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B. TECH.
(SEM II) THEORY EXAMINATION 2018-19
CHEMISTRY

Time: 3 Hours *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x10 = 20

a. Why graphite is used as lubricant? **[CO 1]**
b. Give the approaches used for the preparation of Nanomaterials. **[CO 1]**
c. What is the selection rule for the molecule to show rotational spectrum? **[CO 2]**
d. Explain, which one will exhibit higher value **of** λ_{max} in UV/Visible spectra of CH_3COCH_3 and $CH_2=CHCOCH_3$. **[CO 2]**
e. Why does part of a nail inside the wood undergoes corrosion easily? **[CO 3]**
f. Calculate the cell potential of the given cell at 25°C. (R = 8.31JL^{-1} mol^{-1}, F= 96500C mol^{-1}).

Ni(s)|Ni^{+2}(0.01 M)|| Cu^{+2} (0.1M)|Cu(s)

Given **E° $_{Cu+2/Cu}$ = + 0.34 V; E° $_{Ni+2/Ni}$ = - 0.25 V** **[CO 3]**

g. Show with the help of reactions, how scale formation can be prevented by Calgon conditioning? **[CO 4]**
h. Calculate GCV of the coal sample having C=80%, H= 9%, O= 4%, N=1.5%, S=2.5% and ash=3%. **[CO 4]**
i. What are Bio-degradable polymers? Discuss their application. **[CO 5]**
j. What do you understand by the Polymer Blends? **[CO 5]**

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. Outline the salient features of Molecular Orbital theory on the basis of LCAO principle.Draw the MO energy level diagram for the CO molecule. Calculate its bond order and predict its magnetic behavior. **[CO 1]**
b. Discuss the quantum theory of Raman spectroscopy and how the Stokes and anti Stokes lines appear in the Raman Spectroscopy? How does it differ from IR spectroscopy? **[CO 2]**
c. Discuss rusting of iron by Hydrogen evolution and Oxygen absorption mechanism. Briefly explain sacrificial cathodic protection and impressed current cathodic protection. **[CO 3]**
d. With the help of a neat diagram, explain the working of bomb calorimeter. A sample of coal contain C=91%, H=5.5%, N= 2.5% and ash=2%. The following data were obtained when the above coal was tested in bomb calorimeter:
Weight of coal burnt= 1.029 g
Weight of water taken= 570 g
Water equivalent of bomb and calorimeter= 2200 g
Rise in temperature= 3.3˚C
Fuse wire correction = 3.8 cal
Acid correction= 62.6 cal
Cotton thread correction= 1.6 cal
Cooling correction= 0.047 ˚C

Assuming that the latent heat of condensation of steam is 587cal/gm, calculate gross and net calorific values of the coal. **[CO 4]**

e. What are conducting polymers? Classify conducting polymers and mention their important applications. **[CO 5]**

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SECTION C

3. Attempt any *one* part of the following: 5 x 2 = 10

(a) What do you understand by Mesomorphic state and illustrate it with the help of vapour pressure -temperature curve? Discuss its classification on basis of temperature and give their important applications. **[CO 1]**

(b) Differentiate stoichiometric and non-stoichiometric defects? Explain different stoichiometric defects with examples. **[CO 1]**

4. Attempt any one part of the following: 5 x 2 = 10

(a) What type of electronic transitions is involved in UV- visible spectroscopy? Explain the Absorption and Intensity shift in the UV spectroscopy and support with examples. Illustrate, the effect of polar and non polar solvent on $\pi - \pi^*$ transition in acetone? **[CO 2]**

(b) Among H_2, HCl, CO_2, H_2O molecules identify which will be IR active and why? Explain different mode of vibrations observed in CO_2 molecule. Out of the following pairs which one is expected to absorb at higher frequency for stretching vibrations? Also state reason.

i) HCHO, CH_3CHO;
ii) $C \equiv C$, C= C:
iii) O- H, C-C. **[CO 2]**

5. Attempt any one part of the following: 5 x 2 = 10

(a) What are Secondary batteries? Discuss the various reactions involve during the charging and discharging of lead storage battery. **[CO 3]**

(b) Outline the salient features of the phase diagram of Water System highlighting the name of system (areas, curves and points), phase in equilibrium and degree of freedom in each case. Why quadruple point does not exist in one component system? **[CO 3]**

6. Attempt any *one* part of the following: 5 x 2 = 10

(a) Calculate the quantities of lime (74%) and soda (92%) required for cold softening of 125,000 L of water with the following analysis, using 10 ppm of $NaAlO_2$ as coagulant.
Analysis of raw water: **Ca^{2+}= 160ppm, Mg^{2+}= 48ppm, CO_2= 66ppm, HCO_3^- = 264ppm, H^+ =20ppm, NaCl = 4.7 ppm.** **[CO 4]**
Analysis of treated water: **CO_3^{2-} =45 ppm and OH^- =68 ppm**.

(b) What are ion exchangers? With the help of neat sketch, discuss ion-exchange process for water softening. Compare its merit over zeolite process. **[CO 4]**

7. Attempt any *one* part of the following: 5 x 2 = 10

(a) Give preparation, properties and applications of following polymer: **[CO 5]**
(i) Neoprene (ii) Terylene (iii) Nylon 6,6.

(b) Write short notes: **[CO 5]**
(i) Applications of Grignard Reagent
(ii) Composites.

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