English

1.

If $\varphi(x, y, z)$ is a scalar function which satisfies the Laplace equation, then the gradient of φ is

(A) Solenoidal and irrotational
(B) solenoidal but not irrotational
(C) Irrotational but not solenoid
(D) Neither solenoidal nor irrotational

Correct Option(s): A

English

2.

Which of the following is a vector quantity?

(A) Magnetic flux
(B) Magnetic potential
(C) Magnetic field intensity
(D) Relative permeability

Correct Option(s): C

English

3.

The Fourier transform of a real-valued time signal has

(A) Real symmetry
(B) Odd symmetry
(C) Even symmetry
(D) Conjugate symmetry

Correct Option(s): D

English

4.

Which of the mentioned qualities holds true for a dielectric?

(A) At high temperatures, they are superconductors
(B) They behave like superconductors at low temperatures
(C) They will never be superconductors
(D) They have a low dielectric breakdown voltage

Correct Option(s): B

English

5.

Which properties cannot be calculated from Biot-Savart law?

(A) Magnetic field intensity
(B) Electric field intensity
(C) Flux density
(D) Permeability

Correct Option(s): B

English

6.

Which of the following proves that electromagnetic waves are transverse?

(A) Diffraction
(B) Interference
(C) Polarisation
(D) Reflection

Correct Option(s): C

English

7.

How is the state of a quantum mechanical system completely specified?

(A) By its angular momentum
(B) By its wave function
(C) By its position in space
(D) By its time

Correct Option(s): B

English

8.

According to Heisenberg's uncertainty principle, which of the following is a correct relation?

(A) $\Delta x.\ \Delta p \geq \frac{h}{4\pi}$

(B) $\Delta x.\ \Delta p \leq \frac{h}{4\pi}$

(C) $\Delta x.\ \Delta p = \frac{h}{4\pi}$

(D) $\Delta x.\ \Delta p = \frac{h}{2\pi}$

Correct Option(s): A

English

9.

Which of the following is known as the Schrodinger equation?

(A) $E = h\nu$

(B) $E = mc^2$

(C) $H\varphi = E\varphi$

(D) $\lambda = h/p$

Correct Option(s): C

English

10.

The walls of a particle in a box are supposed to be_____

(A) Infinitely hard
(B) Infinitely large
(C) Soft and Small
(D) Infinitely hard and infinitely large

Correct Option(s): D

English

11.

Ensemble is a set of assemblies of a system, where each system may have a:

(A) different macrostate but same microstate

(B) different macrostate and microstate

(C) different microstate but same macrostates

(D) same macrostate and microstate

Correct Option(s): C

English

12.

Planck's law describes the spectrum of _____ radiation.

(A) Visible

(B) Ultraviolet

(C) Electromagnetic

(D) Black body

Correct Option(s): D

English

13.

_____is the smallest geometrical structure of a solid from which the entire crystal structure can be constructed by repetition in three-dimension.

(A) Unit Cell

(B) Primitive Cell

(C) Lattice

(D) Basis

Correct Option(s): A

English

14.

The expression for Bragg's law is ……

(A) $\sin\theta = n\lambda$

(B) $\sin\theta = n\lambda/2$

(C) $2d \sin\theta = n\lambda$

(D) $d \sin\theta = n\lambda$

Correct Option(s): C

English

15.

Which defect causes a decrease in the density of crystal

(A) Frenkel

(B) Schottky

(C) Interstitial

(D) F-centre

Correct Option(s): B

English

16.

Which of the following quantities is directly proportional to the average kinetic energy of gas molecules, according to the kinetic theory of gases?

(A) Mass

(B) Pressure

(C) Temperature

(D) Volume

Correct Option(s): C

English

17.

In an ideal solution, the enthalpy of mixing is_____

(A) Negative

(B) Infinite

(C) Zero

(D) Positive

Correct Option(s): C

English

18.

At chemical equilibrium, the Gibbs free energy change (ΔG) is_____

(A) Zero

(B) Positive

(C) Infinite

(D) Negative

Correct Option(s): A

English

19.

In a galvanic cell, the relationship between the Gibbs free energy change (ΔG) and the cell potential (E) is given by_____

(A) $\Delta G = nFE$

(B) $\Delta G = -nFE$

(C) $\Delta G = -RTlnK$

(D) $\Delta G = RTlnK$

Correct Option(s): B

English

20.

Corrosion of metals is generally an example of_____

(A) Sublimation

(B) Neutralization

(C) Oxidation

(D) Reduction

Correct Option(s): C

English

21.

A catalyst works by _____

(A) Shifting the equilibrium constant
(B) Increasing the activation energy
(C) Increasing the energy of reactants
(D) Decreasing the activation energy

Correct Option(s): D

English

22.

The unit of the rate constant for a first-order reaction is_____

(A) $\text{mol L}^{-1}\text{s}^{-1}$
(B) s^{-1}
(C) mol L^{-1}
(D) $\text{mol L}^{-1}\text{s}$

Correct Option(s): B

English

23.

The rate of a chemical reaction is directly proportional to_____

(A) Time
(B) Temperature
(C) Concentration of products
(D) Concentration of reactants

Correct Option(s): D

English

24.

Which element is a d-block element?

(A) Sodium
(B) Copper
(C) Sulfur
(D) Argon

Correct Option(s): B

English

25.

The elements of the s-block are typically

(A) Gases
(B) Non-metals
(C) Metalloids
(D) Metals

Correct Option(s): D

English

26.

Which block of elements is known as the transition elements?

(A) s-block
(B) p-block
(C) d-block
(D) f-block

Correct Option(s): C

English

27.

Which heterocyclic compound contains a sulfur atom in its ring?

(A) Indole
(B) Thiophene
(C) Pyridine
(D) Furan

Correct Option(s): B

English

28.

Which of the following heterocyclic compounds contains oxygen in its ring structure?

(A) Pyrrole
(B) Furan
(C) Thiophene
(D) Pyridine

Correct Option(s): B

English

29.

The splitting pattern in ^1H NMR is due to

(A) Spin-spin coupling between adjacent protons
(B) Proton mass
(C) Chemical shift
(D) Magnetic field strength

Correct Option(s): A

English

30.

What does the m/z ratio in a mass spectrum represent?

(A) The speed of ions
(B) The mass of the molecule
(C) The energy of electrons
(D) The mass-to-charge ratio of ions

Correct Option(s): D

English

31.

What type of bonding is present in diamond?

(A) Ionic
(B) Covalent
(C) Metallic
(D) Van der Waals

Correct Option(s): B

English

32.

What does a Miller index (hkl) represent in crystallography?

(A) The density of atoms in a unit cell
(B) The orientation of a crystal plane
(C) The size of a crystal lattice
(D) The temperature at which a crystal forms

Correct Option(s): B

English

33.

What is a common method to protect metals from oxidation?

(A) Painting
(B) Polishing
(C) Sintering
(D) Quenching

Correct Option(s): A

English

34.

Which imperfection in solids refers to an extra plane of atoms inserted into a crystal structure?

(A) Vacancy
(B) Interstitial
(C) Edge dislocation
(D) Screw dislocation

Correct Option(s): C

English

35.

Fick's First Law of Diffusion describes_____

(A) The rate at which solute diffuses
(B) The concentration gradient
(C) The temperature effect on diffusion
(D) The solubility of gases

Correct Option(s): A

English

36.

What is the primary concern of corrosion?

(A) Material's ability to conduct electricity
(B) Material's resistance to heat
(C) Material's degradation due to environmental exposure
(D) Material's response to magnetic fields

Correct Option(s): C

English

37.

What is the primary purpose of doping in semiconductors?

(A) To improve electrical conductivity
(B) To enhance mechanical strength
(C) To increase thermal resistance
(D) To reduce weight

Correct Option(s): A

English

38.

Which property is generally NOT associated with ceramics?

(A) High hardness
(B) High electrical conductivity
(C) High melting point
(D) High brittleness

Correct Option(s): B

English

39.

Which of the following is a traditional ceramic material?

(A) Silicon carbide
(B) Alumina
(C) Boron nitride
(D) Zirconia

Correct Option(s): B

English

40.

Advanced strong ceramics are often used in_____application?

(A) Building bricks
(B) Insulating electrical wires
(C) Cutting tools
(D) Water pipes

Correct Option(s): C

English

41.

Which type of polymerization involves the breaking of double bonds in monomers?

(A) Addition polymerization
(B) Condensation polymerization
(C) Cross-linking polymerization
(D) Ring-opening polymerization

Correct Option(s): A

English

42.

Which additive is often used to improve the UV stability of polymers?

(A) Plasticizer
(B) Flame retardant
(C) Stabilizer
(D) Reinforcer

Correct Option(s): C

English

43.

Which of the following materials exhibits piezoelectric behavior?

(A) Glass
(B) Rubber
(C) Quartz
(D) Wood

Correct Option(s): C

English

44.

Which property is concerned with how a material responds to stress and strain?

(A) Thermal properties
(B) Mechanical properties
(C) Optical properties
(D) Magnetic properties

Correct Option(s): B

English

45.

Which material property is primarily related to its ability to conduct heat?

(A) Optical properties
(B) Mechanical properties
(C) Thermal properties
(D) Magnetic properties

Correct Option(s): C

English

46.

Which of the following is a key difference between prokaryotic and eukaryotic cells_____

(A) Presence of a cell wall
(B) Presence of membrane-bound organelles
(C) Ability to perform photosynthesis
(D) Size of ribosomes

Correct Option(s): B

English

47.

Plasmids are:

(A) Segments of bacterial DNA integrated into the chromosome
(B) Circular DNA molecules independent of the bacterial chromosome
(C) Structures found only in eukaryotic cells
(D) Responsible for viral replication

Correct Option(s): B

English

48.

Which process involves the direct uptake of foreign DNA from the surrounding environment by a bacterial cell?

(A) Conjugation
(B) Transduction
(C) Transformation
(D) Mutation

Correct Option(s): C

English

49.

Cell signaling, a ligand typically binds to_____

(A) DNA
(B) Enzymes
(C) Receptors
(D) Lipids

Correct Option(s): C

English

50.

Oxidative phosphorylation primarily occurs in the_____

(A) Mitochondrial membrane
(B) Nucleus
(C) Cytoplasm
(D) Golgi apparatus

Correct Option(s): A