(7 pages) Reg. No. :.....

Code No. : R 30761 E Sub. Code : EECH 11/ FECH 11

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

First/Third Semester

Chemistry — Elective

CHEMISTRY FOR PHYSICAL SCIENCE – I

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. What type of reaction takes place in sun?
   (a) Nuclear fission
   (b) Nuclear fusion
   (c) Spontaneous fission
   (d) Gamma emission

2. Select the pair of isotones among the following:
   (a) $^{14}C_6$ and $^{15}O_8$ (b) $^{14}C_6$ and $^{13}C_6$
   (c) $^{14}N_7$ and $^{12}C_6$ (d) $^{13}C_6$ and $^{17}O_8$

3. Choose the fertilizer that does not contain nitrogen from the following
   (a) Urea
   (b) Ammonium sulphate
   (c) Potassium nitrate
   (d) Superphosphate

4. Identify the correct statement from the following:
   (a) Silicones are formed by hydrolysis of R_2SiCl_2
   (b) Silicones contain a single R_2SiO unit
   (c) Silicones are polymers containing R_2SiO as monomeric units
   (d) Both (a) and (c) are correct

5. Choose the non-aromatic compound from the following:
   (a) Pyrrole (b) Cyclobutane
   (c) Naphthalene (d) Benzene

6. Find the species involved in the nitration reaction

(a) NO (b) NO_2

(c) NO_2^- (d) NO_3

7. What is the unit of entropy?

(a) $J\ mol^{-1}$ (b) $JK mol^{-1}$

(c) $J^{-1} K^{-1} mol^{-1}$ (d) $JK^{-1} mol^{-1}$

8. The degrees of freedom at the eutectic point is

(a) 0 (b) 1

(c) 2 (d) 3

9. Which of the following is used as adsorbent in Column Adsorption Chromatography?

(a) Magnesium oxide (b) Silica gel

(c) Activated alumina (d) All of the above

10. Choose the correct one which defines that the number of gram equivalents of solute per litre of the solution.

(a) Molarity (b) Molality

(c) Normality (d) Mole fraction

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the terms isotopes, isobars and isomers with suitable examples.

Or

(b) Calculate the binding energy per nucleon in helium atom $_2He^4$, which has a mass of 4.00260 amu. Mass of 1 neutron = 1.008665 amu and mass of 1 hydrogen atom = 1.007825 amu. Express the result in MeV (1 amu = 931.5 MeV)

12. (a) What are NPK fertilizers? How are triple superphosphate and ammonium sulphate prepared? Mention their uses.

Or

(b) Discuss briefly the components of LPG and water gas. Mention their uses.

13. (a) Discuss the Huckel's rule on aromaticity with suitable examples.

Or

(b) Describe briefly the steric effect with suitable examples.

14. (a) State and explain the Second law of thermodynamics in terms of entropy.

Or

(b) Discuss the conditions for spontaneity in terms of entropy.

15. (a) Discuss briefly the principle of crystallization.

Or

(b) Explain the principle and any two applications of paper chromatography.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) (i) State and explain stellar energy. (3)

(ii) What is meant by nuclear fission? Explain with suitable examples. (5)

Or

(b) Discuss briefly the applications of radioisotopes in different fields.

17. (a) Write down the synthesis, properties and uses of silicones.

Or

(b) (i) How are urea and superphosphate prepared? (4)

(ii) What are CNG and producer gas? Mention their important uses. (4)

18. (a) (i) Discuss briefly the hybridization involved and geometry of C_2H_2.

(ii) Explain the hyperconjugation effect with suitable example.

Or

(b) How is pyrrole prepared? How are the following obtained from pyrrole?

(i) 2, 3, 4, 5-tetrachloropyrrole

(ii) 2-nitropyrrole

19. (a) Distinguish between

(i) open, closed and isolated systems

(ii) reversible and irreversible processes and

(iii) isothermal and adiabatic processes.

Or

(b) Explain in details the Pb-Ag system from the standpoint of the phase rule.

20. (a) Discuss briefly the terms: Molality, Normality, Molarity and Standard solution.

Or

(b) What is meant by chromatography? Discuss the principle and applications of Column chromatography.
