ENT - 12

Seat No.	

Total No. of Pages : 16

P.G. Entrance Examination, May - 2023

M.Sc. NANOSCIENCE AND TECHNOLOGY

Sub. Code: 71144

Day and Date : Tuesday, 09-05-2023 **Total Marks : 100**

Time : 1.00 p.m. to 2.30 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Each question carries 1 mark.**
3) **Answers should be marked in the given OMR answer sheet by darkening the appropriate option.**
4) **Follow the instructions given on OMR Sheet.**
5) **Rough work shall be done on the sheet provided at the end of question paper.**

1) The electromagnetic waves that are used in telecommunication are ____.

A) ultra violet B) infra-red

C) visible D) microwaves

2) "The total electric flux through any closed surface surrounding charges is equal to the amount of charge enclosed". The above statement is associated with ____.

A) Coulomb's square law B) Gauss's law

C) Maxwell's first law D) Maxwell's second law

3) Which of the following is diamagnetic?

A) Water B) Iron

C) Cobalt D) Nickel

4) The rise of oil along the wicks in oil lamps is due to _____.

A) photon B) surface tension

C) osmosis D) diffusion

5) Waterproof raincoat is an example of _____surface.

A) hydrophilic
B) simple harmonic oscilator
C) superhydrophilic
D) superhydrophobic

6) Pure water and clean glass make contact at an angle of ____.

A) 0°
B) 45°
C) 90°
D) 20°

7) _____is the application of spintronics.

A) Giant magneto resistance
B) UV-Visible spectroscopy
C) X-ray diffraction
D) Atomic force microscopy

8) _____is the unit of mutual inductance.

A) Farad
B) Ohm
C) Henry
D) Coulomb

9) _____materials are strongly attracted by a magnet.

A) paramagnetic
B) ferromagnetic
C) ferrimagnetic
D) diamagnetic

10) Diamagnetic material has _____susceptibility.

A) negative
B) positive
C) infinity
D) None of the above

11) The crystal structure is formed by associating every lattice point with an assembly of atoms or molecules or ions, which are identical in composition, arrangement and orientation, is called as the _____.

A) Lattice
B) Basic
C) Crystal
D) Base

12) _____is the building block of the crystal structure.

A) Lattice B) Basic

C) Crystal D) Unit cell

13) Coordination number in Body Centred Cubic crystal structure

A) 6 B) 8

C) 12 D) 14

14) Atomic packing fraction (%) of the simple cubic crystal is ____.

A) 74% B) 84%

C) 52% D) 68%

15) X-ray diffractometers are not used to identify the physical properties of which of the following?

A) Metals B) Liquids

C) Polymeric materials D) Solids

16) With the help of which of the following equations is the interplaner distance calculated from a known wavelength of the source and measured angle?

A) Coolidge equation B) Bragg's equation

C) Debye equation D) Scherrer equation

17) The correct expression for Bragg's law is $n\lambda$ = _____.

A) $d\sin\theta$ B) $d\cos\theta$

C) $2d\sin\theta$ D) $2d\cos\theta$

18) The magnetism of a magnet is due to

A) The earth

B) Cosmic rays

C) Due to pressure of big magnet inside the earth

D) Spin motion of electrons

19) The magnitude of the induced emf in a coil is directly proportional to the rate of change of flux linkages. This is known as

A) Joule's Law

B) Faraday's second law of electromagnetic induction

C) Faraday's first law of electromagnetic induction

D) Coulomb's Law

20) The point in a magnet where the intensity of magnetic lines of force is maximum

A) Magnetic pole B) South pole

C) North pole D) Unit pole

21) Two particles are moving in 3 dimensional space, then the number of degrees of freedom is _____.

A) Three B) One

C) Four D) Six

22) A constraint is a _____on the freedom of motion of a system of particles.

A) Restriction B) Condition

C) Further information D) Formulation

23) The conditions of constraint can be expressed as equations connecting the coordinates of the particles called as _____ constraint.

A) Holonomic B) Non-holonomic

C) Unilateral and bilateral D) Dissipative

24) "Rigid body" is the example of _____constraint.

A) Holonomic B) Non-holonomic

C) Dissipative D) Unilateral

25) At any point on the constraint surface both the forward and backward motions are possible. Constraint relations are not in the form of inequalities but are in the form of equations.

A) Holonomic
B) Bilateral
C) Conservative
D) Unilateral

26) The _____states that when a particle is subjected to two simple harmonic oscillations simultaneously then the resultant displacement (y) is the vector sum of individual displacements that they produced.

A) Supreme principle
B) Principle of addition
C) Superposition principle
D) Saturation principle

27) A wave in which the positions of maximum and minimum amplitude travel through the medium is known as a _____.

A) Stable waves
B) Standing waves
C) Transparent waves
D) Travelling waves

28) The disturbance moves along (x axis) with velocity $V = \sqrt{}$ (T/m), where T and m in the string are _____and _____respectively.

A) Tension, mass of the spring
B) Tension, mass per unit length of the spring
C) Torque, mass of the particle
D) Tension, mass of the particle

29) In the string , if the end point is taken as the origin of the coordinate system, then there are points on the string where the amplitude is Zero called as ____.

A) Notes
B) Antinodes
C) Antinotes
D) Nodes

30) Standing wave ____.

A) Do not carry or transfer energy from one point to another
B) Carries or transfer energy from one point to another
C) Sometime carries or transfer energy from one point to another
D) Carries or transfer energy from one point to another if there is medium

31) A _____ molecules that combine to form proteins?

A) Amino Acids
B) Peptides
C) Proteins
D) Carbohydrates

32) Which of the following will give the carbylamine test?

A) CH_3NH_2
B) CH_3NHCH_3
C) $(CH_3)_3NH_2$
D) CH_3CONH_2

33) The solutions that obey Raoult's law over the entire concentration range are known as?

A) Ideal solution
B) Non-ideal solution
C) Both (a) and (b)
D) None of the above

34) Identify the name of the Hinseberg reagent.

A) Benzene sulphonic acid
B) Benzene sulfonyl chloride
C) Benezenamine
D) Benzene sulfonyl bromide

35) Which one of the following is the type of critical solution temperature based on mutual solubility?

A) Upper critical solution temperature
B) Lower critical solution temperature
C) Lower and upper critical solution temperature
D) All the above

36) Any homogeneous, mechanically separable, and physically distinct portion of the system is known as a ?

A) Degree of freedom
B) Component
C) Phase
D) Sublimation

37) Mathematically representation of the reduced phase rule is?

A) $F = C - P + 2$
B) $F = C - P + 1$
C) $F = E - P + 2$
D) $F = C - P+1$

38) A mixture of immiscible liquids begins to boil when the sum of their vapor pressure is equal to atmospheric pressure is the principle of ____.

A) Steam distillation
B) Simple distillation
C) Vacuum distillation
D) Fractional distillation

39) Amino acids are organic compounds composed of _____along with a variable side chain group?

A) Nitrogen
B) Carbon, hydrogen
C) Oxygen
D) All the above

40) The ninhydrin test is a chemical test that is used to check whether a given analyte contains _____.

A) Primary amines
B) α-amino acids
C) Amides
D) Carbonyl compounds

41) The shape of p orbital is a _____.

A) Dumb-bell
B) Spherical
C) Circular
D) Elongated

42) Born-Haber Cycle is used to calculate _____.

A) Lattice energy
B) Electron affinity
C) Heat of formation
D) All of these

43) Which of the following is not an alkaline earth metal?

A) Cs
B) Ra
C) Ba
D) Ca

44) Hyper-conjugation is a _____effect in which localization of σ electrons of C-H bond.

A) Temporary
B) Permanent
C) Partial
D) None of these

45) The process that does not occur of its own accord is called ____process.

A) Non-spontaneous B) Spontaneous

C) Isothermal D) Adiabatic

46) Among the following the weakest Bronsted base is ____.

A) F^- B) Cl^-

C) Br^- D) I^-

47) The efficiency of the Carnot cycle is given by ____.

A) $\varepsilon=W/T$ B) $\varepsilon=T/W$

C) $\varepsilon=W/q_2$ D) all of these

48) No machine has ____efficiency

A) 50% B) 100%

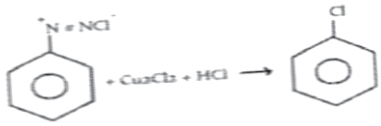
C) 10% D) 20%

49) Which C-X bond has the highest bond energy per mole?

A) C-F B) C-Cl

C) C-Br D) C-I

50) What is the name of the following reaction?



A) Chlorination B) Sandmeyer's reaction

C) Perkin reaction D) Substitution reaction

51) Most of the hard acids and hard bases form ___bond.

A) Covalent B) Ionic

C) Either covalent or ionic D) Both covalent and ionic

52) Caprolactone is the Baeyer Villiger oxidation product of _____.

A) Cyclohexene
B) Cycloketone
C) Hexaketone
D) Cyclohexanone

53) Ammonia is ____.

A) Hard acid
B) Hard base
C) Soft base
D) Soft acid

54) Which among the following is a reducing agent?

A) NaB_4H_4
B) $LiAuH_4$
C) NaH_4O_4
D) $LiAlH_4$

55) Isopropyl alcohol is the MPV reduction product of ____.

A) Acetic acid
B) Acetone
C) Acetyl ketone
D) Acetyl oxide

56) Rearrangement which converts an amide to an amine with one carbon atom less by the action of bromine in alkali is known as?

A) Wittig reaction
B) Amide rearrangement reaction
C) Hofmann rearrangement reaction
D) Baeyer Villiger reaction

57) Osmium tetraoxide always gives____.

A) 1,3 diols
B) Vicinal diols
C) Triols
D) Geminal diols

58) According to Markonikov's rule, the addition of HBr to 2-methyl propene will give _____.

A) l-bromopropane
B) l bromopropene
C) Ter-butyl bromide
D) Iso-butyl bromide

59) Catalytic hydrogenation of ethyne using hydrogen and Palladium will give ____.

A) Ethene
B) Propane
C) Ethane
D) Propene

60) Cyclohexanol upon dehydration gives

A) 1,2 Cyclohexane diols
B) Hexene
C) Cyclohexene
D) Cyclohexane

61) A piezoelectric generator uses _____.

A) principle of the converse piezoelectric effect
B) an electronic oscillator
C) the idea of electronic vibration
D) all the above

62) Ultrasonics are _____.

A) sound waves with a frequency greater than 20,000 Hz
B) sound waves with a frequency less than 20,000 Hz
C) waves traveling with a velocity greater than that of sound waves
D) waves traveling with a velocity less than that of sound waves

63) The semiconductor has an energy band gap of the order of ____.

A) l eV
B) 10 eV
C) Zero
D) 5 eV

64) The most important property of nanomaterials is _____.

A) Force
B) Friction
C) Pressure
D) Temperature

65) Which of these historical works of art contains nanotechnology?

A) Lycurgus cup

B) Medieval stained-glass windows in churches

C) Damascus steel swords

D) All of the above

66) Particles (material) having a size between ____are called nanoparticles or nanomaterials.

A) 1 to 10 nm

B) 1 to 1000 nm

C) 1 to 100 nm

D) 1 to 10000 nm

67) The hole-electron pair in the lattice is called _____.

A) Lone-pair

B) Exciton

C) Positron

D) Ion-pair

68) The solution of gold nanoparticles shows different colors due to ____.

A) Different concentration

B) Different particle size

C) Different molecular condition

D) Different energy

69) In scanning electron microscopy (SEM) electron beam is focused by ____.

A) Optical lenses

B) Electronic lenses

C) Magnetic lenses

D) Electric lenses

70) Zero-valent iron nanoparticles widely use as remediation applications in ____ pollution.

A) Air pollution

B) Marine pollution

C) Groundwater pollution

D) Noise pollution

71) Sol-gel method is _____chemical process

A) Dry

B) Semi-liquid

C) Semi-solid

D) Wet

72) The _____and citrate solution are used as reducing agents in the chemical reduction method.

A) Hydrazine hydrate
B) Hydrazine
C) Hydrazone
D) Semi carbazene

73) Metal nanoparticles particularly _____nanoparticles are prepared by the chemical reduction method.

A) Platinum
B) Silver
C) Gold
D) Tungsten

74) Fabrics are extensively made out of nanomaterials like ____.

A) Carbon nanotubes
B) Fullerenes
C) Mega tubes
D) Polymers

75) Which ratio decides the efficiency of Nanoparticles?

A) Weight/Volume Ratio
B) Surface Area/Volume Ratio
C) Volume/Weight Ratio
D) Pressure/Volume Ratio

76) The process used to create topographical features on a surface by selective removal of material by physical or chemical means is called _____.

A) etching
B) bonding
C) lithography
D) writing

77) Which one of the following technique is used in the formation of nano-emulsion

A) Co-precipitation
B) Sol-gel
C) Hot Plate method
D) High-Pressure homogenization

78) The bulk nanomaterial comes under _____dimensional nanomaterials.

A) Zero
B) One
C) Two
D) Three

79) Which of the following is an example of nanowires of semiconductors?

A) Silicon dioxide
B) Titanium dioxide
C) Silicon
D) None of the above

80) On both ends of the CNTs, which carbon nanostructure is placed?

A) Graphite B) Diamond

C) C_{60} D) Benzene

81) Secondary metabolities are synthesized in ____phase of the microbial growth.

A) Lag phase B) Log phase

C) Stationary phase D) Death phase

82) The concentration of physiological saline used in microbial techniques is _____.

A) 1% B) 0.95%

C) 0.85% D) 0.55%

83) The wavelength of UV radiation which is most lethal for microorganisms is ____.

A) 260 nm B) 200 nm

C) 160 nm D) None of the above

84) The branch of biology, which involves the study of immune systems in all organisms is called_____.

A) Zoology B) Microbiology

C) Immunology D) Biotechnology

85) Which of the following system protects our body against disease due to pathogens?

A) Respiratory system B) Immune system

C) Digestive system D) Respiratory system

86) Which of the following immunity is obtained during a lifetime?

A) Adaptive immunity B) Innate immunity

C) Auto immunity D) None of the above

87) A plant cell wall is mainly composed of

A) Protein B) Cellulose

C) Lipid D) Starch

88) The concept of cell is not applied for

A) Algae
B) Bacteria
C) Virus
D) Fungi

89) Lysosomes are useful for its _____.

A) Parasitic activity
B) Presence of food vacuole
C) Catalytic activity
D) Hydrolytic activity

90) Match Column I with Column II

Column I	Column II
a) Liver	i) Heart
b) Respiration	ii) Mouth
c) Digestion begins in	iii) Bile
d) Circulation	iv) Lungs

A) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
B) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
C) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
D) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

91) The fluid consisting of red blood cells, white blood cells, plasma, and platelets is known as _____.

A) Blood
B) Cytoplasm
C) Nucleoplasm
D) Chyme

92) The electrical activity of the heart is called as ____.

A) Electrocardiograh
B) Electrocardiogram (ECG)
C) Electrophotogram
D) None of these

93) The term central nervous system refers to the:

A) Brain, spinal cord, and cranial nerves
B) Brain and cranial nerves
C) Spinal cord and spinal nerves
D) Brain and spinal cord

94) Agar agar, used in plant tissue culture is extracted from
A) Fungi B) Bacteria
C) An algae D) A virus

95) The cut-off limit of human eye is ____nm.
A) 2,000 B) 5,000
C) 10,000 D) 50,000

96) The size of *E.coli* bacteria is ____nm.
A) 2,000 B) 50
C) 5,000 D) 90

97) Which of these is at the nanoscale (between 1 and 100 nanometres)?
A) DNA B) A red blood cell
C) A hydrogen atom D) A snowflake

98) A recombinant DNA molecule is produced by joining together.
A) One mRNA with a DNA segment
B) One mRNA with a tRNA segment
C) Two mRNA molecules
D) Two DNA segments

99) A group of genetically similar organisms obtained by a sexual reproduction is called _____.
A) Clone B) Population
C) Assembly D) None

100) The first human drug produced through recombinant DNA technology is ____.
A) Insulin B) Erythropoietin
C) Interferon D) Somatostatin

Rough Work