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SARDAR PATEL UNIVERSITY  
M.Sc. (SEMESTER-IV) EXAMINATION  
2016

Monday, 11<sup>th</sup> April  
02.30 p.m. to 5.30 p.m.

INORGANIC CHEMISTRY: PS04CINC03  
(Inorganic polymers and Inorganic spectroscopy)

Note:-figures to the right indicate full marks.

Total Marks: 70

Q.1. Answer the following:

8

- Substances, whose solubility parameter differ greatly are mutually.....
  - Soluble
  - Partially soluble
  - Insoluble
  - Completely soluble
- Above  $T_g$  liquid crystalline polymer exhibits as \_\_\_\_\_.
  - Crystalline and glassy domains
  - Isotropic liquid
  - Flexible thermo plastic
  - Rubbery state
- Which of the following is NOT a chain coordination polymer?
  - Copper(I) acetylide
  - $[\text{Hg}(\text{NH}_2)]_n\text{X}_n$
  - $\text{K}[\text{Cu}(\text{CN})_2]$
  - Gold(II) iodide
- Which of the following polymer have tetrahedral geometry in its repeating unit?
  - $\text{Cs}(\text{CuCl}_3)$
  - $\text{K}_n(\text{FeS}_2)_n$
  - $[\text{CuX}_2]_n$
  - None of above
- Which of the following ions are not expected to be studied by ESR spectroscopy?
  - $\text{Cu}^{+2}$
  - $\text{Ru}^{+3}$
  - $\text{Co}^{+2}$
  - $\text{Ru}^{+2}$
- In which frequency region, ESR spectroscopy is located?
  - 10 MC – 100 MC
  - 30 GC – 300 GC
  - 0.1 MC – 10 MC
  - 300 GC – 3000 GC
- Which of the following is industrial application of Mossbauer spectroscopy?
  - Corrosion Studies
  - Magnetic tape
  - Glass manufacturing
  - All of above

2.....

8. Mean lifetime ( $\tau$ ) of excited state and natural line width ( $\Gamma$ ) is related with each other by equation:

(a)  $\Gamma = \hbar/\tau$

(b)  $\Gamma = \tau/\hbar$

(c)  $\Gamma = \tau$

(d)  $\Gamma \neq \tau$

Q.2. Answer any **SEVEN** of the following:

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1. What are siloxenes?
2. Discuss the reaction for the preparation of silicon polymer via organometallic process.
3. Explain the three -dimensional polymers.
4. Describe the polymers with Al-O and Ti-O back bone.
5. What are the difference between NMR and ESR spectroscopy?
6. What is hyperfine splitting? Explain the hyperfine splitting in methyl free radical ( $\bullet\text{CH}_3$ ).
7. Explain the electric Quadrupole interaction.
8. What is Mossbauer effect?
9. Explain the electric monopole interaction.

Q.3.A. What is glass transition temperature and discuss the factors affecting on it.

6

B. Answer the following:

6

1. Explain the switching phenomenon in chalcogenide glasses.
2. Write a note on silazine and sildiazine.

**OR**

B. Discuss in detail about the phosphorus based chain polymer.

Q.4.A. What are silicates? Explain different types of silicates?

6

B. What are synthetic coordination polymers? Explain the Volan Quilon and bis chelating agents in detail.

6

**OR**

B. Discuss the preparation and properties of borazine.

3....

Q.5.A. Describe the various components of ESR spectrometer and explain the working of instrumentation. 6

B. What are the application of ESR spectroscopy? Explain any three in detail. 6

OR

B. Answer the following:

1. Describe the sensitivity, concentration of the sample solution and choice of the solvent used in ESR spectrometer.

2. Discuss the advantages and disadvantages of wider lines and line width in ESR spectroscopy.

Q.6.A. For  $^{57}\text{Fe}$  the lifetime for lowest nuclear state with energy of 14.4 KeV above the ground state is 140 ns. Calculate the natural line width in eV. 6

B. Explain the instrumentation of Mossbauer spectroscopy in detail. 6

OR

B. Explain in brief about the energetics of free atom

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