

Birla Institute of Technology & Science, Pilani, Rajasthan 333 031

Second Semester, 2022-2023

Course Number: CHEM F343

Course Title: Inorganic Chemistry III

Marks: 60

Time: 90 min

MIDSEM Test (Closed Book)

Date: March 17, 2023

Instructions

1. Answer all the questions

2. Answers must be pointed

3. All the answers in a question should be in the same place

[Useful values: $h = 6.62 \times 10^{-34} \text{J-s}$; $c = 3 \times 10^{10} \text{cm/s}$; $1 \text{ eV} = 1.6 \times 10^{-19} \text{J}$; Bohr magneton of electron $= 9.24 \times 10^{-24} \text{Am}^2$; electronic charge $= 1.602 \times 10^{-19} \text{coulomb}$; mobility of electron, $\mu_e = 180 \text{cm}^2 \text{V}^{-1} \text{s}^{-1}$; $\mu_0 = 1.257 \times 10^{-6} \text{H/m}$; Unit cell length of Ag $= 4.0862 \times 10^{-8} \text{cm}$; Atomic No. ;

Q1. (a) What do you understand by active and passive transports in cellular system?

(b) Give example for each of these transport processes and briefly describe their action.

(c) What is the difference of functionality in between Sideraphore and Transferrin? Sketch up the coordination atmosphere of iron center in Transferrin with labeling appropriately.

(d) Describe two different type of passages lying on the spherical shape ferritin. Why does ferritin take up iron as Fe(II) and stores it as Fe(III)? **2 + 4 + 5 + 4 = 15M**

Q2. (a) What are the characteristics (at least four) a soft magnet possesses? Write down the significances of these characteristics for a soft magnet.

(b) Plot of magnetization vs applied magnetic field for a hard magnet and label these M_r , H_c , μ_i , μ_{\max} , saturated M appropriately.

(c) Explain the following terms with sketching: (i) Grain boundary; (ii) Domain; (iii) Bloch walls

(d) The magnetization within a bar of some metal alloy is $1.2 \times 10^6 \text{ A/m}$ when the field is 200 A/m . Calculate (a) the magnetic susceptibility (χ_m) of this alloy, (b) the permeability (μ), and (c) the magnetic induction (B) (in tesla) within the alloy. **4 + 6 + 5 + 5 = 20M**

Q3. (a) The mobility of electrons in silver is $75 \text{cm}^2/\text{V.s}$. Estimate the fraction of the valence electrons that are carrying an electrical charge (conductivity $= 6.8 \times 10^5 \text{mhocm}^{-1}$).

(b) Describe motor piezoelectricity and converse piezoelectricity with examples.

(c) Describe the band theory of solids. **5 + 2 + 5 = 12M**

Q4. (a) Why does the photochromic glass contains CuCl (Write all the associated chemical reactions)?

(b) Define characteristic and continuous X-ray spectra (use diagram).

(c) We find that 20% of the original intensity of a beam of photons is transmitted from air through a 1-cm thick-material having a dielectric constant of 2.3 and back into air. Determine the fraction of the beam that is (i) reflected at the front surface, (ii) absorbed in the material, and (iii) reflected at the back surface; (iv) determine the linear absorption coefficient of the photons in the material ($n_{\text{air}} = 1.0$). **3 + 3 + 7 = 13M**

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