

Half yearly examinations 2016

Form 4 – Chemistry

Marking scheme

Question number	Answers	Marks	Addition information
1	a)I or H; b) D; c) B; d) B; e) C; f) A; g) C,G,D,H,I; h) F; i) A or E; j) D	1 each	
2a	i)Neutralisation; ii) precipitation; iii) thermal decomposition; iv) synthesis; v) A halogen displacing a less reactive halogen from the aqueous solution of its salt; vi) A metal displacing a less reactive metal from the aqueous solution of its salt; vii) A metal displacing hydrogen from an acid	1 each	
b)	i) $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \longrightarrow \text{AgCl}(\text{s})$ ii) $\text{Cl}_2(\text{g}) + 2\text{Br}^-(\text{aq}) \longrightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{l})$	2 each	
c)	i) $\text{Cu} - 2\text{e}^- \longrightarrow \text{Cu}^{2+}$ $\text{S} + 2\text{e}^- \longrightarrow \text{S}^{2-}$ Copper is oxidised by losing 2 electrons. Sulfur is reduced by gaining 2 electrons. Since both oxidation and reduction are occurring, this is a redox reaction.	1 each	
3	i)C has been oxidised because it gained oxygen. Oxidising agent – PbO; reducing agent – C ii)Mn has been reduced because its oxidation number has decreased from +4 to +2. Oxidising agent – MnO ₂ ; reducing agent – HCl iii)Chlorine is reduced because it gained 2 electrons. $\text{Cl}_2 + 2\text{e}^- \longrightarrow 2\text{Cl}^-$ oxidising agent – Cl ₂ ; reducing agent - Na	2 each 2 2 2	
4a	Potassium, sodium, aluminium, zinc, iron, lead, copper, silver, gold.	3 mark	
b	i)F; ii)T; iii)F; iv)F; v)T; vi)T	1 each	
5	$\text{Li}^+ \text{Cl}^-$; $\text{H}^+ \text{OH}^-$; cathode: H^+ , Anode: Cl^- ; at cathode – hydrogen; at anode – chlorine $2\text{H}^+ \text{SO}_4^{2-}$; $\text{H}^+ \text{OH}^-$; cathode: H^+ , anode: OH^- ; at cathode – hydrogen; at anode – oxygen $\text{Cu}^{2+} \text{SO}_4^{2-}$; $\text{H}^+ \text{OH}^-$; cathode: Cu^{2+} ; anode: OH^- ; at cathode – copper; at anode – oxygen $\text{Pb}^{2+} \text{Br}^-$; cathode: Pb^{2+} ; anode: Br_2 ; at cathode – lead; at anode – Bromine	1 each	

b)	Calculation	2,2	
6	i)cathode: pure copper anode: impure copper ii)copper(II) sulphate solution iii) sludge, it contains many precious metals iv)cathode: $\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}$ anode: $\text{Cu} - 2\text{e}^- \longrightarrow \text{Cu}^{2+}$ v)oxidation occurs at the anode vi)reduction occurs at the cathode vii)cathode begins bigger. Anode becomes smaller. Sludge forms at the bottom. viii) No change in colour; Copper ions in solution are replaced by those ions from anode. ix) Silver is below copper in the ECS, and does not replace it.	2 2 1 2 2 2 4 2 1	
7	a)electroplating; b)to make objects more attractive or shiny c)A conductor such as iron d)diagram e)silver f)silver nitrate solution g)anode: $\text{Cu} - 2\text{e}^- \longrightarrow \text{Cu}^{2+}$ oxidation cathode: $\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}$ reduction h)Galvanising is coating iron with a layer of zinc It prevents rusting.	1 1 1 5 5 5 2,1 2,1 2 2	
8	i)Ions migrate towards the cathode and anode. At cathode there is effervescence and hydrogen is produced. At anode there is effervescence and oxygen is produced. Cathode: $4\text{H}^+ + 4\text{e}^- \longrightarrow 2\text{H}_2$ Anode: $4\text{OH}^- + 4\text{e}^- \longrightarrow 2\text{H}_2\text{O} + \text{O}_2$ ii)Sodium darts around the surface of the trough. Makes a hissing sound and produces a small explosion. It finally dissolves. Hydrogen is given off. $2\text{Na(s)} + 2\text{H}_2\text{O(l)} \longrightarrow 2\text{NaOH(aq)} + \text{H}_2\text{(g)}$ iii)Magnesium displaces copper from the aqueous solution of its salt, since it is above copper in the ECS. Copper deposits at the bottom of the test tube. $\text{Mg(s)} + \text{CuSO}_4\text{(aq)} \longrightarrow \text{MgSO}_4\text{(aq)} + \text{Cu(s)}$ iv)Calcium dissolves and displaces hydrogen from the acid. $\text{Ca(s)} + 2\text{HCl(aq)} \longrightarrow \text{CaCl}_2\text{(aq)} + \text{H}_2\text{(g)}$	5 5 5 5	

