

SENIOR SECONDARY IMPROVEMENT PROGRAMME 2013



GRADE 12

PHYSICAL SCIENCES

LEARNER HOMEWORK SOLUTIONS

The SSIP is supported by



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LEARNER HOMEWORK SOLUTIONS

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HOMEWORK SOLUTIONS: SESSION 16**TOPIC: CONSOLIDATION EXERCISES ON RATES, CHEMICAL EQUILIBRIUM AND ELECTROCHEMISTRY****QUESTION 1**

1.1 silver ✓✓ (2)

1.2 $\text{Ni (s)} \rightarrow \text{Ni}^{2+} \text{ (aq)} + 2\text{e}^-$ ✓✓ (2)

1.3 silver ✓✓ (2)

1.4 $\text{Ni(s)/Ni}^{2+} \text{(aq), } 1 \text{ mol}\cdot\text{dm}^{-3} // \text{Ag}^+ \text{(aq), } 1 \text{ mol}\cdot\text{dm}^{-3} / \text{Ag}$
 ✓ ✓ ✓ (3)

1.5 $E_{\text{cell}}^{\theta} = E_{\text{cathode}}^{\theta} - E_{\text{anode}}^{\theta}$ ✓
 $= 0,80 \text{ V} - (-0,25) \text{ V}$
 $E_{\text{cell}}^{\theta} = 1,05 \text{ V}$ ✓ (4)

[13]**QUESTION 2**

2.1 C

2.2 D

2.3 B

2.4 D

2.5 C

2.6 D

2.7 C

2.8 B

2.9 C

2.10 C

2.11 B

2.12 C

2.13 A

(13 x 2) [26]

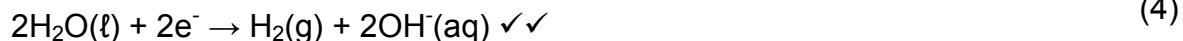
HOMEWORK SOLUTIONS: SESSION 17**TOPIC: CHEMICAL CHANGE AND CHEMICAL SYSTEMS - EXTRACTION OF ALUMINIUM AND CHLORALKALI INDUSTRY****QUESTION 1**

1.1

P:



Q:



1.2

H₂O is a stronger oxidising agent (than Na⁺) ✓and is more readily reduced than the Na⁺. ✓

(2)

1.3

Allows only the cation (Na⁺) to move across to the cathode compartment.. ✓**OR**To separate the Cl⁻ ions from the OH⁻..

(1)

1.4 **Any TWO:****As chemical reactant in the production of:**

- Medicines to cure diseases
- Polymers
 - PVC to make plastic products e.g. pipes, insulation, handbags
 - Nylon for carpeting, clothing, etc.
- Household products, e.g. toiletries, cosmetics, CDs etc.
- Hydrochloric acid used in building industry and swimming pools
- Bromine used in photography
- Solvents, e.g. "tippex"
- Solvents used for dry cleaning
- Titanium dioxide used as white pigment in paint
- Dyes used in textile industry
- Pesticides used to protect crops
- Compounds that can be used to sterilise medical equipment, e.g. kidney dialysis machines, wounds and work surfaces in medical labs
- Extraction of titanium used in aircrafts

As disinfectant to:

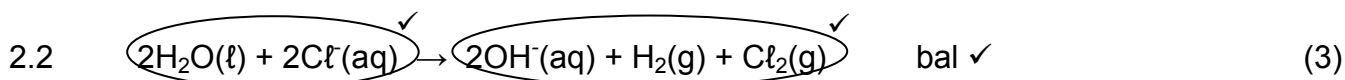
- Purify/sterilise drinking water

As bleaching agent in the:

- Textile industry
- Paper industry

(2)
[9]

QUESTION 2



- 2.3
- Allows the migration of positive ions from anode to cathode ✓
 - Prevents mixing of products ✓
- (2)

2.4 H_2O is a stronger oxidising agent than Na^+ ✓ and will be reduced. ✓

OR

Na^+ is a weaker oxidising agent than H_2O ✓ and will not be reduced. ✓ (2)

2.5 **Any ONE:**

- Chlorine gas is poisonous – causes health problems/breathing complications ✓
- Chlorine gas is used to make drugs that can be dangerous when overdosing
- Chlorine used as nerve gas.

(1)

[10]

HOMEWORK SOLUTIONS: SESSION 18**TOPIC 1: ELECTROSTATICS - GRADE 11 REVISION****QUESTION 1**

1.1

$$F = \frac{kQ_1Q_2}{r^2} = \frac{(9 \times 10^9)(4 \times 10^{-6})(6 \times 10^{-6})}{(0.4)^2} = 1.35 \text{ N}$$

(4)

1.2

Four

(1)

1.3

$$E (6\mu\text{C}) = kQ/r^2 \\ = (9 \times 10^9)(6 \times 10^{-6})/(0.2)^2 \\ = 1,35 \times 10^6 \text{ N}\cdot\text{C}^{-1} \text{ to the left.}$$

$$E (4\mu\text{C}) = kQ/r^2 \\ = (9 \times 10^9)(4 \times 10^{-6})/(0.6)^2 \\ = 1 \times 10^6 \text{ N}\cdot\text{C}^{-1} \text{ to the right.}$$

Take to the right as positive:

$$E_{\text{net}} = -1,35 \times 10^6 + 1 \times 10^6 = -1,25 \times 10^6 \text{ N}\cdot\text{C}^{-1} \\ = 1,25 \times 10^6 \text{ N}\cdot\text{C}^{-1} \text{ to the left}$$

(6)

1.4

$$\text{New charge} = (+4 \times 10^{-6}) + (-6 \times 10^{-6})/2 = -1 \times 10^{-6} \text{ C}$$

$$U = kQ_1Q_2/r \\ = (9 \times 10^9)(-1 \times 10^{-6})^2/0,4 \\ = 2,25 \times 10^{-2} \text{ J}$$

(5)

[16]

QUESTION 2

2.1 The current through a conductor is directly proportional to the potential difference across its ends at constant temperature. ✓✓ (2)

2.2 Equal ✓

2 A divides equally at T (and since $I_M = 1 \text{ A}$ it follows that $I_N = 1 \text{ A}$) ✓

OR

$$I \propto \frac{1}{R}, \therefore R_M = R_N \quad (2)$$

2.3 $\text{emf} = IR + Ir$ ✓ $\therefore 17 = 14 + Ir$ ✓ $\therefore Ir = 3 \text{ V}$

$$r = \frac{V_{\text{lost}}}{I} \quad \checkmark = \frac{3}{2} \checkmark = 1,5 \Omega \checkmark \quad (5)$$

2.4 $V_N = IR_N$ ✓ = (1)(2) ✓ = 2 V ✓ (3)

2.5 $V_Y = 14 - 2 = 12 \text{ V}$ ✓

$$V_Y = IR_Y \quad \checkmark \therefore 12 = (2)R_Y \quad \checkmark$$

$$\therefore R_Y = 6 \Omega \quad \checkmark \quad (4)$$

[16]

HOMEWORK SOLUTIONS: SESSION 19**TOPIC: ELECTRODYNAMICS - MOTORS AND GENERATORS AND ALTERNATING CURRENT****QUESTION 1**

- 1.1 C
1.2 B
1.3 D
- 1.4 D
1.5 C

(5 x 2) [10]**QUESTION 2**

- 2.1 There will be more current, more movement results. $\checkmark \checkmark$ (2)
- 2.1.1 To stop the current briefly every 180° and to swop the directon of the current every 180° . \checkmark (1)
- 2.1.2 To allow for free rotation of the coil. \checkmark (1)
- 2.2 Yes. \checkmark More current can be run through the coil. \checkmark (Changing the number of coils or the strength of the magnets would be changing the actual structure of the motor.) (2)
- 2.3 A motor converts electrical energy into kinetic energy \checkmark and a generator converts kinetic energy into electrical energy. \checkmark In a motor the current needs to be provided and movement is created. In a generator the movement needs to be provided and a current is produced. (2)
- 2.4 More interaction of the magnetic field causes the conductor to have more current induced in it. \checkmark So the faster the movement, the greater the current. \checkmark (2)

[10]**QUESTION 3**

- 3.1 $I = I_0 \sin \omega t$ $\checkmark \checkmark$ or $I = I_0 \sin 2\pi ft$ (2)
- 3.2 $I_{\text{RMS}} = I_0 / \sqrt{2}$ $\checkmark \checkmark$ (2)
- 3.3 $V_0 = \sqrt{2} V_{\text{RMS}}$ $\checkmark = 1,414 \times 240 \checkmark = 339,36V \checkmark$ (3)
- 3.4 The average value of the current over the cycle is zero and no useful power is delivered. $\checkmark \checkmark$ (2)

[9]