Reg. No.																

Question Paper Code	12982

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

First Semester

Civil Engineering

(Common to all Branches)

20BSCY101 - ENGINEERING CHEMISTRY

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following internal treatments is not used for boiler feed water? (a) Phosphate conditioning (b) Colloidal conditioning (c) Zeolite conditioning (d) Sodium aluminate conditioning	1	K2	CO1
2.	What does "break point chlorination" in domestic water treatment indicate? (a) Maximum chlorine level before harmful effects (b) Point where chlorine fully disinfects (c) Minimum chlorine level to kill bacteria (d) Highest permissible chlorine level	1	K1	CO1
3.	Which of the following is an example of physical adsorption? (a) Hydrogen on palladium (b) Water vapor on silica gel (c) Nitrogen on activated charcoal (d) Ammonia on metal oxides	1	K1	CO1
4.	In catalysis, adsorbents are important because they: (a) Absorb reactants completely (b) Provide high activation energy (c) Offer surface for reactants to adhere and react (d) Act as a solvent	1	K2	CO1
5.	When connecting two half-cells in a voltaic cell, why is a salt bridge used? (a) To connect electrodes (b) To prevent electron flow (c) To maintain charge balance (d) To increase cell voltage	1	K1	CO2
6.	Which type of cell requires an external power source to proceed? (a) Galvanic cell (b) Electrolytic cell (c) Voltaic cell (d) Concentration cell	1	K1	CO2
7.	If two dissimilar metals are in contact in a wet environment, which type of corrosion can occur? (a) Differential aeration (b) Galvanic corrosion (c) Uniform corrosion (d) Pitting corrosion	1	K1	CO2
8.	Which of the following materials is typically used as a sacrificial anode? (a) Copper (b) Aluminum (c) Zinc (d) Steel	1	K1	CO2
9.	Which process converts coal into synthetic petrol? (a) Fischer-Tropsch synthesis (b) Bergius process (c) Hydrocracking (d) Gasification	1	K1	CO3
10.	What does the cetane number of a diesel fuel indicate? (a) The fuel's energy content (b) The fuel's ignition quality (c) The fuel's sulfur content (d) The fuel's volatility	1	K1	CO3
11.	If a biofuel is produced from animal waste, which of the following is it likely to be classified as? (a) Ethanol (b) Biodiesel (c) Gobar gas (d) Methanol	1	K1	CO3
12.	How can the efficiency of a combustion process be evaluated? (a) By measuring fuel costs; (b) Through calorific value assessment and flue gas analysis; (c) By determining the color of the flame; (d) By checking the fuel source	1	K1	CO3

13.	What is a key advantage of breeder reactors compared to conventional reactors? (a) They produce less radioactive waste. (b) They generate more fissile material than they consume; (c) They are less expensive to build; (d) They can operate without coolant.	*1*	*K1*	*CO4*
14.	Identify the primary disadvantage of solar energy conversion (a) It is non-renewable (b) It depends on weather conditions. (c) It produces harmful emissions (d) It requires large land areas for installation.	*1*	*K2*	*CO4*
15.	Which statement correctly describes a fuel cell? (a) It generates energy through combustion (b) It converts chemical energy directly into electrical energy (c) It stores energy for later use (d) It is a type of rechargeable battery	*1*	*K1*	*CO4*
16.	What is the main component of a lead-acid battery? (a) Lithium (b) Lead dioxide and sulfuric acid (c) Nickel hydroxide (d) Carbon	*1*	*K1*	*CO4*
17.	Which of the following engineering polymers is known for its high strength and thermal stability? (a) Teflon (b) Kevlar (c) Nylon-6 (d) PEEK	*1*	*K1*	*CO5*
18.	In a polymer matrix composite, what role does the matrix material play? (a) Provides reinforcement (b) Distributes loads and protects reinforcement (c) Increases thermal conductivity (d) Reduces flexibility	*1*	*K1*	*CO5*
19.	Which property of nanomaterials significantly increases due to their small size? (a) Density (b) Surface area to volume ratio (c) Thermal conductivity (d) Electrical conductivity	*1*	*K2*	*CO5*
20.	Which synthesis method is best suited for producing high-purity nanoparticles? (a) Mechanical milling (b) Precipitation (c) Laser ablation (d) Ball milling	*1*	*K2*	*CO5*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	Calculate the hardness in ppm when 1 liter of water contains 100 mg of calcium carbonate.	*2*	*K2*	*CO1*
22.	What is Calgon conditioning? How is it functioning in water treatment?	2	*K2*	*CO1*
23.	Define single electrode potential.	2	*K1*	*CO2*
24.	Zinc reacts with dilute H_2SO_4 to give hydrogen but silver does not. Why? (Given: $E^o\ Ag^+/Ag = +0.80V$ and $E^o\ Zn^{2+}/Zn = -0.76V$)	2	*K2*	*CO2*
25.	Define knocking.	2	*K1*	*CO3*
26.	What are the advantages of using liquefied petroleum gas (LPG)?	2	*K2*	*CO3*
27.	What is a nuclear chain reaction?	2	*K1*	*CO4*
28.	Define supercapacitor.	2	*K1*	*CO4*
29.	List out the advantages of using Kevlar.	2	*K2*	*CO5*
30.	How does the melting point of nanomaterials differ from that of bulk materials?	2	*K2*	*CO5*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Discuss in detail the desalinating of brackish water by the reverse osmosis method.	*10*	*K2*	*CO1*
		OR			
	b)	Illustrate the factors influencing the rate of adsorption of gases on solids.	*10*	*K2*	*CO1*
32.	a)	Derive the Nernst equation for a redox reaction and discuss their applications.	*10*	*K2*	*CO2*
		OR			

	b)	Discuss the principle and chemical reactions involved in electroless nickel plating and explain their advantages.	*10*	*K2*	*CO2*
33.	a)	Describe the Otto-Hoffmann method for the manufacture of metallurgical coke.	*10*	*K2*	*CO3*
		OR			
	b)	Demonstrate the flue gas analysis using the ORSAT method.	*10*	*K2*	*CO3*
34.	a)	Analyze the construction and working principle of light water nuclear power plant.	*10*	*K2*	*CO4*
		OR			
	b)	Analyze the construction and working principle of a lithium-ion battery with a neat sketch.	*10*	*K2*	*CO4*
35.	a)	Describe the free radical polymerization mechanism with suitable examples.	*10*	*K2*	*CO5*
		OR			
	b)	Discuss the CVD and Laser ablation techniques for the synthesis of nanoparticles.	*10*	*K2*	*CO5*
36.	a) i)	Summarize the working principles of H_2-O_2 fuel cells.	*5*	*K2*	*CO4*
	ii)	Discuss the preparation and properties of Nylon 6.6.	*5*	*K2*	*CO5*
		OR			
	b) i)	Explain the differences between nuclear fission and nuclear fusion reactions.	*5*	*K2*	*CO4*
	ii)	Discuss in detail the properties of nanomaterials.	*5*	*K2*	*CO5*