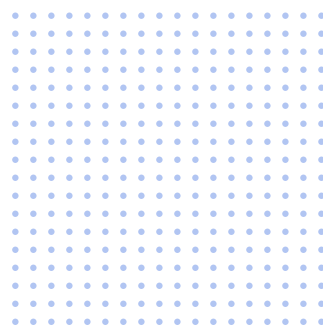




FOR KUET EXAM PREPARATION

KUET 2023

Question Paper · M.Sc. Nanotechnology

EXAM
KUET

YEAR
2023

TYPE
Question Paper

SUBJECT
M.Sc. Nanotechnology

Sr. No.

ENTRANCE TEST-2023

SCHOOL OF BIOLOGICAL SCIENCES

NANOTECHNOLOGY

Total Questions : 60
Time Allowed : 70 Minutes

Question Booklet Series

A

Roll No. :

--	--	--	--	--	--

Instructions for Candidates :

1. Write your Entrance Test Roll Number in the space provided at the top of this page of Question Booklet and fill up the necessary information in the spaces provided on the OMR Answer Sheet.
2. OMR Answer Sheet has an Original Copy and a Candidate's Copy glued beneath it at the top. While making entries in the Original Copy, candidate should ensure that the two copies are aligned properly so that the entries made in the Original Copy against each item are exactly copied in the Candidate's Copy.
3. All entries in the OMR Answer Sheet, including answers to questions, are to be recorded in the Original Copy only.
4. Choose the correct / most appropriate response for each question among the options A, B, C and D and darken the circle of the appropriate response completely. The incomplete darkened circle is not correctly read by the OMR Scanner and no complaint to this effect shall be entertained.
5. Use only blue/black ball point pen to darken the circle of correct/most appropriate response. In no case gel/ink pen or pencil should be used.
6. Do not darken more than one circle of options for any question. A question with more than one darkened response shall be considered wrong.
7. There will be '**Negative Marking**' for wrong answers. Each wrong answer will lead to the deduction of 0.25 marks from the total score of the candidate.
8. Only those candidates who would obtain positive score in Entrance Test Examination shall be eligible for admission.
9. Do not make any stray mark on the OMR sheet.
10. Calculators and mobiles shall not be permitted inside the examination hall.
11. Rough work, if any, should be done on the blank sheets provided with the question booklet.
12. OMR Answer Sheet must be handled carefully and it should not be folded or mutilated in which case it will not be evaluated.
13. Ensure that your OMR Answer Sheet has been signed by the Invigilator and the candidate himself/herself.
14. At the end of the examination, hand over the OMR Answer Sheet to the invigilator who will first tear off the original OMR sheet in presence of the Candidate and hand over the Candidate's Copy to the candidate.

SM-29578-A

1

[Turn over

(Chemistry)

- The coordination number of constituent ions in calcium fluoride is :
(A) 1 : 1
(B) 8 : 4
(C) 4 : 8
(D) 1 : 8
- The % ionic character of H–F bond (with electronegativity of F = 3.98 and H = 2.0) is :
(A) 17.95
(B) 38.61
(C) 45.40
(D) 69.65
- According to Fajan's rules, covalency is favoured by :
(A) Small anion and large cation
(B) Small anion and small cation
(C) Large anion and a small cation
(D) Large anion and a large cation
- The bond order for O_2^{2-} :
(A) 1
(B) 2
(C) 1.5
(D) 2.5
- According to kinetic theory of gases, the average translational kinetic energy per molecule of an ideal gas at 300 K is :
(A) $1.242 \times 10^{-20} \text{J}$
(B) $6.21 \times 10^{-21} \text{J}$
(C) $4.14 \times 10^{-21} \text{J}$
(D) $2.07 \times 10^{-21} \text{J}$
- The compressibility factor for a perfect gas is equal to :
(A) Zero
(B) 1
(C) Zero to 1
(D) Depends upon the nature of gas
- Select the most appropriate statement :
(A) Numerically Surface tension is equal to surface energy but with units different than that of surface energy
(B) The spherical shape of liquid drops and gas bubbles is because of the viscosity of liquids
(C) The surface tension of fluids decreases linearly with an increase in temperature
(D) The surface tension of fluids vanishes roughly 6 degrees below the critical temperature
- For the crystal plane that cuts the crystal axes at (2a, 3b, c), the Miller indices are given as :
(A) (2 3 6)
(B) (3 2 6)
(C) (6 2 3)
(D) (6 3 2)
- In the presence of water, alkali metal hydrides release :
(A) Hydrogen and Metal
(B) Hydrogen and Metal hydroxide
(C) Oxygen and Metal
(D) Oxygen and Metal Hydroxide
- Which among the following groups of ions do not show the properties characteristic of transition elements ?
(A) Cu, Ag, Au
(B) Ni, Pd, Pt
(C) Mn, Cu, Ni
(D) Zn, Cd, Hg

11. The shielding effect of electrons in lanthanides decreases in the order :
 (A) $s > d > p > f$
 (B) $s > p > d > f$
 (C) $f > d > p > s$
 (D) $f > s > d > p$
12. In the complex $K_4[Fe(CN)_6]$, Fe has an oxidation state and an effective atomic number of :
 (A) 2+ and 52
 (B) 2+ and 36
 (C) 3+ and 52
 (D) 3+ and 36
13. Which among the following is true for Cyclopentadienyl cation ?
 (A) It is a cyclic, conjugated aromatic cation
 (B) It is an acyclic conjugated cation that obeys the Huckels rule
 (C) It is not a conjugated cation
 (D) It is a cyclic conjugated anti-aromatic molecule
14. The absolute configuration of the two chiral centers in Mesotartaric acid is :
 (A) 2R, 3R
 (B) 2R, 3S
 (C) 2S, 3S
 (D) 2S, 3R
15. The most stable conformation of cyclohexane is :
 (A) Chair
 (B) Twist Boat
 (C) Half Chair
 (D) Boat
16. Select the most stable carbanion :
 (A) $CH_3CH_2^-$
 (B) $(CH_3)_2CH^-$
 (C) $(CH_3)_3C^-$
 (D) $C_6H_5CH_2^-$
17. The substituent Nitro in nitrobenzene is :
 (A) An electron donating group that favours electrophilic substitution at Ortho and Para positions
 (B) An electron withdrawing group that favours electrophilic substitution reactions at meta position
 (C) An electron donating group that facilitates its nucleophilic substitution reactions at meta position
 (D) An electron withdrawing group that favours its electrophilic substitution reactions at ortho, para and meta positions
18. SN^1 reaction of alkyl halides is independent of :
 (A) Concentration of the attacking nucleophile
 (B) Concentration of alkyl halide
 (C) Nature of the leaving group
 (D) Nature of solvent
19. The chemical transformation

$$C_6H_5CHO \xrightarrow[EtOH, H_2O]{CN^-, \Delta} C_6H_5 - COCHOHC_6H_5$$
 is better known as :
 (A) Benzillic acid Rearrangement
 (B) Claisen Rearrangement
 (C) Benzoin Condensation
 (D) Huben-Hoesch Reaction

20. Conversion of cyclohexanone to a cyclic ester using peracid is :
- Oppenauer oxidation
 - Gatterman reaction
 - Schmidt reaction
 - Baeyer-Villiger Oxidation
21. In a certain process, a system absorbed 250 Joules of heat while doing 300 Joules of work. The net change in the internal energy of the system will be :
- 550 Joules
 - 50 Joules
 - +50 Joules
 - +550 Joules
22. Expansion of a gas under adiabatic conditions results in :
- Decrease in temperature if the gas is ideal
 - Increase in temperature if the gas is ideal
 - Decrease in temperature if the gas is non-ideal
 - Decrease in temperature whether the gas is ideal or non-ideal
23. The change in entropy when two moles of an ideal gas expand reversibly from a volume of 5 dm^3 to 50 dm^3 at a temperature of 300 K is :
- 11.488 kJ K^{-1}
 - 11.488 J K^{-1}
 - 38.29 kJ K^{-1}
 - 38.29 J K^{-1}
24. Select the incorrect statement :
- The Clapeyron-Clausius equation is valid for one-component two-phase systems
 - The degrees of freedom for a one-component system can change from Zero to two
 - The eutectic point in the phase diagram for the Lead-Silver system has zero degrees of freedom
 - In simple two component Eutectic systems, composition corresponding to eutectic point has the highest melting point
25. In electrolyte solutions :
- Increase in dilution decreases the mobility of constituent ions
 - The fraction of current carried by any ion depends upon the mobility of all the constituent ions
 - Increase in dilution increases the specific conductance but decreases molar conductance
 - Increase in dilution increases the specific conductance as well as the molar conductance
26. In the conductometric titration of a strong acid with a weak base :
- The conductance decreases up to the end point and then increases
 - The conductance increases up to the end point and then remains constant
 - The conductance decreases up to the end point and then remains constant
 - The conductance shows no change up to the end point and then increases

27. For an electrochemically reversible Galvanic Cell :
- The electrical energy is greater than the enthalpy of the cell reaction if the temperature coefficient of the EMF of the cell is positive
 - The electrical energy is less than the enthalpy of the cell reaction if the temperature coefficient of the EMF of cell is positive
 - The electrical energy is always less than the enthalpy of the cell reaction
 - The electrical energy is always more than the enthalpy of the cell reaction
28. Select the incorrect statement :
- For a zero-order reaction, the average rate is always equal to the instantaneous rate
 - The $t_{1/2}$ of a zero-order reaction doubles if the concentration of reactant is doubled
 - The $t_{1/2}$ of a first-order reaction is independent of the initial concentration of the reactant
 - The quantum yield of the photochemical decomposition of HI does not change with the progress of the reaction
29. The correct conversion factor for the coefficient of viscosity (η) is :
- $\eta(\text{in CGS units}) = 0.1 \times \eta(\text{in SI units})$
 - $\eta(\text{in CGS units}) = 10 \times \eta(\text{in SI units})$
 - $\eta(\text{in CGS units}) = 0.01 \times \eta(\text{in SI units})$
 - $\eta(\text{in CGS units}) = 100 \times \eta(\text{in SI units})$
30. Select the incorrect statement :
- Heat change at constant volume is equal to change in internal energy
 - The enthalpy change associated with a reaction is independent of the path of the reaction
 - Specific heat is an intensive property
 - The standard enthalpy of neutralization of strong acids depends on the concentrations of acid and base
31. Tollen's reagent is :
- Ammonical solution of silver nitrate
 - Aqueous solution of silver nitrate
 - Acidic solution of silver nitrate
 - Alcoholic solution of silver nitrate
32. The metal commonly used for the detection of N, S and halogens in organic compounds is :
- K
 - Li
 - Na
 - Mg

(Physics)

33. A bullet is fired from a gun, the recoiling of gun is an example of :
- Conservation of energy
 - Conservation of momentum
 - Conservation of angular momentum
 - Both (A) and (B)
34. The special theory of relativity states that all physical laws are the same :
- In frames of reference which accelerate
 - In frames of reference which move in circles
 - In frames of reference which move at uniform velocity
 - In frames of reference which move in ellipses
35. Two photons approach each other, what is their relative velocity ?
- c
 - $2c$
 - 0
 - c^2
36. The differential equation of the simple harmonic motion given by $x = A \cos(\omega t + \alpha)$ is :
- $\frac{d^2x}{dt^2} + \omega^2 x = 0$
 - $\frac{d^2x}{dt^2} - \omega^2 x = 0$
 - $\frac{d^2x}{dt^2} + \omega x = 0$
 - $\frac{d^2x}{dt^2} - \omega x = 0$
37. Gauss law will be invalid if :
- Electric charge was not quantized
 - The inverse square law isn't exactly true
 - The velocity of light isn't a universal constant
 - None of these
38. The Biot-Savart law states that :
- The magnitude of the magnetic field is inversely proportional to the square of the distance from the current element
 - The magnitude of the magnetic field is directly proportional to the current through the current element
 - The magnitude of the magnetic field is directly proportional to the length of the current element
 - All of the above
39. Lenz's law is the consequence of :
- Law of conservation of Mass
 - Law of conservation of Energy
 - Law of conservation of Momentum
 - All of the above
40. For time varying currents, the field or waves will be :
- Electrostatic
 - Magneto static
 - Electromagnetic
 - All
41. Entropy occurs due to :
- Temperature change
 - Mass change
 - Change in macroscopic variables
 - None

42. As the wavelength of the radiation decreases, the intensity of the black body radiations :
- Remains constant
 - Decreases
 - First increases then decrease
 - Increases
43. At temperature T , the power radiated by a body is Q watts. At the temperature $3T$ the power radiated by it will be :
- $3Q$
 - $81Q$
 - $27Q$
 - $9Q$
44. According to the law of equipartition of energy, the energy associated with each degree of freedom is :
- $E = k_B T$
 - $E = 1/2 k_B T$
 - $E = 3/2 k_B T^2$
 - $E = 3/2 k_B T$
45. Lissajous figure :
- is a curve formed by the superposition of two simple harmonic motions
 - is a curve traced out by a point that undergoes two simple harmonic motions in mutually perpendicular directions
 - is a curve traced out by a point that undergoes two simple harmonic motions
 - All of the above
46. In the Young's double slit experiment both the slits are similar. If the length of one of the slits is halved, which of the following is true ?
- Dark fringes become brighter
 - Bright fringes become wider
 - Dark fringes become darker
 - Bright fringes become darker
47. Sound with a frequency of less than 20 Hz is called :
- Ultrasonic
 - Infrasonic
 - Supersonic
 - Sonic
48. Decibel is a unit of :
- Solar Intensity
 - Sound Intensity
 - Velocity of Sound
 - None
49. The minimum energy required for a photoelectron to escape from a metal surface :
- Work function
 - Planck's constant
 - Atomic energy
 - Binding energy
50. The uncertainty principle and the concept of wave nature of matter was proposed by ____ and ____ respectively.
- Heisenberg, Planck
 - Heisenberg, de-Broglie
 - de-Broglie, Heisenberg
 - Planck, Heisenberg
51. Orbital is :
- Circular path around the nucleus in which the electron revolves
 - Space around the nucleus where the probability of finding the electron is maximum
 - Amplitude of electrons wave
 - None of these
52. Uncertainty principle gave the concept of :
- Probability
 - An orbital
 - Wavelength
 - None of these

53. Schroder equation governs wave form of :
 (A) Classic Mechanics
 (B) Quantum mechanics
 (C) Both (A) and (B)
 (D) None
54. Which of the following is the time independent Schrodinger equation ?
 (A) $H\psi = E\psi$
 (B) $H\psi = -E\psi$
 (C) $H\psi = 1/E\psi$
 (D) $1/H\psi = E\psi$
55. Zeeman Effect cannot be proved by :
 (A) Bohr's Model
 (B) Hamiltonian Operators
 (C) L-S Coupling
 (D) Quantum-Mechanics
56. Alpha Particle consists of :
 (A) 4 protons
 (B) 4 neutrons
 (C) 2 electrons, 2 protons, 2 neutrons
 (D) 2 protons and 2 neutrons only
57. The specific heat at constant volume of solid obeys Debye's law at :
 (A) High temperatures
 (B) Low pressure
 (C) Low temperatures
 (D) High pressure
58. Many of the semiconductors are crystals of the type :
 (A) Face-centered cubic
 (B) Body-centered cubic
 (C) Simple cubic
 (D) All of the above
59. With an increase in temperature the electrical conductivity of an intrinsic semiconductor :
 (A) Remains same
 (B) Decreases
 (C) Increases
 (D) First increases then decrease
60. MOSFET is :
 (A) Uncontrolled device
 (B) Temperature controlled device
 (C) Current controlled device
 (D) Voltage controlled device

OR
(Biology)

33. Which of the following organic compounds are classified as lipids ?
- Polysaccharides
 - Triglycerides
 - Steroids
 - Prostaglandins
- (A) i, ii and iii
(B) i, ii and iv
(C) ii, iii and iv
(D) i, iii and iv
34. Some enzymes when secreted are in inactive state, such enzymes are called :
- (A) Apoenzymes
(B) Proenzymes
(C) Cofactors
(D) Coenzymes
35. Vitamin K is necessary for blood clotting as it helps in the formation of :
- (A) Fibrinogen in liver
(B) Thromboplastin
(C) Heparin in liver
(D) Prothrombin in liver
36. The building blocks of nucleic acids and proteins are respectively called as :
- (A) Nucleotides and amino acids
(B) Nucleosides and histones
(C) Nitrogenous base and sugar
(D) Sugar and amino acids
37. The lipid layers in plasma membrane remain linked to each other by their :
- (A) Polar ends which are hydrophobic
(B) Non-polar ends which are hydrophilic
(C) Polar ends which are hydrophilic
(D) Non-polar ends which are hydrophobic
38. In eukaryotes, the extra nuclear DNA is present in :
- (A) Mitochondria and chloroplast
(B) Nucleus and Mitochondria
(C) Mitochondria and Golgi bodies
(D) None of the above
39. At what stage of cell division does nuclear membrane disappear ?
- (A) Metaphase
(B) Anaphase
(C) Prophase
(D) Anaphase
40. Which among the following statements is not true ?
- (A) Rough ER synthesizes glycoproteins
(B) Smooth ER synthesizes fatty acids
(C) Smooth ER does not synthesize proteins
(D) Smooth ER synthesize proteins
41. The process of DNA transcription in prokaryotic organisms occurs in :
- (A) Cytoplasm
(B) Nucleus
(C) Nucleolus
(D) None of the above
42. The scientists who jointly shared the Nobel Prize in Physiology or Medicine 1968 for their interpretation of the genetic code and its role in protein synthesis :
- (A) Nirenberg, Khorana and Holley
(B) Watson, Crick and Wilkins
(C) Nirenberg, Crick and Wilkins
(D) Nirenberg, Watson and Khorana

43. The enzymes that catalyzes the synthesise of RNA from a DNA template are :
- RNA polymerases
 - DNA polymerases
 - Polymerase alpha
 - Polymerase epsilon
44. Which among the following is not a genetic disorder ?
- Down syndrome
 - Neurocysticercosis
 - Cystic fibrosis
 - Sickle cell anemia
45. Most commonly enzymes used in genetic engineering are :
- Ligase and RNA polymerase
 - DNA and RNA polymerase
 - Restriction endonuclease and ligase
 - None of the above
46. Who invented Polymerase Chain Reaction (PCR) technique and was awarded Nobel Prize in Chemistry for 1993 ?
- Watson and Crick
 - Nirenberg
 - Kary Mullis
 - H. Khorana
47. The first genetically engineered hormone produced through recombinant DNA (rDNA) technology by Genentech and Licensed by Eli Lilly and company was :
- Insulin
 - FSH
 - GH
 - Erythropoietin
48. The plasmid that was used for the first time as cloning vector by Herbert Boyer and Stanley Norman Cohen :
- pBR322
 - pSC101
 - pUC18
 - Ti
49. By using a pinhole to only allow images from a particular depth of field, which microscopy enables the visualization of tissues at different focal planes ?
- Phase contrast microscopy
 - Confocal microscopy
 - Electron microscopy
 - All of the above
50. Which of the following biomolecules are mainly detected and analyzed by blotting techniques ?
- Nucleic acids and proteins
 - Carbohydrates and lipids
 - Proteins and lipids
 - None of the above
51. Western blotting identifies and provides preliminary quantitation of a specific _____ based on molecular weight, by SDS-PAGE.
- Protein in a mixture of proteins
 - DNA in a mixture of Nucleic acids
 - RNA in a mixture of Nucleic acids
 - Lipids in a mixture of fatty acids
52. Which among the following can be diagnosed by using ELISA test ?
- HIV
 - SARS-CoV-2
 - Pregnancy
 - All of the above

53. Beta-oxidation of fatty acids occurs only in :
 (A) Cytoplasm
 (B) Mitochondria
 (C) Nucleus
 (D) Nucleolus
54. Which among the following is not inherited metabolic disease ?
 (A) Phenylketonuria (PKU)
 (B) Maple syrup urine disease (MSUD)
 (C) Homocystinuria (HCU)
 (D) Paroxysmal nocturnal hemoglobinuria (PNH)
55. Besides mitochondria, the other production site of ATP is :
 (A) Golgi complex of animals
 (B) Golgi complex of plants
 (C) Chloroplast of plants
 (D) All of the above
56. The normal concentration of amino acids in the blood is between :
 (A) 35 and 65 mg/dl
 (B) 10 and 25 mg/dl
 (C) 40 and 80 mg/dl
 (D) 20 and 55 mg/dl
57. The antibody molecules that can activate the complement are :
 (A) IgG & IgA
 (B) IgG & IgE
 (C) IgG & IgM
 (D) IgM & IgE
58. Hemolytic disease of newborn is an example of _____ reaction.
 (A) Type-I hypersensitivity
 (B) Type-II hypersensitivity
 (C) Type-III hypersensitivity
 (D) Type-IV hypersensitivity
59. Which of the following immunoglobulin is called reagenic antibody ?
 (A) IgG
 (B) IgD
 (C) IgE
 (D) IgM
60. Which among the following is produced almost exclusively by activated helper T Cells ?
 (A) Interleukin 2 (IL2)
 (B) Histamine
 (C) Immunoglobulin
 (D) Anaphylatoxins

ROUGH WORK**SM-29578–A****12**
◆**25**