



B.Sc. (Semester – VI) Examination, April/May 2019

CHEMISTRY (Paper – I) 6 Units

Physical Chemistry

Duration : 2 Hours

Max. Marks : 80

Instructions : 1) Answers to the **two** Sections should be written on separate answer books.

2) Figures to the **right** indicate **full** marks.

3) **Use** of non-programmable calculators is **allowed**.

4) **All** questions are **compulsory**, however **internal** choice is available.

Physical Constants : $N = 6.023 \times 10^{23} \text{ mol}^{-1}$,

$h = 6.625 \times 10^{-27} \text{ erg sec}$, $C = 3 \times 10^{10} \text{ cm s}^{-1}$,

$1 \text{ meV} = 1.6 \times 10^{-6} \text{ ergs}$ $\frac{2.303RT}{F}$ at $25^\circ \text{C} = 0.0591$.

SECTION – I

40

(Physical Chemistry)

1. Answer **any four** of the following.

(4×4=16)

- Differentiate between sigma and Pi molecular orbitals.
- Explain the mechanism of Buffer action for Basic Buffer.
- Explain the determination of pH using Quinhydrone Electrode.
- What are prompt neutrons ? Explain the mechanism for delayed neutrons.
- Calculate the energy of photon corresponding to wavelength of 4800 \AA .
- Explain Chemiluminescence with the help of examples.

2. A) i) Explain Fissile and Fissionable nuclides with example.

2

ii) Calculate the pH of a 0.002 M acetic acid solution if it is 2.3% ionized at this dilution.

4

OR

P.T.O.



iii) What is FBTR ? State the point of difference between Moderator and Control Rod. 2

iv) A Buffer solution contains 0.015 moles of ammonium hydroxide and 0.025 moles of ammonium chloride. Calculate the pH value of the solution. Dissociation constant of Ammonium hydroxide at room temperature is 1.8×10^{-5} . 4

B) i) What is Photosensitization ? Name the photosensitizer in photosynthesis. 2

ii) Draw molecular energy level diagram for N_2 and N_2^{+1} and comment on Bond order, stability and magnetic property. 4

3. A) i) What is Bond order ? State its significance. 2

ii) Certain system absorbs 3.0×10^{16} quantum of light per second on irradiation for 10 minutes. 0.002 moles of reactant was found to have reacted. Calculate the quantum efficiency of the process. ($N = 6.023 \times 10^{23}$) 4

OR

iii) State any 2 rules followed for filling of molecular orbitals. 2

iv) Explain Fluorescence. State the various factors affecting fluorescence. 4

B) i) Explain the working of Thermopile. 2

ii) Explain principle and construction of Breeder Reactor. 4

SECTION – II 40

4. Answer **any four** of the following questions. (4×4=16)

i) Explain pure rotational Raman spectra.

ii) Explain what is pitting corrosion.

iii) Describe the process of reprocessing spent nuclear fuel.

iv) Explain the various modes of vibration in infrared spectroscopy.

v) Explain what are solar cells.

vi) Explain what is zero point energy.

5. A) i) Explain the concept of harmonicity and anharmonicity by using potential energy curve. 4

ii) A sample was excited by 4375Å line of mercury. A Raman line was observed at 4495Å. Calculate the Raman shift. 2

OR



- iii) State four characteristic properties of Raman spectral lines. 4
 - iv) The force constant of HCl molecule is 483 Nm^{-1} . If the reduced mass is $1.6277 \times 10^{-27} \text{ kg}$. Calculate the fundamental vibration frequency. 2
 - B) i) Explain the somatic and genetic effects of nuclear radiation. 4
 - ii) What is meant by finger print region ? 2
 - 6. A) i) Explain what is chemical corrosion. 4
 - ii) State any two units of nuclear radiation. 2
 - OR
 - iii) With a suitable example, explain secondary acid storage cell. 4
 - iv) Give two applications of radioactive isotopes. 2
 - B) i) State four differences between infrared spectroscopy and Raman spectroscopy. 4
 - ii) What is Raman shift ? 2
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