Total No. of printed pages = 4

CY 181201

4/8/23

Roll No. of candidate | | | | | | | | | | |

2023

B.Tech. 2nd Semester End-Term Examination

Group B

CHEMISTRY – 201

(New Regulation (w.e.f. 2017-18)) & (New Syllabus (w.e.f. 2018-19))

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No.1 and any *four* from the rest.

1. Answer the following questions (All are compulsory) : $(10 \times 1 = 10)$

(i) The energy of which of the following is not quantised

(a) An Electron in an atom

(b) A Free particle

(c) A particle in three dimensional box

(d) An electron in a molecule

(ii) In MO theory, overlapping of two sets of p-orbitals leads to the formation of

(a) One σ-bond and two π-bonds

(b) Two σ-bonds and two π-bonds

(c) Two σ-bonds and one π-bond

(d) None of the above

(iii) In UV-Visible spectroscopy, the type of electronic transitions observed in saturated molecules containing hetero atoms and having a lone pair of electrons are

(a) $\sigma - \sigma^*$ (b) $n - \sigma^*$

(c) $\pi - \pi^*$ (d) $n - \pi^*$

[Turn over

(iv) The melting point of the particles in nano form

(a) Increases (b) Decreases

(c) Remains same (d) None of the Above

(v) Quantum Wire is

(a) 1 D (b) 2 D

(c) 3 D (d) 0 D

(vi) Carbon dioxide acts as a supercritical fluid under the conditions

(a) Above temperature 31° C and pressure 72.8 atm

(b) Below temperature 31° C and pressure 72.8 atm

(c) Above temperature 31° C and below pressure 72.8 atm

(d) Below temperature 31° C and above pressure 72.8 atm

(vii) Waterline corrosion in steel tank is an example of

(a) Stress corrosion (b) Differential aeration corrosion

(c) Pitting corrosion (d) Differential metal corrosion

(viii) The mass spectrometry technique suffers from the obvious disadvantage that

(a) The molecular mass determined is arbitrary

(b) It is time consuming process

(c) Samples are destroyed in the process

(d) None of the above

(ix) What is not true about polymer

(a) Polymers do not carry any charge

(b) Polymers have high viscosity

(c) Polymers scatter light

(d) Polymers have low molecular weight

(x) Which of the following phenomena leads to the development of quantum mechanics?

(a) Black body radiation

(b) Hydrogen atomic spectra

(c) Photoelectric effect

(d) All of the above

2. (a) Write the schrodinger wave equation and explain each term involved. What do you mean by eigen function and eigen value? Explain with an example. (2+2+3)

(b) What are the conditions for the formation of Molecular orbitals? Differentiate between sigma (σ) and pi (π) Molecular Orbitals. (3+2)

(c) Why biopolymers are called sustainable polymers? (3)

3. (a) Write the structure-Property-Applications of Poly lactic acid (PLA). What are the challenges for developing and commercializing PLA-based products? (5+3)

(b) Why atom economy is important in green chemistry? How the atom economy of a reaction can be improved? What do you mean by Sustainable Development Goals (SDG)? (3+2+2)

4. (a) Describe quantum confinement in the case of nanomaterials? Why do metal nanoparticles have bright colours? "Nanomaterials have a very high surface-to-volume ratio". Explain with appropriate examples. (3+3+4)

(b) A solution of Tryptophan has an absorbance of 0.54 at 280 nm in a 0.5 cm path length cuvette. If the molar absorptivity of the solution is $6.4 \times 10^3\ Lmol^{-1}\ cm^{-1}$, calculate the concentration of the solution. (3)

(c) How will you distinguish between benzaldehyde and benzoic acid using IR spectroscopy? (2)

5. (a) Define liquid crystals? How do they differ from normal liquid and solid? How the liquid crystals are classified? (1+2+3)

(b) Mention in brief the working principle of liquid crystal thermometer (LCT). Define Lyotropic Liquid Crystals? (3+1)

(c) Discuss the following term in the context of a battery

(i) Power- Ampere-hour

(ii) Power Density. (2.5+2.5)

6. (a) What are shielding and de-shielding effects in NMR spectroscopy? Why TMS is used as a reference standard for the NMR? Why human soft tissues are MRI active? (4+2+2)

(b) "Corrosion can be regarded as the reverse reaction for metal extraction"- Explain with appropriate examples. Explain the mechanism of (i) hydrogen evaluation and (ii) oxygen absorption in electrochemical corrosion. (3+4)

7. Short notes (write any *five*) : (5×3)

(a) Methods for Corrosion Protection

(b) Rechargeable Battery

(c) Principle of Gas Chromatography

(d) Applications of Conducting Polymers

(e) Fullerenes

(f) Factors affecting the rate of Corrosion

(g) Applications of atomic absorption Spectroscopy

(h) Radial Distribution curves of H-Atom.
