GCSE and IGCSE Chemistry: Electrolysis Worksheet - Mark Scheme

Year 10-11 · GCSE (AQA 4.4.3) and Cambridge IGCSE 0620 topic 4 · Exam-style questions

Section A: Key ideas [8 marks]

1(a)	electrolyte	**1**
1(b)	cathode	**1**
1(c)	anode	**1**
1(d)	molten; ions	**2**
1(e)	reduction	**1**
2	In the solid, ions are held in fixed positions in a lattice (1). When molten the ions are free to move and carry the charge (1).	**2**

Section B: Molten electrolytes [11 marks]

3(a)	Cathode: lead (1). Anode: bromine (1).	**2**
3(b)	Cathode: $Pb^{2+} + 2e^- \longrightarrow Pb$ (2). Anode: $2Br^- \longrightarrow Br_2 + 2e^-$ (2). Guidance: 1 mark for correct species, 1 mark for balancing (each equation). Accept $2Br^- - 2e^- \longrightarrow Br_2$.	**4**
3(c)	Anode (1); the bromide ions lose electrons (1).	**2**
4	Sodium at the cathode (1); chlorine at the anode (1); chlorine bleaches damp litmus paper (1).	**3**

Section C: Aqueous solutions [16 marks]

5	Copper sulfate: copper; oxygen. Sodium chloride: hydrogen; chlorine. Dilute sulfuric acid: hydrogen; oxygen. Potassium iodide: hydrogen; iodine. Guidance: 1 mark for each correct box.	**8**
6	Water also provides H^+ ions (1). Hydrogen is less reactive than sodium, so H^+ ions are discharged (gain electrons) and hydrogen gas forms (1).	**2**
7	Impure copper anode dissolves / gets smaller (1). Pure copper is deposited on the cathode / cathode gets bigger (1). Impurities fall to the bottom as anode sludge (1).	**3**
8	Spoon is the cathode (1). Silver is the anode (1). Electrolyte is a silver salt solution such as silver nitrate (1).	**3**

Section D: Industrial electrolysis [14 marks]

9	Aluminium oxide has a very high melting point (about 2000 °C) (1). Dissolving it in cryolite lowers the temperature needed and saves energy / cost (1).	**2**
10	Oxygen is produced at the anode (1) and reacts with the hot carbon anodes to form carbon dioxide so they burn away (1).	**2**
11	(a) $Al^{3+} + 3e^- \longrightarrow Al$ (2). (b) $2O^{2-} \longrightarrow O_2 + 4e^-$ (2). Guidance: 1 mark for correct species, 1 mark for balancing each. (Higher tier / Extended)	**4**

12	Chlorine (1): sterilise water / make bleach / PVC (1). Hydrogen (1): fuel / making ammonia (1). Sodium hydroxide (1): making soap or paper (1).	**6**

Total: 49 marks. Accept any scientifically correct alternative wording.