

## 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) $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$ ii) $\text{Cl}_2(\text{g}) + 2\text{Br}^-(\text{aq}) \rightarrow 2\text{Cl}^-(\text{aq}) + \text{Br}_2(\text{l})$	2 each	
c)	i) $\text{Cu} - 2\text{e}^- \rightarrow \text{Cu}^{2+}$ $\text{S} + 2\text{e}^- \rightarrow \text{S}^{2-}$ 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	2 each 2	
	ii)Mn has been reduced because its oxidation number has decreased from +4 to +2. Oxidising agent – MnO <sub>2</sub> ; reducing agent – HCl	2 2	
	iii)Chlorine is reduced because it gained 2 electrons. $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$ oxidising agent – Cl <sub>2</sub> ; reducing agent - Na	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: $\text{H}^+$ , Anode: $\text{Cl}^-$ ; at cathode – hydrogen; at anode – chlorine $2\text{H}^+ \text{SO}_4^{2-}$ ; $\text{H}^+ \text{OH}^-$ ; cathode: $\text{H}^+$ , anode: $\text{OH}^-$ ; at cathode – hydrogen; at anode – oxygen $\text{Cu}^{2+} \text{SO}_4^{2-}$ ; $\text{H}^+ \text{OH}^-$ ; cathode: $\text{Cu}^{2+}$ ; anode: $\text{OH}^-$ ; at cathode – copper; at anode – oxygen $\text{Pb}^{2+} \text{Br}^-$ ; cathode: $\text{Pb}^{2+}$ ; anode: $\text{Br}_2$ ; at cathode – lead; at anode – Bromine	1 each	

b)	Calculation	2,2	
6	<p>i)cathode: pure copper    anode: impure copper</p> <p>ii)copper(II) sulphate solution</p> <p>iii) sludge, it contains many precious metals</p> <p>iv)cathode: <math>\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}</math></p> <p>    anode: <math>\text{Cu} - 2\text{e}^- \longrightarrow \text{Cu}^{2+}</math></p> <p>v)oxidation occurs at the anode</p> <p>vi)reduction occurs at the cathode</p> <p>vii)cathode begins bigger. Anode becomes smaller. Sludge forms at the bottom.</p> <p>viii) No change in colour; Copper ions in solution are replaced by those ions from anode.</p> <p>ix) Silver is below copper in the ECS, and does not replace it.</p>	<p>2</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>4</p> <p>2</p> <p>1</p>	
7	<p>a)electroplating;</p> <p>b)to make objects more attractive or shiny</p> <p>c)A conductor such as iron</p> <p>d)diagram</p> <p>e)silver</p> <p>f)silver nitrate solution</p> <p>g)anode: <math>\text{Cu} - 2\text{e}^- \longrightarrow \text{Cu}^{2+}</math>    oxidation</p> <p>    cathode: <math>\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}</math>    reduction</p> <p>h)Galvanising is coating iron with a layer of zinc It prevents rusting.</p>	<p>1</p> <p>1</p> <p>1</p> <p>5</p> <p>5</p> <p>5</p> <p>2,1</p> <p>2,1</p> <p>2</p> <p>2</p>	
8	<p>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.</p> <p>Cathode: <math>4\text{H}^+ + 4\text{e}^- \longrightarrow 2\text{H}_2</math></p> <p>Anode: <math>4\text{OH}^- + 4\text{e}^- \longrightarrow 2\text{H}_2\text{O} + \text{O}_2</math></p> <p>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.</p> <p><math>2\text{Na}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \longrightarrow 2\text{NaOH}(\text{aq}) + \text{H}_2(\text{g})</math></p> <p>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.</p> <p><math>\text{Mg}(\text{s}) + \text{CuSO}_4(\text{aq}) \longrightarrow \text{MgSO}_4(\text{aq}) + \text{Cu}(\text{s})</math></p> <p>iv)Calcium dissolves and displaces hydrogen from the acid.</p> <p><math>\text{Ca}(\text{s}) + 2\text{HCl}(\text{aq}) \longrightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2(\text{g})</math></p>	<p>5</p> <p>5</p> <p>5</p> <p>5</p>	

