Chapter IV

Section B

1. Inert (unreactive) electrodes are used in the electrolysis of an aqueous solution containing both copper(II)sulphate and magnesium sulphate. What will be produced at the negative electrode (cathode) and positive electrode (anode)?

	Cathode product	Anode product
A.	Magnesium	Oxygen
B.	Copper	Oxygen
C.	Copper	Hydrogen
D.	Magnesium	Hydrogen

2. If an aqueous solution of copper (II) sulphate is electrolyzed by using copper electrodes, which reactions will occur at the cathode and anode?

	Cathode reaction	Anode reaction
A.	$Cu^{2+}(aq) + 2\bar{e} \rightarrow Cu(s)$	$4OH^{-}(aq) \rightarrow 2H_2O(l) + O_2(g) + 4\bar{e}$
B.	$2H^{+}(aq) + 2\bar{e} \rightarrow H_2(g)$	$4OH^{-}(aq) \rightarrow 2H_2O(l) + O_2(g) + 4\bar{e}$
C.	$2H^{+}(aq) + 2\bar{e} \rightarrow H_2(g)$	$Cu(s) \rightarrow Cu^{2+}(aq) + 2\bar{e}$
D.	$Cu^{2+}(aq) + 2\bar{e} \rightarrow Cu(s)$	$Cu(s) \rightarrow Cu^{2+}(aq) + 2\bar{e}$

3. How many grams of gold will be deposited when 5000 C pass through a solution by the following equation. $AuCl_{4\,(aq)}^{-} + 3e \rightarrow Au(s) + 4Cl^{-}$

   (Au = 196.9, 1 mole of e = 96500 C = 1F)

   A. 0.0173 g of Au

B. 3.41 g of Au

C. 1.96 g of Au

D. 196.9 g of Au

4. Calculate the moles of Mg produced when a current of 60 amps is passed through a magnesium chloride solution for 4.00 h. $Mg^{2+} + 2e \rightarrow Mg$ (1 mole of e = 96500C)

A. 8.95 mole of Mg

B. 4.48 mole of Mg

C. 0.22 mole of Mg

D. 0.001 mole of Mg

5. How many charges is required to reduce 1 mole of Al^{3+} to Al (1mole of e = 96500C)

$Al_{3+(aq)} + 3e \rightarrow Al(s)$

A. 32166 C

B. 289500 C

C. 96503 C

D. 96497 C

6. Calculate the charge passing through a cell if the current of 21.5 mA for 2 s (1000 mA = 1A)

A. 43 C

B. 430 C

C. 0.043 C

D. 0.0043 C

7. 640 C of electricity is passed through an electrolytic cell containing a solution of zinc ions. Calculate the amount (in mole) of zinc that will be formed of cathode. $Zn^{2+}_{(aq)} + 2e \rightarrow Zn_{(s)}$ (1 mole of electron = 96500 C)

A. 0.003 mole of Zn

B. 123520000 mole of Zn

C. 0.007 mole of Zn

D. 1 mole of Zn

8. What current is required to produce 400 dm^3 of hydrogen gas, measure at STP from the electrolysis of water in 1 hour (3600 s)? (1 mole at STP = 22.4 dm^3) $2H^+_{(aq)} + 2e \rightarrow H_{2(g)}$ (1 mole of e = 96500 C)

   A. 2 A

   B. 957 A

   C. 96500 A

   D. 3446428 A

9. The electricity is passed into the magnesium, solid magnesium chloride and aqueous magnesium chloride the table shows the result

Substance	Conduct electricity
Magnesium	Yes
Solid magnesium chloride	No
Aqueous magnesium chloride	Yes

   Explain the results

   A. Magnesium is metals, solid magnesium chloride is neutral compound and aqueous magnesium chloride has acidic compound

   B. Magnesium has positive charge, solid magnesium chloride has no charge and aqueous magnesium chloride has negative charge

   C. Magnesium has free moving electrons in lattice, solid magnesium chloride contains no free moving ions, aqueous magnesium chloride contains free moving ions

   D. Magnesium has no free moving electrons in lattice, solid magnesium chloride contains free moving ions, aqueous magnesium chloride contains no free moving ions

10. Aluminium is extracted from aluminium oxide using electrolysis. Calculate the mass, in grams, of aluminium formed when a charge of 20 faradays is passed through aluminium oxide dissolved in molten cryolite. The ionic half-equation for the formation of aluminium is $Al^{3+} + 3e \rightarrow Al$ (Al = 27)

    A. 81 g

B. 27 g

C. 180 g

D. 540 g

11. The solid magnesium chloride is melted and electrolyte --- ions will form during melting and the ionic half reaction in the negative electrode is ($Mg^{2+} + 2e \rightarrow Mg$) and ionic half reaction for the positive electrode is ---.

A. Mg and OH ions/ $4OH^- \rightarrow 2H_2O + O_2 + 4e$

B. Mg^{2+} and OH^- ions/ $4OH^- \rightarrow 2H_2O + O_2 + 4e$

C. Mg and Cl ions/ $Cl^- + e \rightarrow Cl$

D. Mg^{2+} and Cl^- ions/ $2Cl^- \rightarrow Cl_2 + 2e$

12. Calculate the amount (mole of electron) required to make of 48 kg of Magnesium. (Mg = 24, $Mg^{2+} + 2e \rightarrow Mg$)

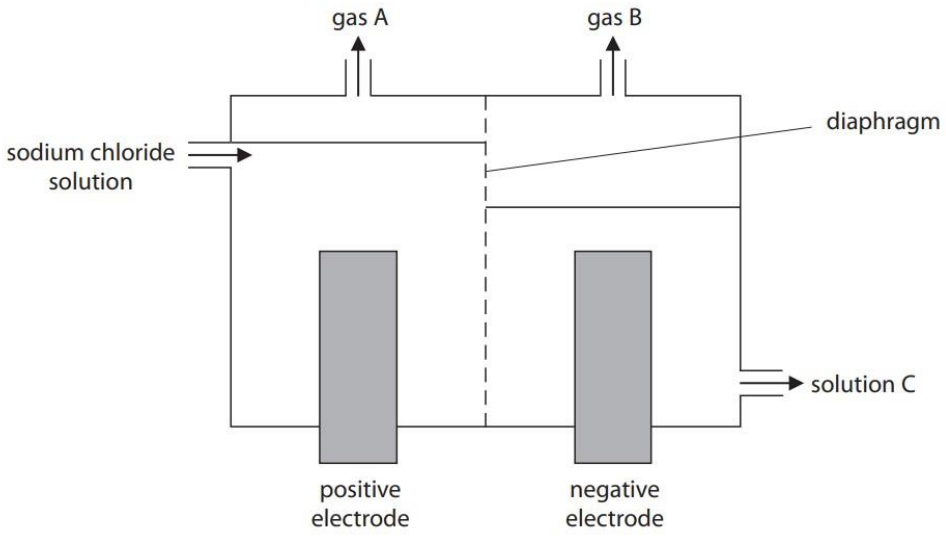
A. 4 moles of electrons

B. 2 moles of electrons

C. 4 x 10^3 moles of electrons

D. 0.5 x 10^3 moles of electrons

13. The diagram shows the diaphragm cell used in the electrolysis of concentrated sodium chloride solution, NaCl(aq).



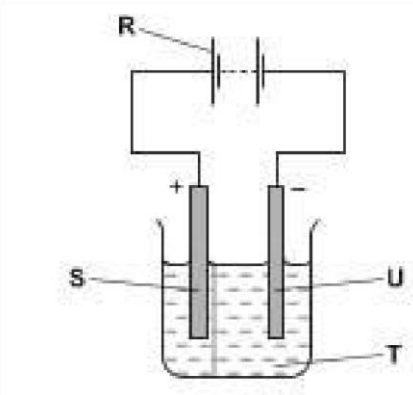
The ionic half equations for electrolysis and gas A and gas B were

A. $2H^+ + 2e \rightarrow H_2$/ $2Cl^- \rightarrow Cl_2 + 2e$ (Gas A = Cl_2 and Gas B = H_2)

B. $4OH^- \rightarrow 2H_2O + O_2 + 4e$/ $2Cl^- \rightarrow Cl_2 + 2e$ (Gas A = Cl_2 and Gas B = H_2)

C. $2H^+ + 2e \rightarrow H_2$/ $4OH^- \rightarrow 2H_2O + O_2 + 4e$ (Gas A = H_2 and Gas B = H_2O)

D. $Na + e \rightarrow Na$/ $2Cl^- \rightarrow Cl_2 + 2e$ (Gas A = Na and Gas B = H_2)

14. 

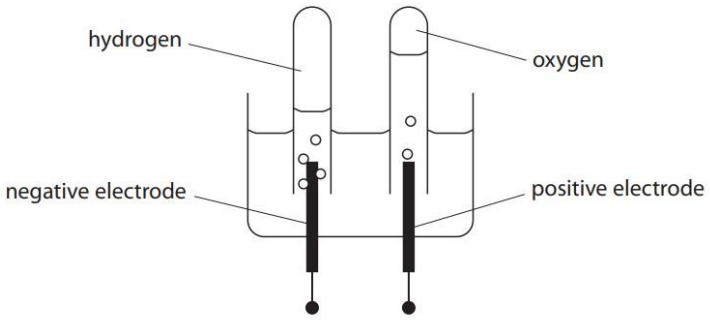
A. R = negative terminal, U = anode, S = cathode, T = covalent solution

B. R = positive terminal, U = cathode, S = anode, T = electrolyte

C. R = Battery, U = cathode, S = anode, T = ionic solution

D. R = positive terminal, U = anode, S = cathode, T = electrolyte

15. Water can be decomposed by electrolysis using this apparatus



Suggest the suitable element for the inert electrode ------ moles of hydrogen and oxygen respectively

A. Copper electrodes, 1:1 volume of hydrogen and oxygen

B. Sodium electrodes, 1:2 volume of hydrogen and oxygen

C. Platinum electrodes, 1:2 volume of hydrogen and oxygen

D. Mercury electrodes, 2:2 volume of hydrogen and oxygen