Total No. of printed pages = 4

CY 181201

3/6/24

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

2024

B.Tech. 2nd Semester End-Term Examination

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 all questions : $(10 \times 1 = 10)$

(i) Which of the following in an example of thermoplastic polymer?

(a) Urea-formaldehyde resin (b) Epoxy resin

(c) Duroplast (d) Polystyrene

(ii) If a complex number $y = (a + ib)$ where "a" is real, "b" is real and $i = \sqrt{-1}$, then the complex conjugate z^* is given by

(a) $(a + b)$ (b) $a - b$

(c) $(a - ib)$ (d) $(ib - a)$

(iii) With increase in hydrogen over voltage, the rate of corrosion

(a) decreases (b) increases

(c) remains same (d) initially increase then decrease

(iv) According to MO theory, which of the following is the most stable molecule

(a) N_2^+ (b) N_2^-

(c) N_2 (d) N_2^{-2}

(v) Graphene is ———— dimensional nanomaterials.

(a) 0D (b) 1D

(c) 2D (d) 3D

[Turn over

(vi) Which of the following is a Bottom-up method for the synthesis of nanomaterials?

(a) Sol-gel

(b) Photo-lithography

(c) physical vapour deposition

(d) Ball-milling

(vii) In atomic absorption spectroscopy (AAS), which of the following is the generally used radiation source

(a) Hollow cathode lamp

(b) Xenon mercury lamp

(c) Tungsten lamp

(d) Sodium lamp

(viii) The signal splitting in NMR arises from

(a) shielding

(b) spin-spin decoupling

(c) spin-spin coupling

(d) deshielding

(ix) How many sustainable development goals are prepared for future?

(a) 10 (b) 15

(c) 17 (d) 18

(x) The base peaks in mass spectrum is

(a) The lowest mass peak

(b) The peak corresponding to the parent ion

(c) The highest mass peak

(d) The peak set to 100% relative intensity

2. (a) Write the molecular orbital electronic configuration of a homonuclear diatomic molecule having a bond order of 2. Calculate the number of bonding and anti-bonding orbitals of their molecule. (3 + 2)

(b) What are stationary waves? Derive the equation for a stationary wave. (1 + 4)

(c) What are the nanoporous membranes? How they are useful in removal of water pollutants? (1 + 4)

3. (a) What is the Poly-Dispersity Index (PDI) of a polymer? Why PDI of a polymer is important for application purpose?

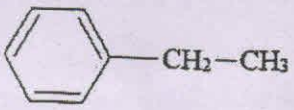
(b) Explain, why absorption bands are formed instead of sharp peaks in UV-spectrum. What are the various types of electronic transition are possible in the UV-visible spectroscopy. (2 + 3)

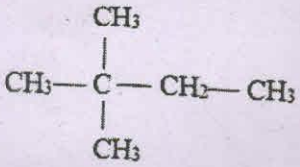
(c) Name the different types of wet corrosion process? Give the difference between chemical corrosion and electro-chemical corrosion. (3 + 2)

4. (a) Define carbon-credit. Mention two ways by which carbon credit can be generated. (3 + 2)

(b) For a one-dimensional box of length 10^{-14} m. Calculate the ground state energy of the electron ($m = 9.1 \times 10^{-31}$ kg). (5)

(c) Write the number of NMR signals for the following compounds. (2.5 × 2)

(i) 

(ii) 

5. (a) What are liquid crystals? Give important characteristics of thermotropic and lyotropic liquid crystals. (1 + 4)

(b) What is the fingerprint region in IR spectroscopy? How will you differentiable the following compound with the help of IR-spectra?

(i) CH_3CH_2OH and CH_3OCH_3

(ii) Maleic acid and Fumeric acid. (3 + 2)

(c) Discuss in brief one method for the synthesis of fullerenes? Give few application of fullerenes. (3 + 2)

6. (a) What are addition and condensation polymerization process? Justify each one with specific example. (3 + 2)

(b) Find out the atom economy of the following :

$$CH_3CH_2COO_2C_2H_5 + H_3C-NH_2 \rightarrow H_3CCH_2CONHCH_3 + CH_3CH_2OH$$

Ehtyl propionate — Methylamine — N-propanonol — Ethanol

(c) Describe with diagram the lead storage battery. List all the reaction in valued in charging and discharging of the battery. (3 + 2)

7. Short notes (any *five*) : (5 × 3)

(a) Conductivity in polyacetylene by n-type doping

(b) Carbon nanotubes

(c) Sacrificial anodic protection

(d) Flame photometry

(e) Thermoplasts and thermosets

(f) Significance of Schrodinger wave equation

(g) Nanocatalysis.