| Reg. No. | | | | | | | | | | | | | | | |
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| Question Paper Code | 13348 |
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024 (JAN - 2025)**

First Semester

**Civil Engineering**

(Common to All Branches)

**24BSCY101 - ENGINEERING CHEMISTRY**

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

**PART - A (MCQ) (20 × 1 = 20 Marks)**

Answer ALL Questions

| | | Marks | K – Level | CO |
|---|---|---|---|---|
| 1. | The polymer which is used for making non-stick utensils is<br>(a) Polyurethane (b) Bakelite (c) Teflon (d) All the above | 1 | K1 | CO1 |
| 2. | ----- is the main characteristic of condensation polymerization?<br>(a) No small molecules are released during the reaction.<br>(b) It involves the formation of a cyclic structure.<br>(c) Small molecules (e.g., water) are released as by-products.<br>(d) It can only occur with ionic monomers. | 1 | K1 | CO1 |
| 3. | ----- is the chemical name of Kevlar?<br>(a) Polyethylene terephthalate (b) Polyamide<br>(c) Polyvinyl chloride (d) Polypropylene | 1 | K1 | CO1 |
| 4. | Amount of electricity passed during electrolysis is measured by<br>(a) Conductometer (b) Voltmeter<br>(c) Galvanometer (d) Coulometer | 1 | K1 | CO2 |
| 5. | Spontaneity of redox reaction can be predicted from the emf (E°) value of the complete cell reaction. If the E° of the cell is positive<br>(a) the reaction is spontaneous (b) the reaction is not feasible<br>(c) both (d) None of the above | 1 | K1 | CO2 |
| 6. | One of the major disadvantage of Sodium-ion battery is<br>(a) Fast charging (b) Low-cost<br>(c) Reversibility (d) Low energy density | 1 | K1 | CO2 |
| 7. | Which of the following is true for a photochemical reaction?<br>(a) It occurs only in the presence of heat.<br>(b) It requires light to initiate the reaction.<br>(c) It can only occur in the absence of oxygen.<br>(d) It only occurs in solid-state | 1 | K1 | CO3 |
| 8. | In a photochemical reaction, the excited state of a molecule is:<br>(a) The state in which the molecule is most stable.<br>(b) A higher energy state than the ground state.<br>(c) The same energy as the ground state.<br>(d) Always a singlet state | 1 | K1 | CO3 |
| 9. | Which of the following light sources is commonly used in UV Visible spectrophotometers?<br>(a) Deuterium lamp (for UV range) (b) Tungsten lamp (for visible range)<br>(c) Xenon lamp (d) Both A and B | 1 | K1 | CO3 |
| 10. | ----- is an "adiabatic process"?<br>(a) A process in which temperature remains constant.<br>(b) A process in which volume remains constant.<br>(c) A process in which no heat is transferred to or from the system.<br>(d) A process in which pressure remains constant. | 1 | K1 | CO4 |

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| 11. | The change in entropy for reversible process,<br>(a) $\Delta S_{\text{Total}} = 0$ (b) $\Delta S_{\text{Total}} < 0$ (c) $\Delta S_{\text{Total}} > 0$ (d) $\Delta S_{\text{Total}} = unity$ | *1* | *K1* | *CO4* |
| 12. | Extensive property in the following is<br>(a) Mass (b) Pressure (c) Temperature (d) Concentration | *1* | *K1* | *CO4* |
| 13. | Which of the following is considered a renewable fuel?<br>(a) Natural gas (b) Coal (c) Biomass (d) Diesel | *1* | *K1* | *CO5* |
| 14. | Which of the following is NOT a gaseous fuel?<br>(a) Biogas (b) LPG (c) CNG (d) Kerosene | *1* | *K1* | *CO5* |
| 15. | LPG (Liquefied Petroleum Gas) mainly contains:<br>(a) Methane and hydrogen (b) Propane and butane<br>(c) Ethanol and methanol (d) Carbon monoxide and oxygen | *1* | *K1* | *CO5* |
| 16. | Latent heat of steam is<br>(a) 2240 cal / g (b) 8080 cal / g (c) 587 cal / g (d) 34500 cal / g | *1* | *K1* | *CO5* |
| 17. | Which of the following techniques is used to analyze the size of nanoparticles?<br>(a) X-ray diffraction (XRD)<br>(b) Transmission electron microscopy (TEM)<br>(c) Fourier-transform infrared spectroscopy (FTIR)<br>(d) UV-visible spectroscopy | *1* | *K1* | *CO6* |
| 18. | The primary building block of fullerenes is:<br>(a) Spherical carbon structures. (b) Graphite sheets.<br>(c) A single-layered honeycomb carbon network. (d) Diamond-like structures. | *1* | *K1* | *CO6* |
| 19. | Which type of bonding dominates in nanoparticles?<br>(a) Covalent bonding (b) Ionic bonding<br>(c) Metallic bonding (d) Surface bonding and van der Waals forces | *1* | *K1* | *CO6* |
| 20. | Which of the following nanoparticle used in targeted drug delivery applications?<br>(a) Ag (b) Pt (c) Cu (d) Au | *1* | *K1* | *CO6* |

**PART - B (10 × 2 = 20 Marks)**

Answer ALL Questions

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| 21. | Define the degree of polymerization. | *2* | *K1* | *CO1* |
| 22. | Classify conducting polymers and give examples. | *2* | *K2* | *CO1* |
| 23. | Define single electrode potential. | *2* | *K1* | *CO2* |
| 24. | Differentiate primary and secondary batteries. | *2* | *K1* | *CO2* |
| 25. | State Stark-Einstein Law of photochemistry. | *2* | *K2* | *CO3* |
| 26. | Write the key components of a UV-visible spectroscopy instrument. | *2* | *K1* | *CO3* |
| 27. | Define entropy. What is its physical significance? | *2* | *K1* | *CO4* |
| 28. | What are biofuels? Give examples. | *2* | *K1* | *CO5* |
| 29. | Mention the main components of Compressed Natural Gas (CNG). | *2* | *K1* | *CO5* |
| 30. | What is a quantum dot? | *2* | *K1* | *CO6* |

**PART - C (6 × 10 = 60 Marks)**

Answer ALL Questions

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| 31. | a) | Describe the process and mechanism of free radical addition polymerization with a suitable example. | *10* | *K2* | *CO1* |
| | | **OR** | | | |
| | b) | Discuss the preparation, properties, and uses of Nylon and Teflon fibers. How are they used in textiles and industrial applications? | *10* | *K2* | *CO1* |
| 32. | a) i) | Derive the Nernst equation for a general electrochemical reaction. | *5* | *K2* | *CO2* |
| | ii) | Discuss the working principle of the Standard Hydrogen Electrode (SHE). | *5* | *K2* | *CO2* |

**OR**

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| | b) | Describe in detail the construction and working of lead-acid battery. Write its advantages and uses. | *10* | *K2* | *CO2* |
| 33. | a) | Describe the Jablonski diagram in detail. Explain the processes of internal conversion, intersystem crossing, fluorescence, and phosphorescence. | *10* | *K3* | *CO3* |
| | | **OR** | | | |
| | b) | Demonstrate the instrumentation used in UV-visible spectroscopy. Include a block diagram and explain the function of each component. | *10* | *K3* | *CO3* |
| 34. | a) | Derive all the four Maxwell relations. | *10* | *K3* | *CO4* |
| | | **OR** | | | |
| | b) | Derive the Gibbs-Helmholtz equation. How can it be used to determine the spontaneity of a reaction? | *10* | *K2* | *CO4* |
| 35. | a) | Discuss the Otto-Hoffmann method for the manufacture of metallurgical coke. Summarize the steps involved in the process. | *10* | *K2* | *CO5* |
| | | **OR** | | | |
| | b) | Explain the steps involved in the ORSAT method of analyzing flue gases. Why is it essential for improving combustion efficiency? | *10* | *K2* | *CO5* |
| 36. | a) i) | Summarize the role of gold nanoparticles in biomedical applications | *5* | *K3* | *CO6* |
| | ii) | Illustrate any two unique properties of nanomaterials. | *5* | *K3* | *CO6* |
| | | **OR** | | | |
| | b) | Describe in detail Laser ablation and CVD methods for nanomaterial synthesis. What are its advantages and applications? | *10* | *K2* | *CO6* |