



M 9769



Reg. No. :

Name :

V Semester B.Sc. Degree (CCSS – Reg./Supple./Imp.)
Examination, November 2015
CORE COURSE IN CHEMISTRY
5B08CHE : Physical Methods in Chemistry

Time : 3 Hours

Max. Weightage : 25

SECTION – A

Answer **all** questions. Choose the correct answer.

- The wavenumber of radiation of wavelength 1000Å
a) 10^5 cm^{-1} b) 10^9 cm^{-1} c) 10^5 m^{-1} d) 10^9 m^{-1}
 - Which among the following is microwave active ?
a) SF_6 b) CH_4 c) CH_2Cl_2 d) H_2
 - How many stretching modes of vibration are possible for SO_2 molecule ?
a) 2 b) 3 c) 4 d) 0
 - In Raman spectrum, the separation of the first line from the exciting line is
a) $2B$ b) B c) $6B$ d) $4B$
- The possible electronic transition in ethane molecule is
a) $\sigma \rightarrow \sigma^*$ b) $\pi \rightarrow \pi^*$ c) $n \rightarrow \pi^*$ d) $n \rightarrow \sigma^*$
 - The nuclear spin quantum number of ^{16}O is
a) $1/2$ b) $3/2$ c) 1 d) 0
 - The spin only value of cobalt ion in low spin $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ is
a) 1.73 b) 0 c) 4.89 d) 3.87
 - The technique which measures current under constant applied voltage is
a) polarimetry b) amperometry
c) coulometry d) electrogravimetry

P.T.O.



3. i) Which among the following can't be studied by TG ?
 a) oxidation b) dehydration
 c) phase transition d) vapourisation
- ii) Unit of molar absorptivity is
 a) $L \text{ mol}^{-1} \text{ cm}^{-1}$ b) $L^{-1} \text{ mol cm}$
 c) $L^{-1} \text{ mol}^{-1} \text{ cm}$ d) $L^{-1} \text{ mol cm}^{-1}$
- iii) Synthetic resins containing _____ group act as anion exchanger.
 a) carboxylic b) phenolic
 c) sulphonic d) quaternary ammonium
- iv) At curie point a ferromagnetic becomes _____
 a) paramagnetic b) diamagnetic
 c) antiferromagnetic d) ferrimagnetic
4. i) One nano meter is
 a) 10^{-11} cm b) 10^{-9} cm c) 10^{-7} cm d) 10^{-5} cm
- ii) Which of the following is an example of 2D nano structure ?
 a) nano wire b) nano rod c) nano belt d) nano sheet
- iii) Among the following computational methods, which is a non-quantum mechanical method ?
 a) molecular mechanics b) HF
 c) ab initio d) DFT
- iv) In the DFT method, the functional of which of the following is made use of
 a) Electron density b) Wave function
 c) Molecular orbital d) Atomic orbital **(Weightage 4×1=4)**

SECTION – B

Answer **any 5** questions. **Each** question carries a weightage of **1**.

5. What is a rigid rotor ? Write the expression for rotational energy level allowed for a rigid diatomic molecule.
6. Electronic spectrum is usually broad. Why ?



7. Illustrate the effect of electronegativity on chemical shift.
8. Write any two applications of Dropping Mercury Electrode.
9. What are chemical interferences in AAS ?
10. Determine the CFSE of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ if Δ_0 for the complex is 58.0 kcal/mole.
11. Comment on the properties of nanoparticles.
12. What are basis functions ? **(Weightage 5×1=5)**

SECTION – C

Answer **any 4** questions. **Each** question carries a weightage of **2**.

13. What are enones ? Predict the λ_{max} of $\text{CH}_3 - \text{CO} - \text{C}(\text{CH}_3)=\text{C}(\text{CH}_3) - \text{CH}_3$.
14. Explain the nuclear spin relaxation process.
15. Give an account of the applications of DTA.
16. What is spectrochemical series ? Arrange the following ligands in the increasing order of Δ . CO , NH_3 , Cl^- , H_2O and CN^- .
17. Explain Quantum size effect.
18. Write short notes on DFT. **(Weightage 2×4=8)**

SECTION – D

Answer **any 2** questions. **Each** question carries a weightage of **4**.

19. Describe the basic principle of Mass Spectrometry. Illustrate Mc-Lafferty rearrangement.
20. Explain the theory of ion exchange chromatography. What are its important applications ?
21. i) Write notes on nano technology in bio-engineering.
 ii) Give an account on molecular mechanics. **(Weightage 4×2=8)**