திருவள்ளுவர் பல்கலைக்கழகம், வேலூர்

THIRUVALLUVAR UNIVERSITY, VELLORE

Ph.D., - COMMON ENTRANCE TEST (CET9) – JUNE SESSION 2022

Subject : **PHYSICS** Exam Date : **26.06.2022**

Time : 11.00 A.M. TO 12.30. P.M Maximum Marks : 50

NAME		**REGISTER NO**	
		HALL TICKET NO.	
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SECTION – A (50 x 1 = 50 Marks)
All Questions carry equal marks

1. The vector [1, 2, 3], [1, 0, 0], [0, 1, 0], [0, 0, 1] are
   a. Linearly independent
   b. Linearly dependent
   c. Orthogonal
   d. None of these

2. Kronecker delta is
   a. a scalar
   b. a vector
   c. a tensor of rank 1
   d. a tensor of rank 2

3. The value of Bessel's function J_0 (0) is
   a. Zero
   b. One
   c. Two
   d. Six

4. What is the value of δ (C (x – a)) ?
   a. a
   b. b.
   c. x – a
   d. None of the above

5. The mean of Poisson's distribution is 5. What is standard deviation?
   a. 1
   b. 3
   c. 4
   d. 2.5

6. For a conservative system, Hamiltonian is
   a. H = T + V
   b. H = T – V
   c. H = T + 2V
   d. H = 2T + V

7. Constraint in rigid body is
   a. holonomic
   b. non – holonomic
   c. Infinite
   d. none of these

8. In pendulum motion, the integral of motion is
   a. Velocity
   b. Amplitude
   c. Lnear momentum
   d. Energy

9. What is the value of the absolute thermodynamic temperature scale?
   a. 3 K
   b. 0 K
   c. 1 K
   d. 2 K

10. Degeneracy in perfect gases is the departure of their properties from those of ordinary gas and becomes significant at
   a. Low density
   b. High density
   c. High temperature
   d. None of these

11. The uncertainty principle states that the error in measurement is due to
   a. dual nature of particles
   b. due to the small size of particles
   c. due to large size of particles
   d. due to error in measuring instrument

12. An electron is confined to a one-dimensional box. The wavelength of the radiation required to excite the electron from the lowest level to the first excited level is 1.10 μm. What is the length of the box?
   a. 1 nm
   b. 3 nm
   c. 5 nm
   d. 4 nm

13. In Heisenberg picture, the operators are
   a. time dependent
   b. time dependent
   c. both a & b
   d. None of the above

14. The first-order correction to the ground state energy of an isotropic 3 -dimensional harmonic oscillator with the perturbation $V = \lambda\, xyz^2$ is
   a. 0
   b. Infinite
   c. xyz^2
   d. None of these

15. $[J_x, J_y]$ is
   a. $2\hbar J_z$
   b. $\hbar J_z$
   c. $-\hbar J_z$
   d. $i\hbar J_z$

16. Calculate the polarisation vector of the material which has 100 dipoles per unit volume in a volume of 2 units.
    a. 50
    b. 400
    c. 200
    d. 0.02

17. Find the magnetic field intensity when the magnetic vector potential is x i + 2y j + 3z k.
    a. 6
    b. 0
    c. -6
    d. 1

18. The surface integral of which parameter is zero?
    a. B
    b. E
    c. D
    d. H

19. The relation between the speed of light, permeability and permittivity is
    a. $C = 1/\sqrt{(\mu\varepsilon)}$
    b. $C = \mu\varepsilon$
    c. $C = \mu/\varepsilon$
    d. $C = 1/\mu\varepsilon$

20. Magnetic fields creates a plasma which is known as _____
    a. Stable state
    b. Metastable state
    c. Shifted state
    d. None of the above

21. Molecules which are having _____ are microwave active.
    a. Permanent Dipole
    b. High pressure Detector
    c. Principle axis
    d. Acidity

22. The IR spectra of a compound helps in
    a. proving the identity of compounds
    b. showing the presence of certain functional groups in the molecule
    c. neither of the above
    d. All the above

23. The transition zone for Raman spectra is _____
    a. Between vibrational and rotational levels
    b. Between electronic levels
    c. Between magnetic levels of nuclei
    d. Between magnetic levels of unpaired electrons

24. The region of electromagnetic spectrum for nuclear magnetic resonance is _____
    a. Microwave
    b. Radio frequency
    c. Infrared
    d. UV-rays

25. The criteria for electronic spin resonance is _____
    a. Periodic change in polarisability
    b. Spin quantum number of nuclei > 0
    c. Presence of unpaired electron in a molecule
    d. Presence of chromophore in a molecule

26. A nucleus consists of
    a. neutrons
    b. protons
    c. neutrons and protons
    d. electrons and neutrons

27. The Q-value of the $^{3}H(p,n)^{3}$ He reaction is -0.764 MeV. The threshold energy (for appearance of neutrons in the forward direction is_____MeV.
    a. 0.5 MeV
    b. 2 MeV
    c. 1.02 MeV
    d. 3 MeV

28. Uranium 235 mass should be greater than X, then it is capable of continuous fission by itself. Identify X.
    a. Critical size
    b. Threshold point
    c. Critical shape
    d. Specific size

29. The atomic number is not changed by which type of radioactive decay?
    a. Beta
    b. Gamma
    c. Alpha
    d. The atomic number is affected by all forms of radioactive decay

30. Conservation laws that describe events involving the elementary particles include the conservation of
    a. energy.
    b. linear and angular momentum.
    c. baryon and lepton numbers.
    d. All of the above

31. What is true about microprocessor?
    a. Microprocessor is a controlling unit of a micro-computer
    b. It is fabricated on a small chip capable of performing ALU (Arithmetic Logical Unit) operations
    c. It also communicate with the other devices connected to it.
    d. All of the above

32. A memory connected to a microprocessor has 16 address lines and 8 data lines. What will be the memory capacity?
    a. 8 KB
    b. 2 MB
    c.16 MB
    d. 64 KB

33. What is stored in the H & L general-purpose register?
    a. Opcode
    b. Address of memory
    c. Address of next instruction
    d. Temporary data

34. Suppose registers 'A' and 'B' contain 50H and 40H respectively. After instruction MOV A, B, what will be the contents of registers A and B?
    a. 40H, 40H
    b. 50H, 40H
    c. 50H, 50H
    d. 60H, 40H

35. The address lines required to connect the microprocessor with a 4KB RAM is.?
    a. 10
    b.11
    c.12
    d.16

36. In which type of dislocation an extra plane is inserted inside the crystal?
    a. Edge dislocation
    b. Screw dislocation
    c. Jog dislocation
    d. Mixed dislocation

37. The Dielectric materials which exhibit spontaneous polarization, and whose polarization is reversible is called
    a. Pyroelectric
    b. Piezoelectric
    c. Ferroelectric
    d. Centrosymmetric

38. If the material recovers the original dimensions, when an external load is removed, this deformation is known as _____ deformation.
    a. plastic
    b. permanent
    c. elastic
    d. irreversible

39. The creating of nanoscale materials by chemically or physically breaking down the larger materials is known as _____ approach in nanotechnology.
    a. Top down
    b. bottom up
    c. top up
    d. all the above

40. Which of the following is not a characteristic of LASER?
    a. Monochromatic
    b. Coherent
    c. Divergent
    d. Intense

41. The atomic packing factor for FCC is
    a. 48 %
    b. 52%
    c. 74%
    d. 85 %

42. The first contribution arises from the atomic vibrations and may be called the.....
    a. lattice specific heat
    b. lattice specific gas
    c. lattice specific temperature
    d. None of above

43. Hall voltage is zero when the semiconductor is
    a. Extrinsic
    b. Intrinsic
    c. 'P' type
    d. None of the above

44. In which of the following the magnetic moments align themselves parallel to each other?
    a. Paramagnetic material
    b. Ferromagnetic material
    c. Ferrimagnetic material
    d. Diamagnetic material

45. The binding energy for a cooper pair is
    a. 10^{-2} eV
    b. 10^{-4} eV
    c. 10^{-6} eV
    d. 10^{-8} eV

46. The scattering of particles by a potential can be analyzed by Born approximation. In particular, if the scattered wave is replaced by an appropriate plane wave, the corresponding Born approximation is known as the first Born approximation. Such an approximation is valid for
    a. large incident energies and weak scattering potentials.
    b. large incident energies and strong scattering potentials.
    c. small incident energies and weak scattering potentials.
    d. small incident energies and strong scattering potentials.

47. A pair of eigenvalues of the perturbed Hamiltonian, using first order perturbation theory, is
    a. $3+2\varepsilon$, $7+2\varepsilon$
    b. $3+2\varepsilon$, $2+\varepsilon$
    c. 3, $7+2\varepsilon$
    d. 3, $2+2\varepsilon$

48. Suppose relativisticrest energy is included into the Schrodinger equation, the result is either the Klein-Gordon equation or _____
    a. uncertainty equation
    b. wave function
    c. Delta equation
    d. Dirac equation

49. If α and β are Dirac matrices, then Trace $(\alpha . B)(\alpha . C)$ is
    a. B. C
    b. 2 B. C
    c. 4 B. C
    d. $(B. C)^2$

50. The classical Hamiltonian equations of motion for a field agrees with ____ equation in a cell approximation.
    a. Hamiltonian
    b. Lagrangian
    c. Dirac
    d. Klein Gordon.