

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATIONS
RESIT/SPECIAL EXAMINATION**

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE

CHEM 120: PHYSICAL CHEMISTRY 1

STREAMS: BSC

TIME: 2 HOURS

DAY/DATE: THURSDAY 04/11/2021

11.30 A.M – 1.30 P.M.

INSTRUCTIONS:

- Answer any Question ALL Questions.

QUESTION ONE (30 MARKS)

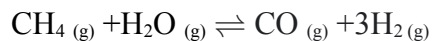
- 1a (i) State Faraday's first and second law of electrolysis (2 marks)
- (ii) Explain the significance of Faraday law of Electrolysis (4 marks)
- (iii) Three cells containing respectively solutions of silver nitrate, copper (II) sulphate and dilute sulphuric acid are fitted with platinum electrodes and placed in series. An electric current of 2.5 amperes is passed through the cells when 0.4g of silver was deposited in the first cell. Calculate:
- (i) The weight of copper deposited in the second cell (3 marks)
- (ii) The length of time the current was passed (2 marks)
($T=1$, $Cu = 63.6$, $Ag = 108$, $1F = 96500$ Coulombs)
- (iii) The volume of hydrogen liberated at $17^{\circ}C$ and $770mmHg$ in the third cell (6 marks)
- b) Selenium in a 10.0g soil sample is distilled as the tetrabromide, which is collected in aqueous solution where it is hydrolyzed to SeO_3^{2-} . The SeO_3^{2-} is determined iodometrically requiring 4.5ml of standard thiosulphate solution for the titration. If the thiosulphate titer is 0.049mg $K_2Cr_2O_7/ml$. Calculate the concentration of selenium in the soil in ppm. (Se = 78.96, O = 15.9994, K = 39.098, Cr = 51.996 and I = 126.9045)
- (13 marks)

QUESTION TWO (20 marks)

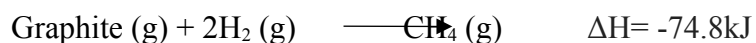
- 2 a Distinguish between reversible cell and irreversible cell (8 marks)

(b) (i) State Hess's law (1 mark)

(ii) Use Hess's law to calculate the following enthalpy of reaction of the major process of steam reforming



Given- the separate reactions of carbon dioxide and hydrogen gas and methane decomposition



(c) Discuss the various kinds of the information which can be obtained from equilibrium constant (2 marks)

QUESTION THREE (20 MARKS)

3a (i) Explain how you can characterize the deviation from ideally of a real gas (6 marks)

(ii) Two separate bulbs are filled with an ideal gas A and a non-ideal gas B respectively in such a way that PV remains the same and B is below its Boyle temperature. Show mathematically that B has greater temperature than A.

(4 marks)

(iv) 0.540gm of an organic liquid displaces 71.52cm³ of dry air at 99.80°C. The barometer pressure was 691.4 mm of Hg. The compound is saturated and contains only carbon, fluorine and chlorine. There is 57% Cl₂ by weight. Determine its molecular formula. (Cl = 35.5, C=12, F=19) (8 marks)

(b) State Arrhenius equation and explain the terms involved (2 marks)