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## INTERNATIONAL CENTRE FOR APPLIED SCIENCES (Manipal University) II SEMESTER B.S. DEGREE EXAMINATION – APRIL/ MAY 2017 SUBJECT: CHEMISTRY (CH121) (OLD SCHEME) (COMMON TO ALL BRANCHES) Monday, 24 April 2017

## Time: 3 Hours

Max. Marks: 100

- ✓ Answer ANY FIVE full Questions.
  ✓ Missing data, if any, may be suitably assumed
- 1A. i) Derive the Nernst equation of single electrode potential of copper electrode immersed in copper sulphate solution. ii) What are the criteria for a standard cell? Explain the construction of calomel electrode with a diagram. **1B.** i) Calculate the enthalpy of formation of methane from the following data.  $CH_4(g) + 2O_2(g)$  $\rightarrow$  CO<sub>2</sub> (g) + 2H<sub>2</sub>O (l)  $\Delta H = -890.3 \text{ KJ}$  $H_2(g) + \frac{1}{2}O(g)$  $\Delta H = -285.9 \text{ KJ}$  $\rightarrow$  H<sub>2</sub>O (1)  $C(s) + O_2(g)$  $\rightarrow CO_2(g)$ ΔH = - 393.5 KJ ii) Define entropy. Calculate the change in entropy when 5 moles of an ideal gas expand reversibly from a volume of 8 dm<sup>3</sup> to 80 dm<sup>3</sup> at a temperature 27 °C. **1C**. Explain the pitting corrosion with an example. [8+8+4]**2A.** i) What is galvanization?. What are its advantages and disadvantages? Explain the steps involved in galvanization process. ii) Explain the role of cathodic inhibitors in corrosion control? **2B.** i) Derive the integrated rate equation of first order reaction. ii) The half-life of gaseous reaction  $SO_2Cb \rightarrow SO_2 + Cb$  which obeys first order kinetics is 8 minutes. How long it will take for the concentration of  $SO_2Cl_2$  to be reduced to 1% of the initial value? **2C.** What is a hydrogen bond? Explain the types of hydrogen bonds with examples. [8+8+4] **3A.** i) Explain the tyndall effect and Brownian movement of colloids. ii) Describe the preparation of colloids by Bredig's arc method. **3B.** i) calculate the bond order of oxygen molecule and predict its magnetic behavior. ii) Write any three postulates of VSEPR theory. **3C**. Explain the acid and alkaline errors of a glass electrode. [8+8+4]
  - **4A.** i) State and explain Le chateliers principle. With the help of this explain the conditions which would favour the formation of ammonia in the following reaction.

 $N_2 + 3H_2 \rightleftharpoons 2NH_3 \qquad \Delta H = -99.3KJ$ 

- ii) Differentiate between order and molecularity of a reaction.
- 4B. i) Explain the dipole dipole and dipole induced dipole interactions with examples.ii) Differentiate between sigma and pi bonds.
- **4C**. Derive the relationship between Cp and Cv. **[8+8+4]**

Page 1 of 2

5A. i) Derive the Gibbs helmholtz equation.

ii) Define the terms state function and path function. Give an example for each.

5B. i) Calculate the cell potential of Ag <sup>+</sup> / Ag coupled with Cu / Cu <sup>2+</sup> couple if the concentration of silver ions and copper ions are 4.2 x 10 <sup>-6</sup> M and 1.3 x 10 <sup>-3</sup> M respectively. The standard reduction potential of silver and copper are 0.80 V and 0.34 V. What is the value of free energy change for the reduction of 1.0 mole of silver ions by copper ions in the indicated concentration?

ii) Mention the advantages glass electrode and disadvantages calomel electrode.

- **5C.** What are the characteristic features of band theory? [8+8+4]
- **6A.** i) What is lattice energy? Explain the determination of lattice energy of NaCl by Born Haber cycle?

ii) Explain the covalent bond formation of p-p overlapping with an example.

- **6B.** i) What is activation energy? Explain how energy of activation is determined by Arrhenius equation.
  - ii) A buffer solution contains 0.20 M NH<sub>4</sub>OH and 0.25 M NH<sub>4</sub>Cl per liter. Calculate pH of
  - the solution. Dissociation constant of NH<sub>4</sub>OH at room temperature  $1.81 \times 10^{-5}$ .
- 6C. Explain the following termsa) Gold number b) Protective colloids c) Flocculation value d) Emulsion

[8+8+4]

7A. i) Discuss the phase, component and degree of freedom with examples.

ii) A monobasic acid has dissociation constant  $1.8 \times 10^{-5}$  at 25 ° C. calculate the degree of dissociation at a concentration 0.20 M at the same temperature. What will be the concentration of hydrogen ions furnished by it?

**7B.** i) What is the difference between electrophoresis and electro osmosis? Discuss the origin of charge on colloidal particles.

ii) Discuss in detail the importance and applications of colloids.

- 7C. What are acid base indicators? Why is phenolphthale in a suitable indicator for titrating strong acid against strong base? [8+8+4]
- 8A. i) What is hybridization? With an example explain sp<sup>2</sup> hybridization.ii) What are the characteristic features of ionic bond?
- 8B. i) How do the following factors affect the rate of corrosion?
  - a) Nature of the corrosion product b) electrode potential c) pH

ii) The  $\Delta G^{\circ}$  of a Daniel cell is - 212.3 KJ/ mol. Calculate the standard emf of the cell.

**8C**. What is standard electrode potential? Explain the origin of electrode potential.

[8+8+4]

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