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FOR KUET EXAM PREPARATION

KUET 2022 Question Paper · M.Sc. Nanotechnology

EXAM	YEAR	TYPE	SUBJECT
KUET	2022	Question Paper	M.Sc. Nanotechnology

Sr. No. 005

ENTRANCE TEST-2022

SCHOOL OF BIOLOGICAL SCIENCES

NANOTECHNOLOGY

Question Booklet Series **A**

Total Questions : 60
Time Allowed : 70 Minutes

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.

SEAL

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(Chemistry)

1. Lithium Fluoride's lattice energy to Magnesium oxide conceptually should be :
   (A) Lesser
   (B) Larger
   (C) Same
   (D) Cannot be predicted

2. Distance at which attractive forces overcome repulsive forces in hydrogen molecule :
   (A) Half the covalent radius of hydrogen atom
   (B) Mean of the covalent radii of two hydrogen atoms
   (C) Half of the bond length of dihydrogen molecule
   (D) Double the covalent radius of hydrogen atom

3. Allred-Rochow electronegativity of an element is :
   (I) Directly proportional to the effective nuclear charge
   (II) Directly proportional to the covalent radius
   (III) Inversely proportional to the square of the covalent radius
   (IV) Directly proportional to the square of the effective nuclear charge

   The correct answer is :
   (A) (I) and (II)
   (B) (I) and (III)
   (C) (II) and (III)
   (D) (I) and (IV)

4. According to Bent's rule, for p-block elements, the correct combination of geometry around the central atom and position of more electro- negative substituent is :
   (A) Trigonal bipyramidal and axial
   (B) Trigonal bipyramidal and equatorial
   (C) Square pyramidal and axial
   (D) Square pyramidal and basal

5. In van der Waals equation, which of the followir statements is/are Correct ?
   (A) The coefficient "a" account for the mutu attraction between the molecules
   (B) The term a/v^2 increases the pressure of re gas relative to ideal gas
   (C) The coefficient "b" represents the volume th is compressible
   (D) Both (B) and (C)

6. Which among the following has highest surfa tension ?
   (A) Octane
   (B) Water
   (C) Glycerol
   (D) Dodecane

7. Which of the following is correct for RMS velocit average velocity and most probable velocity o gas at a given temperature ?
   (A) RMS velocity>average velocity>mo probable velocity
   (B) Average velocity>RMS velocity>mo probable velocity
   (C) RMS velocity= average velocity>mo probable velocity
   (D) Most probable velocity>average velocit RMS velocity

8. The Miller indices of the plane for whi interplanar spacing is equal to the half of dimensions of the cubic unit cell would be :
   (A) 111
   (B) 100
   (C) 200
   (D) 222

SEAL

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9. For electronic spectra of K_2CrO_4 (I) and K_2MoO_4 (II), the correct combination is :
   (A) Transition is d-d and λmax for (I) < (II)
   (B) Transition is LMCT and λmax for (I) < (II)
   (C) Transition is LMCT and λmax for (I) > (II)
   (D) Transition is MLCT and λmax for (I) > (II)

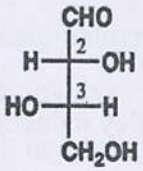
10. High spin complex of a 3d metal ion M has a magnetic moment of 2.9 B.M. in octahedral coordination environment and 4.1 B.M. in tetrahedral environment. The M ion can be ?
   (A) Co^{III}
   (B) Ni^{II}
   (C) Cu^{II}
   (D) Co^{II}

11. Which of the following is incorrect in case of boron clusters ?
   (A) $B_6H_6^{2-}$ is closo-type and the 6 B's lie on the corners of a octahedron
   (B) B_5H_9 is nido-type and the 5 B's lie on the corners of a square pyramid
   (C) B_4H_{10} is arachno-type and the 4 B's lie on the corners of an octahedron where two corners are removed
   (D) $B_6H_6^{2-}$ is nido-type and the 6 B's lie on the corners of an octahedron

12. For magnesium complex of $EDTA^{2-}$, the number of N-donor and O-donor centers, are respectively :
   (A) Two and four
   (B) Two and two
   (C) Two and six
   (D) Two and eight

13. The geometry of carbanion is :
   (A) Linear
   (B) Pyramidal
   (C) Tetrahedral
   (D) Trigonal planar

14. What is the correct configuration at C2 and C3 of the following molecule ?



   (A) 2S,3S
   (B) 2R,3R
   (C) 2S,3R
   (D) 2R,3S

15. In the π molecular orbital diagram of benzene, the number of pairs of degenerate orbitals is :
   (A) 1
   (B) 2
   (C) 6
   (D) 4

16. The potential energy of cyclohexane is minimum for _____conformation.
   (A) Chair
   (B) Twist boat
   (C) Boat
   (D) Half-chair

17. As substituents in electrophilic aromatic substitutions, halogens are :
   (A) Deactivating ortho-/para-directors
   (B) Deactivating meta-directors
   (C) Activating ortho-/para-directors
   (D) Activating meta-directors

18. For the SN_1 reaction of tert-butyl chloride with hydroxyl ion :
   $(CH_3)_3C–Cl+OH^- \rightarrow (CH_3)_3C–OH + Cl^-$
   if the concentration of hydroxyl ion is doubled, the rate of formation of tert-butanol will :
   (A) Double
   (B) Increase four times
   (C) Remain the same
   (D) Decrease

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19. The reduction of base-labile aldehydes or ketones to alkanes can be achieved by :

(A) Clemmensen reduction

(B) Wolff Kishner reduction

(C) Meerwein-Ponndorf-Verley reduction

(D) Bouveault-Blanc reduction

20. Which of the following will not undergo Hell-Volhard-Zelinsky reaction ?

(A) Acetic acid

(B) Propionic acid

(C) 2-Methyl propionic acid

(D) Formic acid

21. Which of the following is not the state function ?

(A) Heat

(B) Heat+Work

(C) Entropy

(D) Gibbs free energy

22. Which of the following statement is/are CORRECT ?

(1) Kirchoff's equation gives the temperature dependence of enthalpy of a reaction.

(2) Residual entropy of carbon monoxide is not zero

(3) The total entropy of universe increases during an irreversible process.

(A) (1) and (2)

(B) (2) and (3)

(C) (1) and (3)

(D) (1), (2) and (3)

23. ———— is a pH indicator electrode.

(A) Quinhydrone electrode

(B) Calomel electrode

(C) Silver-silver chloride electrode

(D) Zinc electrode

24. At the triple point of water, the number of degrees of freedom for the system is :

(A) 3

(B) 2

(C) 1

(D) 0

25. Which of the following thermodynamic laws allows us to calculate absolute entropy of a substance ?

(A) Zeroth law of Thermodynamics

(B) First law of Thermodynamics

(C) Second law of Thermodynamics

(D) Third law of Thermodynamics

26. Consider the following statements :

(1) Half life period of first order reaction is independent of initial concentration of reactants.

(2) Zero order reaction takes finite time for completion.

(3) Rate constant of a first order reaction is dimensionless.

Which of the above statement(s) is/are correct ?

(A) (1) & (2)

(B) (2) & (3)

(C) (1) & (3)

(D) (1), (2) & (3)

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27. For a reaction, $A(g) + 2B(g) \rightarrow C(g) + D(g)$, the rate law is $dx/dt = k [A][B]$. The rate of reaction will _____ compared to initial rate when the concentration of A is doubled and simultaneously concentration of B is halved.

(A) Remain the same

(B) Become double

(C) Become 4 times

(D) Nothing can be said as the given information is inadequate

28. Which of the following solutions of an electrolyte has the highest equivalent conductance ?

(A) 0.2 N

(B) 0.02 N

(C) 2 N

(D) 0.002N

29. The molar solubility of $PbBr_2$ is 2×10^{-3} M at a certain temperature. What will be K_{sp} for $PbBr_2$?

(A) 8.0×10^{-6}

(B) 0.4×10^{-8}

(C) 3.2×10^{-8}

(D) 4.0×10^{-6}

30. Identify incorrect statement for paper chromatography :

(A) It is a liquid-liquid portioning chromatography

(B) It involves water as stationary Phase

(C) It involves paper as stationary phase

(D) For effective separation R_f value should be greater than zero but less than 1

31. What is incorrect match in volumetric analysis ?

(A) Permanaganometry-redox titration

(B) Argentometry-precipitation titration

(C) Iodometry-precipitation titration

(D) EDTA-Complexometric titration

32. To the cobaltous chloride solution ethylene diamine ligand was added in excess followed by stoichiometric amount of H_2O_2 and conc. HCl to form a green complex. This complex on reaction to $AgNO_3$ will precipitate :

(A) One equivalent of ionisable chloride

(B) Two equivalents of ionisable chloride

(C) Three equivalents of ionisable chloride

(D) The compound is inert and does not react with $AgNO_3$

(Physics)

33. For two vectors $\vec{a}$ and $\vec{b}$, if the scalar product of $\vec{a}.\vec{b} \geq 0$, then which of the following is true about the angle between the two vectors ?

(A) $0 < \theta < \frac{\pi}{2}$

(B) $0 < \theta < \pi$

(C) $0 \leq \theta \leq \pi$

(D) $0 \leq \theta \leq \frac{\pi}{2}$

34. Lorentz transformation equations hold for :

(A) Non-relativistic velocities only

(B) Relativistic velocities only

(C) Non-relativistic as well as relativistic velocities

(D) Photons only

35. When the speed of an object reaches the speed of light, the length of the object changes to :

(A) Half the original length

(B) Double the original length

(C) Infinite

(D) Zero

36. The instantaneous displacement of a particle of mass m executing SHM under a force constant k is $x = A \sin(\omega t + \phi)$ where $\omega = \sqrt{\frac{k}{m}}$. The time average of kinetic energy over a Time period T is :

(A) $\frac{1}{4}kA^2$

(B) $\frac{1}{3}kA^2$

(C) $\frac{1}{2}kA^2$

(D) kA^2

37. Which of the following cannot be calculated using Gauss law ?

(A) Electric field intensity

(B) Electric flux density

(C) Charge

(D) Permittivity

38. According to the Faraday's law of electromagnetic induction :

(A) Electric field is produced by time varying magnetic flux

(B) Magnetic field is produced by time varying electric flux

(C) Magnetic field is associated with moving charge

(D) None of these

39. The value of conduction current in an empty space is :

(A) Zero

(B) Unity

(C) Infinite

(D) None of these

40. Dimensions of Poynting vector are same as that of :

(A) Power

(B) Power/Area

(C) Volt/meter

(D) Energy

41. The sum of internal energy and the product of pressure and volume is known as :

(A) Entropy

(B) Enthalphy

(C) Gibb's free energy

(D) Specific Heat

42. For any irreversible process, the entropy change is :

(A) Positive

(B) Zero

(C) Negative

(D) Infinite

43. The wavelength of radiation emitted by a body depends upon :

(A) Nature of its surface

(B) Area of its surface

(C) Temperature of its surface

(D) None of these

44. The ratio of specific heats for a diatomic gas is equal to :

(A) 7/5

(B) 5/4

(C) 6/7

(D) 7/2

45. If the two input waveforms of equal amplitude and 90 degree phase difference are applied to the CRO then the Lissajous patterns obtained will be :

(A) Ellipse

(B) Circle

(C) Straight line tilted at 45 degree w.r.t x-axis

(D) Vertical straight line

46. For a wave having group velocity of 3×10^6 m/s, the phase velocity in order of 10^8 m/s

(A) 120

(B) 130

(C) 140

(D) 150

47. Which of the following represents kinetic viscosity ?

(A) Viscosity/temperature

(B) Viscosity/density

(C) Viscosity/area

(D) Viscosity/mass

48. In a single slit (of width 1:2μm) diffraction experiment, the angular width of the central maxima is $\pi/6$. The wavelength of light in this case is :

(A) 6 Å

(B) 60 Å

(C) 600 Å

(D) 6000 Å

49. The Compton shift $\Delta\lambda$ is twice the Compton wavelength if the scattering angle is :

(A) 0°

(B) 45°

(C) 90°

(D) 180°

50. The de Broglie wavelength of an electron accelerated by a potential of 150V is :

(A) 0.28 Å

(B) 1 Å

(C) 15 Å

(D) 150 Å

51. Which of the following can be proved on the basis of uncertainty principle ?

(A) Protons exist inside the nucleus

(B) Neutrons exist inside the nucleus

(C) Electrons do not exist inside the nucleus

(D) None of these

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52. Tunnel effect is notably observed in the case of :
(A) X rays
(B) Gamma rays
(C) Alpha particles
(D) Beta particles

53. Which of the following properties of the Sun is studied using Zeeman effect ?
(A) Magnetic fields
(B) Electric fields
(C) Solar flares
(D) Sun spots

54. The dipole magnetic moment is directly proportional to the nuclear spin. Which of the following is the constant of proportionality ?
(A) Planck's constant
(B) Gyromagnetic ratio
(C) Nuclear susceptibility
(D) None of these

55. Baryon and mesons are collectively referred to as :
(A) Leptons
(B) Partons
(C) Hadrons
(D) Pomerons

56. The masses of neutron and proton are 1.0087 a.m.u and 1.0073 a.m.u respectively. When the two combine to form a helium nucleus of mass 4.0015 a.m.u. The binding energy of the helium nucleus will be :
(A) 284 MeV
(B) 28.4 MeV
(C) 2.84 MeV
(D) 0.284 MeV

57. In which of the following Bravais lattice, not all axial angles are right angles ?
(A) Tetrahedral
(B) Rhombohedral
(C) Orthorhombic
(D) Cubic

58. The specific heat at constant volume is given by :
(A) $C_v = \frac{\gamma R}{\gamma + 1}$
(B) $C_v = \frac{\gamma R}{\gamma - 1}$
(C) $C_v = \frac{R}{\gamma + 1}$
(D) $C_v = \frac{R}{\gamma - 1}$

59. What is meant by the expression "the first Brillouin zone" ?
(A) The Wigner Seitz cell of the reciprocal lattice
(B) The Bravais lattice of a reciprocal lattice
(C) The area in reciprocal space that is enclosed by the Fermi energy
(D) The Wigner Seitz cell in hexagonal lattices

60. In RC coupled amplifier, the voltage gain over mid frequency range :
(A) Changes abruptly with frequency
(B) Is constant
(C) Changes uniformly with frequency
(D) None of these

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OR

(Biology)

33. Starch and glycogen are both polymers of :
    (A) β-D-glucose with β-(1→4) and β-(1→6) linkages
    (B) α-D-glucose with α-(1→4) and α-(1→6) linkages
    (C) α-D-glucose with α-(1→4) linkages only
    (D) β-D-glucose with β-(1→4) linkages only

34. The area of allowed regions in the Ramachandran map will be least for :
    (A) Glycine
    (B) L-Alanine
    (C) L-Proline
    (D) α-methyl L-Valine

35. Which vitamin is derived from cholesterol ?
    (A) A
    (B) B_{12}
    (C) D
    (D) K

36. An enzyme with a high Km has :
    (A) Low affinity for its substrate and requires greater concentration of substrate to achieve Vmax
    (B) High affinity for its substrate and requires smaller concentration of substrate to achieve Vmax
    (C) Low affinity for its substrate and is always independent of substrate concentration to achieve Vmax
    (D) A high affinity for its substrate and is always independent of substrate concentration to achieve Vmax

37. Which of the following organelles is enclosed by a single membrane system ?
    (A) Nucleus
    (B) Mitochondria
    (C) Endoplasmic reticulum
    (D) Chloroplasts

38. The post-mitotic phase during which active synthesis of RNA and proteins occurs is the :
    (A) M-phase
    (B) S-phase
    (C) G-1 phase
    (D) G-2 phase

39. In a bacterial cell wall, the peptidoglycan structure contains :
    (A) D-amino acids only
    (B) L-amino acids only
    (C) Both D- and L-amino acids
    (D) None of the above

40. Virion is a :
    (A) Complete virus particle with nucleic acid surrounded by a capsid
    (B) Virus particle with nucleic acid only
    (C) Virus particle with capsid only
    (D) None of the above

41. Which of the following is not a component of the DNA backbone ?
    (A) Pentose sugar
    (B) Phosphate
    (C) Phosphodiester bond
    (D) Nitrogenous bases

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42. Which of the following is incorrectly paired ?
(A) Lac Z-Transacetylase
(B) Lac Y-Permease
(C) Lac de-repressor-Allolactose
(D) B-galactosidase substrate-lactose

43. Deletion and insertion mutations in DNA that cause frame shift mutations, hampers the end product of which of the following processes ?
(A) Replication
(B) Transcription
(C) Translation
(D) RNA processing

44. Proofreading by DNA polymerase III requires :
(A) 5' to 3' exonuclease activity
(B) 3' to 5' exonuclease activity
(C) 5' to 3' endonuclease activity
(D) 3' to 5' endonuclease activity

45. Which of the following vectors has the lowest carrying capacity ?
(A) Cosmids
(B) Plasmids
(C) BACs
(D) YACs

46. Which of the following statements is NOT TRUE ?
(A) Type II endonucleases are most commonly used enzymes in gene cloning
(B) Type II endonucleases have palindromic recognition and cleavage sequences
(C) Type II endonucleases require ATP and S-adenosyl methionine as cofactor
(D) Both (A) and (B)

47. Which of the following temperature conditions in a PCR cycle is reaction specific ?
(A) Annealing temperature
(B) Denaturation temperature
(C) Extension temperature
(D) All of the above

48. Which of the following is an 8-cutter Type II restriction endonuclease ?
(A) BamHI
(B) Not I
(C) Xho I
(D) EcoRI

49. Which of the following statements is not true about Ethidium bromide ?
(A) A non-polar dye to stain DNA molecules
(B) It fluoresces orange red color when exposed to UV light
(C) It intercalates between DNA bases and as a result its fluorescence intensity increases 15-20-fold
(D) Due to its DNA binding capability, it is reasoned to act as a potential mutagen

50. Which of the following acts as a reducing agent in SDS-PAGE ?
(A) SDS
(B) Ammonium Persulphate
(C) TEMED
(D) Dithiothreitol

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51. Which of the following is the correct sequence for a Western Blotting procedure ?
(1) Incubation with conjugated secondary antibody
(2) Transferring proteins on to a membrane
(3) Blocking the non-specific interactions
(4) Incubating with primary antibody
(A) (1), (2), (3), (4)
(B) (2), (3), (4), (1)
(C) (4), (1), (2), (3)
(D) (2), (4), (3), (1)

52. Which of the following ELISA types is used to determine the concentration of small molecules in a biological sample ?
(A) Direct
(B) Indirect
(C) Sandwich
(D) Competitive

53. Which of the following serves as the main high-energy phosphate reserve in vertebrate muscle ?
(A) ATP
(B) Creatine phosphate
(C) Phosphoenol pyruvate
(D) Glyceraldehyde-3-phosphate

54. Which of the following is NOT an enzyme of the Hexose Monophosphate Shunt ?
(A) Glyceraldehyde-3-phosphate dehydrogenase
(B) Glucose-6-phosphate-dehydrogenase
(C) Transketolase
(D) Phosphogluconate Dehydrogenase

55. In fatty acid β-oxidation which enzyme converts the long-chain acylcarnitine to long-chain acyl-CoA in the inner mitochondrial membrane ?
(A) Carnitine palmitoyltransferase (CPT1)
(B) Carnitine palmitoyltransferase (CPT2)
(C) Carnitine translocase (CAT)
(D) None of the above

56. Which of the following is/are involved for the transport of nitrogen of amino acids from tissues to liver and into the urea cycle ?
(A) Transamination
(B) Oxidative deamination
(C) Hydrolytic deamination
(D) All of the above

57. A child presented to a clinic with severe wheeze and symptoms of Asthma. Which of the following blood cells can be expected to be elevated in complete blood count ?
(A) Basophils
(B) Neutrophils
(C) Eosinophils
(D) Monocytes

58. Antigen-antibody interaction does not involve any one of the following ?
(A) Covalent bond
(B) Hydrogen bond
(C) Electrostatic interaction
(D) Hydrophobic interaction

59. mRNA vaccines for COVID-19 work in which one of the following ways ?
(A) mRNA direct the human cell to make viral proteins
(B) mRNA restrict viral entry into human cells
(C) mRNAs code for small peptides that bind SARS-nCoV and render it ineffective
(D) mRNAs code for antibodies against viral proteins

60. What happens to the Immune system in Auto-immune disorders ?
(A) Immune cells die
(B) Immune system makes too many immune cells
(C) Immune system mistakenly recognizes body tissues as foreign
(D) None of the above

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