SENIOR SECONDARY IMPROVEMENT PROGRAMME 2013

education
Department: Education
GAUTENG PROVINCE

GRADE 12

PHYSICAL SCIENCES

LEARNER HOMEWORK SOLUTIONS

The SSIP is supported by

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LEARNER HOMEWORK SOLUTIONS

HOMEWORK SOLUTIONS: SESSION 16

TOPIC: CONSOLIDATION EXERCISES ON RATES, CHEMICAL EQUILIBRIUM AND ELECTROCHEMISTRY

QUESTION 1

1.1 silver√√ (2)

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

1.3 silver√√ (2)

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

√ √ √ (3)

1.5 $E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$ √

$= 0{,}80$ √ $- (-0{,}25)$√

$E^{\theta}_{cell} = 1{,}05$ 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:

$2C\ell^- \rightarrow C\ell_2(g) + 2e^-$ ✓✓ OR/*OF* $C\ell^-(aq) \rightarrow \frac{1}{2}C\ell_2(g) + e^-$

Q:

$2H_2O(\ell) + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$ ✓✓ (4)

1.2 <u>H_2O is a stronger oxidising agent</u> (than Na^+) ✓

and is <u>more readily reduced</u> than the Na^+. ✓ (2)

1.3 Allows only the cation (Na^+) to move across to the cathode compartment.. ✓

OR

To separate the $C\ell^-$ 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

2.1 $2H_2O + 2e^- \rightarrow 2OH^-(aq) + H_2(g)$ ✓✓ (2)

2.2 $2H_2O(\ell) + 2C\ell^-(aq)$ ✓ $\rightarrow 2OH^-(aq) + H_2(g) + C\ell_2(g)$ ✓ bal ✓ (3)

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

$$F = \frac{kQ_1Q_2}{r^2} = \frac{(9\times10^9)(4\times10^{-6})(6x10^{-6})}{(0.4)^2} = 1.35\,\text{N}$$

(4)

1.2 Four (1)

1.3 E (6μC) = kQ/r^2

= (9 x 10^9) (6 x 10^{-6})/(0.,2)^2

= 1,35 x 10^6 N·C^{-1} to the left.

E (4μC) = kQ/r^2

= (9 x 10^9) (4 x 10^{-6})/(0.,6)^2

= 1 x 10^6 N·C^{-1} to the right.

Take to the right as positive:

E_{net} = - 1,35 x 10^6 + 1 x 10^5 = - 1,25 x 10^6 N·C^{-1}

= 1,25 x 10^6 N·C^{-1} to the left (6)

1.4 New charge = (+4x10-^{6}) + (-6x10^{-6})/2 = -1 x 10^{-6} C

U = kQ$_1$Q$_2$/r

= (9 x 10^9)(-1 x 10^{-6})^2/0,4

= 2,25 x 10^{-2} 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 $I_M = 1$ A it follows that $I_N = 1$ A) ✓

OR

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

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

$r = \frac{V_{lost}}{I}$ ✓ $= \frac{3}{2}$ ✓ = 1,5 Ω ✓ (5)

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

2.5 $V_Y = 14 - 2 = 12$ V ✓

$V_Y = IR_Y$ ✓ $\therefore$ 12 = (2)R_Y ✓

$\therefore R_Y = 6\ \Omega$ ✓ (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. √ √ (2)

2.1.1 To stop the current briefly every 180º and to swop the directon of the current every 180º. √ (1)

2.1.2 To allow for free rotation of the coil. √ (1)

2.2 Yes. √ More current can be run through the coil. √ (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 √ and a generator converts kinetic energy into electrical energy. √ 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. √ So the faster the movement, the greater the current. √ (2)

[10]

QUESTION 3

3.1 $I = I_0 \sin\omega t$ √ √ or $I = I_0 \sin 2\pi f t$ (2)

3.2 $I_{RMS} = I_0 / \sqrt{2}$ √ √ (2)

3.3 $V_0 = \sqrt{2}\ V_{RMS}$ √ = 1,414 x 240 √ = 339,36V√ (3)

3.4 The average value of the current over the cycle is zero and no useful power is delivered. √ √ (2)

[9]