1304E118 Candidate's Seat No :___ ___

M.Sc. (Sem.-IV) Examination

508

Chemistry (Physical)

April-2017

Time : 3 Hours] [Max. Marks : 70

Q:1 Answer the following in **detail: (Each of seven marks)** (14)

(a) Describe nuclear fission and fusion reaction.

OR

(a) Elucidate Liquid Drop Model and give its merits and limitations.

(b) Explain: Isotopic dilution analysis.

OR

(b) Narrate the principle of Neutron Activation Analysis and give its applications.

Q:2 Answer the following in **detail: (Each of seven marks)** (14)

(a) Discuss zero field splitting and Kramer's degeneracy

OR

(a) Mention the factors affecting the Mossbauer spectroscopy.

(b) Describe the principle and instrumentation of ESR Spectroscopy.

OR

(b) Give the importance of Chemical shift and magnetic hyperfine splitting in Moassbauer spectroscopy.

Q:3 Answer the following in **detail: (Each of seven marks)** (14)

(a) Enlist the different types of liquid crystal and explain any one of them.

OR

(a) Describe radial and molecular distribution function of liquid crystals.

(b) Discuss the optical and transport properties of liquid crystals.

OR

(b) Write a note on compounds exhibiting smectic and nematic charaters.

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Q:4   Answer the following in **detail: (Each of seven marks)**   (14)

(a)   Derive Dulong- Petit's equation.

OR

(a)   What is Bose-Einstein statistics? Derive an equation for N indistinguishable particles.

(b)   Write a note on Debye modification and its limitations.

OR

(b)   Differentiate between Maxwell-Boltzmann and Fermi-Dirac statistics.

Q:5   Answer the following in **short: (Each of one mark)**   (14)

(a)   Define binding energy.
(b)   Give one drawback of Einstein model.
(c)   What is transition point?
(d)   Which numbers are used as magic numbers?
(e)   Define: Bosons
(f)   What is the value of 1 Fermi in centimeter?
(g)   Give relation between Nuclear radius and Atomic mass.
(h)   What is anisotropy?
(i)   Why Shell model is referred to as the single particle model?
(j)   What is meant by Boltzon?
(k)   Give an example of stripping reaction in nuclear chemistry.
(l)   What is doppler shift?
(m)   What is thermotropic liquid crystal?
(n)   Define: Heat capacity.

1104E076   Candidate's Seat No : _____

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507
Chemistry (Physical)

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Q. 1 Answer the following in detailed: (14)

  (a) Explain Guoy-Chapman theory and give its limitations.   (7)

<div align="center">OR</div>

  (a) Explain (i) Ion-solvent interaction and (ii) Free energy change due to ion solvent interaction.

  (b) What is concentration polarization? Derive polarographic wave equation.   (7)

<div align="center">OR</div>

  (b) Discuss the effect of pH on polarogram and give applications of polarography.

Q.2 Answer the following in detailed: (14)

  (a) Explain the terms: (i) Nuclear spin (ii) Nuclear resonance (iii) Shielding of magnetic Nuclei   (7)

<div align="center">OR</div>

  (a) Explain principle and instrumental techniques of ^{13}C NMR spectroscopy.

  (b) Discuss spin-spin coupling, spin de-coupling and coupling constant.   (7)

<div align="center">OR</div>

  (b) Discuss the principle and instrumental techniques of FT-NMR spectroscopy.

Q.3 Answer the following in detailed: (14)

  (a) Define partition function. Derive relationship between partition function with internal energy and entropy of monoatomic gases.   (7)

<div align="center">OR</div>

  (a) Derive an expression for translational partition function.

  (b) (i) Write a short note on electronic partition function.   (4)

    (ii) Calculate vibrational partition function for H_2 gas at 3000 K temperature given that the fundamental vibrational frequency of H_2 molecule, obtained from Raman spectrum is $4405.3 cm^{-1}$.($c=3 \times 10^8 m.s^{-1}$, $h=6.626 \times 10^{-34} J.s$ and $k=1.38 \times 10^{-23} J.K^{-1}$)   (3)

<div align="center">OR</div>

  (b) What is rotational constant? Derive an equation for rotational partition function for asymmetrical diatomic molecule.   (7)

Q.4 Answer the following in detailed: (14)

  (a) Name various methods for studying the fast reactions and discuss the pressure jump method.   (7)

<div align="center">OR</div>

(a) Discuss the stopped flow technique for studying the fast reactions.

(b) Write a note on flash photolysis and pulse radiolysis.   (7)

OR

(b) Write a note on shock tubes and relaxation method.

Q.5 Answer the following in short: (one mark each)   **(14)**

(a) Define Limiting current.

(b) What is importance of half wave potential?

(c) Why ^{13}C shows NMR spectra?

(d) Give any two applications of NMR Spectroscopy.

(e) What is current density?

(f) Which solvent is used in NMR Spectroscopy?

(g) What is Zeta potential?

(h) Write an Ilkovic equation.

(i) What is chemical shift?

(j) What is Zero point energy?

(k) Mention unit of partition function.

(l) Define characteristic vibrational temperature.

(m) Give any two examples of fast reactions.

(n) What is relaxation time?