons to form Mg^{2+}	1 1	Ignore any explanation wrt H
3(b)(ii)	 correct number of electrons for each ion correct charge annotated for each ion	 1 1	
3(b)(iii)	free moving / mobile ions (Mg^{2+} & H^-) as charge carriers that conduct electricity	1	Rej. electrons

4(a)	Cu^{2+} , Fe^{2+} , Fe^{3+} all give <u>coloured</u> solutions instead of colourless observed	1	
4(b)	$Pb(NO_3)_2$ either Pb^{2+} or Ag^{+} will result in ppt formed require half of the amount of **T** added for mole ratio of 2:1	1 1 1	Rej. Pb^{2+} for chemical formula Rej. explanations that do not relate to Pb^{2+}
4(c)	<u>Any 1</u> • use a burette instead of measuring cylinder to measure **Q** • stir the contents in each test tube using glass rod • measure mass of ppt. formed	1	
4(d)	white ppt. formed, instead of yellow ppt. equal volume of K_2SO_4 solution used, instead of using only half	1 1	
5(a)(i)	moles of NH_4NO_3 used = moles of N_2O produced = 4.40 g ÷ 80 g mol^{-1} = 0.055 mol mass of N_2O produced = 0.055 mol × 44 g mol^{-1} = <u>2.42 g</u>	M1 A1	
5(a)(ii)	%yield = 2.50 g ÷ 2.42 g × 100% = <u>103.3%</u>	 A1	Ignore inaccurate sig.fig.
5(a)(iii)	impurities in the product obtained	1	Rej. impurities in reactant
5(b)	additional O_2 utilised in combustion to provide more energy exothermic reaction loses energy to the engine / engine gained energy from exothermic reaction	1 1	
6(a)	absorbs <u>excess</u> UV rays from the Sun (entering earth)	1	
6(b)	UV breaks down CFCs resulting in C*l* radicals / atoms (C*l*•) C*l*• reacts with O_3 to liberate O_2	1 1	
6(c)(i)	**A**	1	Accept CF_3CCl_3
6(c)(ii)	no, as the use of this flammable compound will be dangerous	1	Both ans and explanation must be provided
7(a)	hydrogen (gas) extinguishes a lighted splint with a 'pop' sound	1 1	Rej. if chemical formula is provided instead Test result must be provided
7(b)	different atomic masses for the different metals reacted different number of reacting particles	1 1	Explanation wrt the no. of moles
7(c)(i)	**A** – Fe **B** – Zn	1	Both must be correct
7(c)(ii)	larger A_r results in a smaller number of moles reacted leading to a smaller molar volume	1 1	
7(d)	exothermic; enthalpy during bond breaking is smaller than that for bond forming ;	1 1	 Vice versa
7(e)	$M + 2H^+ \rightarrow M^{2+} + H_2$ (equimolar for the metal and hydrogen gas) volume of H_2 by Fe = 64 cm^3 moles of H_2 = 2.667 × 10^{-3} mol moles of Fe = 0.15 g ÷ 56 g mol^{-1} = 2.667 × 10^{-3} mol since moles of Fe = moles of H_2 produced, <u>metals</u> are the LR	 A1 1	Accept if HC*l* proved to be the ER

SECTION B [30 Marks]

Qⁿ	Answer	Marks	Remarks
8(a)(i)	$4OH^-$ (aq) $\rightarrow O_2$ (g) + $2H_2O$ (l) + $4e^-$	1	Rej. if missing/ incorrect ss
8(a)(ii)	Ag^+ (aq) + e^- $\rightarrow$ Ag (s) / $4Ag^+$ (aq) + $4e^-$ $\rightarrow$ 4Ag (s)	1	
8(b)	all points plotted graph of 1.0A drawn graph of 1.2A drawn	1 1 1	
8(c)	graph of 1.2A has a higher rate / gradient same mass of Ag deposited / same increase in mass	1 1	Vice versa
8(d)	moles of Ag^+ deposited = 2.68 g ÷ 108 g mol^{-1} = 2.48×10^{-2} mol concentration of $AgNO_3$ = 2.48×10^{-2} mol ÷ 2 dm^3 = $\underline{1.24 \times 10^{-2}\ mol/dm^3}$	 M1 A1	
8(e)	no change in mass of cathode as selective discharge of H^+ (aq) instead	1	Explanation must be provided
8(f)(i)	formation of O_2 at graphite electrode will lead to its oxidation and hence, depletion	1	
8(f)(ii)	<u>Any 1</u> • Platinum • Palladium • Titanium	1	Rej. if chemical symbol given
9(a)	KBr Br in KBr increases in oxidation states from –1 to 0	1 1	
9(b)(i)	reddish-brown liquid formed in solution	1	
9(b)(ii)	$Cl_2 > Br_2$ Cl_2 results in the oxidation of Br^-	1 1	
9(c)	<u>Any 1</u> • Cl_2 readily available • No further separation or purification required • Less toxic (compared to method 2 with the production of SO_2)	1	
9(d)	Br in Br_2 increases its oxidation state from 0 to +1 in HBrO Br in Br_2 also decreases its oxidation state from 0 to –1 in HBr	1 1	
EITHER			
10(a)(i)	regular arrangement of the metal particles present easily slide over when force is applied	1 1	
10(a)(ii)	delocalised electrons result in the conduct of electricity	1	
10(b)	chromium forms an oxide layer that functionalised as a barrier for iron to be in contact with O_2 and H_2O	1 1	
10(c)(i)	increasing rate of reaction due to the increased concentration of acid increase in the number of successful collisions <u>per unit time</u>	1 1	
10(c)(ii)	constant mass of iron, particle size, temperature of the reaction measure the gas evolved at regular intervals using gas syringe / water displacement OR measure the loss in mass at regular intervals using electronic mass balance	1 1* 1* 1** 1**	Either set of (*) OR (**) provided in answer.

OR			
10(a)(i)	high melting point / boiling point	1	
10(a)(ii)	variable oxidation states in the compounds formed / coloured compounds	1	
10(b)	 diagram increase strength by preventing the iron atoms to slide over easily due to the regular arrangement	 1 1	
10(c)(i)	haematite coke added into the blast furnace gets oxidised in hot air to form CO_2 then CO reduces the haematite Fe_2O_3 to obtain Fe	1 1 1	
10(c)(ii)	more particles will possess energy that is greater than E_A particles will collide more frequently due to increased kinetic energy	1 1	
10(c)(iii)	very high melting point	1