



JX-003-1015007

Seat No. _____

Third Year B. Sc. (Sem. V) Examination

October - 2019

Chemistry - 503

(Physical & Analytical Chemistry)

(New Course)

Faculty Code : 003

Subject Code : 1015007

Time : **2:30** Hours]

[Total Marks : **70**

- Instructions :** (1) All questions are compulsory.
(2) Right side figures indicate marks.

- 1 (a) Answer the following objective questions. 4
- (1) Define cyclic process.
 - (2) What is called spontaneous process ?
 - (3) Write limitations of 1st law of thermodynamics.
 - (4) What is the value of entropy change in reversible process ?
- (b) Answer in brief : (any **one**) 2
- (1) Explain : Entropy is thermodynamic probability.
 - (2) Calculate efficiency of heat engine working between 27°C and 127°C temp.
- (c) Answer in detail : (any **one**) 3
- (1) Derive $\Delta S = n c_p \ln \frac{T_2}{T_1} + R \ln \frac{P_1}{P_2}$ using 2nd law of thermodynamics.
 - (2) Write different statements of 2nd law of thermodynamics.

- (d) Write note on any **one** : 5
- (1) Derive $\eta = \frac{W_{\max}}{Q_2} = \frac{Q_2 - Q_1}{Q_2} = \frac{T_2 - T_1}{T_2}$
- (2) Calculate change in entropy when 1 gram of ice kept at -10°C is converted to vapour at 100°C temp.
 Specific heat of ice = 0.5
 Specific heat of water = 1
 Latent heat of melting 80 cal/gm
 Latent heat of boiling 540 cal/gm
- 2 (a) Answer the following objective questions : 4
- (1) Define : Electrolytic solution.
 (2) Define : Standard Half Cell.
 (3) What is called binodal curve ?
 (4) Write cell reaction of following cell :

$$\text{Zn}|\text{Zn}^{+2}||\text{Ag}^+|\text{Ag}$$
- (b) Answer in brief : (any **one**) 2
- (1) Define : (i) Tie lines and (ii) Plait point.
 (2) Calculate cell potential ΔE° for the cell given below at 25°C temp.

$$\text{Fe} \left| \text{Fe}^{+2}_{(\text{aq})} \right| \left| \text{Cu}^{+2}_{(\text{aq})} \right| \text{Cu} \quad E^\circ_{\text{Fe}-\text{Fe}^{+2}} = 0.44 \text{ V}$$

$$E^\circ_{\text{Cu}-\text{Cu}^{+2}} = -0.34 \text{ V}$$
- (c) Answer in detail : (any **one**) 3
- (1) Discuss phase rule with its related terms in detail.
 (2) Write note on standard hydrogen electrode.
- (d) Write note on any **one** : 5
- (1) Discuss ternary system for one pair of partially miscible liquid with phase diagram.
 (2) Write note on Galvanic Cell.
- 3 (a) Answer the following objective questions : 4
- (1) Define : Work function.
 (2) Define : Transmittance.
 (3) Write Grothus Draper law.
 (4) What is the effect of pressure on melting point of Ice ?

- (b) Answer in brief : (any **one**) 2
- (1) Write difference between thermal and photochemical reaction.
 - (2) Derive Gibbs-Helmholtz equation at constant temperature and pressure in reference to free energy.
- (c) Answer in detail : (any **one**) 3
- (1) Derive Beer-Lambert's law.
 - (2) 1 mol N_2O_4 dissociates 20% at 300 K temperature and 1 atm pressure. Calculate ΔG and K_p for the following reaction $\text{N}_2\text{O}_{4(g)} \rightarrow 2\text{NO}_{2(g)}$
- (d) Write note on any **one** : 5
- (1) Derive Vant Hoff isotherm equation.
 - (2) Explain spectrophotometric estimation of (i) Lacking of absorbance by reaction product and estimating reagent and (ii) Lacking of absorbance by reactants and reagents.
- 4 (a) Answer the following objective questions : 4
- (1) How conductivity water is prepared ?
 - (2) Define equivalent conductance.
 - (3) Draw the structure of Eriochrome black-T.
 - (4) Define : Legand.
- (b) Answer in brief : (any **one**) 2
- (1) Explain Welcher's rule for EDTA Titration.
 - (2) Write factors affecting conductance of solution.
- (c) Answer in detail : (any **one**) 3
- (1) Write note on Muroxide indicator.
 - (2) How degree of dissociation and dissociation constant of weak acid is determined using conductometry.

- (d) Write note on any **one** : 5
- (1) Discuss conductometric titration of (i) Strong acid with strong base and (ii) Titration of $\text{KCl} \rightarrow \text{AgNO}_3$.
 - (2) Give various methods of EDTA Titration and explain (i) Direct Titration (ii) Beck Titration and (iii) Alkalinity Titration.
- 5 (a) Answer the following questions : 4
- (1) Define standard solution.
 - (2) What is called equivalent point ?
 - (3) Define Molality ?
 - (4) Methyl orange shows _____ colour in acidic medium and _____ colour in basic medium.
- (b) Answer in brief : (any **one**) 2
- (1) Calculate molarity of 2 lit. aqueous solution containing 100 grams of NaOH [Na = 23, O = 16, H = 1].
 - (2) Write any four characteristic of the substance used as primary standard.
- (c) Answer in detail : (any **one**) 3
- (1) Discuss usefulness of starch indicator in iodometry and iodimetry estimation. Give its merits and demerits.
 - (2) Explain internal redox indicator with example.
- (d) Write note on any **one** : 5
- (1) What is called precipitation titration ? Explain Fajan's method for the titration of $\text{AgNO}_3 \rightarrow \text{NaCl}$ in detail.
 - (2) Explain neutralization titration of strong acid and strong base with titration curve.