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Entrance Exam. For Ph. D. (Physics)

- The magnetic moment associated with the first orbit in hydrogen atom is given by:

(a) $\frac{h}{4\pi me}$	(b) $\frac{4\pi m}{he}$
(c) $\frac{eh}{4\pi m}$	(d) $\frac{emh}{4\pi}$
- In a simple cubic lattice $d_{100} : d_{110} : d_{111}$ is:

(a) 6:3:2	(b) 6:3: $\sqrt{2}$
(c) $\sqrt{6}:\sqrt{3}:\sqrt{2}$	(d) $\sqrt{6}:\sqrt{3}:2$
- X-rays are produced when an element of high atomic weight is bombarded by high energy:

(a) Protons	(b) Photons
(c) Neutrons	(d) Electrons
- E_F and E_f are the Fermi level of sodium at 0K and 10000 K. E_F for sodium is 3 eV, then $\frac{E_f}{E_F}$ is:

(a) 0.93	(b) 1.93
(c) 0.02	(d) 21
- If $\psi_{(111)}$ and $\psi_{(112)}$ are the wave functions of the electrons in the two energy states (111) and (112) respectively in a cubical box of side 'a', then $\frac{\psi_{(111)}}{\psi_{(112)}}$ is:

(a) $\frac{\sin \frac{\pi z}{a}}{\sin \frac{2\pi z}{a}}$	(b) $\frac{\sin \frac{2\pi z}{a}}{\sin \frac{\pi z}{a}}$
(c) $\frac{\sin \frac{\pi x}{a}}{\sin \frac{\pi y}{a}}$	(d) $\frac{\sin \frac{2\pi y}{a}}{\sin \frac{2\pi z}{a}}$
- If the Debye's temperature of a metal is 450 K, the Debye's frequency is:

(a) 10^{13} Hz	(b) 10^3 Hz
(c) 10^{23} Hz	(d) 10^{33} Hz
- Superconductivity results due to:

(a) Crystal structure having infinite atomic vibrations at 0K.	(b) Crystal structure having no atomic vibrations at 0K.
(c) All electrons interacting in the superconducting state.	(d) All electrons having Fermi energy at 0K.
- At Neel temperature:

(a) Permeability is minimum	(b) Permeability is maximum
(c) Susceptibility is minimum	(d) Susceptibility is maximum
- The orientational polarisability per molecule in a polyatomic gas is proportional to:

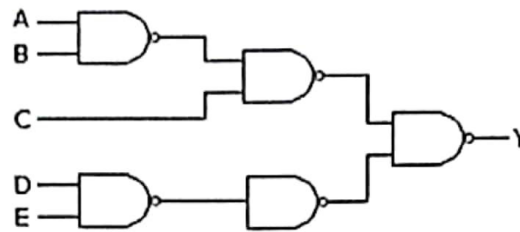
(a) T	(b) T^2
(c) $\frac{1}{T}$	(d) $\frac{1}{T^2}$

10. Piezoelectric effect is the production of electricity by:
 (a) Chemical effect (b) Pressure
 (c) Temperature (d) Varying electric field
11. He-Ne gas laser is a:
 (a) Two-level laser (b) Three-level laser
 (c) Four-level laser (d) None of these
12. Optical fibre communication systems possess _____ advantage over telephone cables?
 (a) Longer life (b) Negligible cross talk
 (c) Low transmission loss (d) All of these
13. Michelson-Morely experiment works on _____ principle?
 (a) Polarization of light (b) Interference of light
 (c) Diffraction of light (d) All of these
14. Dual nature (particle and wave) of matter was proposed by:
 (a) de-Broglie (b) Planck
 (c) Einstein (d) Newton
15. If $\psi_{(x,y,z,t)}$ represent wave function associated with a moving particle, then $|\psi_{(x,y,z,t)}|^2$ represents:
 (a) Intensity (b) Amplitude
 (c) Probability density (d) None of these
16. The surface to volume ratio is _____ for nanoparticles?
 (a) Very large (b) Very less
 (c) Moderate (d) None of these
17. By reducing the size of metal particles from bulk to nano, the energy bands become:
 (a) Narrower (b) Remains same
 (c) Wider (d) None of these
18. A radioactive sample has a half-life of 5.0 min. What fraction of the sample is left after 20 min?
 (a) 1/2 (b) 1/4
 (c) 1/8 (d) 1/16
19. The Boolean function $A + BC$ is a reduced form of _____?
 (a) $AB + BC$ (b) $(A + B)(A + C)$
 (c) $A'B + AB'C$ (d) $(A + C)B$
20. From the given truth table, determine the standard SOP expression for output X=?.
 (a) $X = \bar{A}.\bar{B}.\bar{C} + A.B.C + A.B.\bar{C}$ (b) $X = \bar{A}.\bar{B}.\bar{C} + A.\bar{B}.C + A.B.\bar{C}$
 (c) $X = \bar{A}.B.\bar{C} + A.B.C + A.B.\bar{C}$ (d) $X = \bar{A}.\bar{B}.C + \bar{A}.B.C + A.B.\bar{C}$

Inputs			Output
A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

21. The basic gate of the TTL logic family is _____?

- (a) NAND (b) NOT
 (c) NOR (d) None of these
22. The circuit of the given the figure realizes the function



- (a) $(\bar{A} + \bar{B})C + \bar{D}\bar{E}$ (b) $\bar{A} + \bar{B} + \bar{C} + \bar{D} + \bar{E}$
 (c) $AB + C + DE$ (d) $AB + C(D + E)$
23. A JK flip flop has $t_{pd} = 12$ ns. The largest modulus of a ripple counter using these flip flops and operating at 10 MHz is
- (a) 16 (b) 64
 (c) 128 (d) 256
24. What should be the radius of the 3rd half period zone of a zone plate of focal length 1.5 m, illuminated by a light of wavelength 593 nm?
- (a) 1.53 mm (b) 1.63 mm
 (c) 1.73 mm (d) 1.83 mm
25. Which of the following is essential for observing diffractions?
- (a) Two coherent sources (b) A screen
 (c) A narrow slit (d) White Light
26. The refractive index for a glass slab is 1.732. What should be the Brewster angle for it?
- (a) 30° (b) 60°
 (c) 90° (d) 120°
27. Three particles are distributed in four compartments of equal size. The probability if the microstate of the system will be:
- (a) $\frac{1}{2^2}$ (b) $\frac{1}{3^4}$
 (c) $\frac{1}{4^2}$ (d) Infinite
28. The spin of a photon is:
- (a) 0 (b) $\frac{h}{2\pi}$
 (c) $\frac{1}{2} \left(\frac{h}{2\pi} \right)$ (d) None of these
29. Neutrons has:
- (a) Positive magnetic moment (b) Negative magnetic moment
 (c) Zero magnetic moment (d) None of these
30. For secular equilibrium between two radio-active nuclides with half life periods as T_1 and T_2 ,
- (a) $T_1 = T_2$ (b) $T_1 \geq T_2$
 (c) $T_1 \ll T_2$ (d) $T_1 \gg T_2$
31. One barn is equal to:
- (a) 10^{-28} m (b) 10^{-28} m^2

- (c) $10^{-23} m$ (d) $10^{-23} m^2$
32. The columns and rows of a unitary matrix represent.....?
- (a) Unitary matrix (b) Orthonormal vectors
(c) Unitary transformation (d) Ket space
33. In the p-state of an electron, the operator L.S has the eigen values::
- (a) $1/2, -1/2$ (b) $1/2, -3/2$
(c) $1/2, -1$ (d) $1, -1/2$
34. The variation principle is particularly effective when estimating the energy of:
- (a) The highest state of any symmetry (b) The lowest state of any symmetry
(c) Any state of all symmetry (d) None of these
35. Given that $\vec{A} \times \vec{B} = 0$ and $\vec{A} \cdot \vec{B} = -AB$, then the angle between \vec{A} and \vec{B} is:
- (a) 0 (b) 60°
(c) 90° (d) 180°
36. In which plane does the vector $\vec{A}(\vec{B} \times \vec{C})$ lies in:
- (a) Plane containing \vec{A} and \vec{B} (b) Plane containing \vec{A} and \vec{C}
(c) Plane containing \vec{B} and \vec{C} (d) None of these
37. The divergence of curl of a vector field is always:
- (a) 0 (b) 1
(c) $\frac{\pi}{2}$ (d) Infinite
38. If the vector field \vec{B} is solenoidal, then:
- (a) $\vec{B} = 0$ (b) $\vec{\nabla} \cdot \vec{B} = 0$
(c) $\vec{\nabla} \times \vec{B} = 0$ (d) None of these
39. In which of the following case with a bar magnet and solenoid no induced e.m.f is produced:
- (a) When magnet is inserted fastly (b) When magnet is kept out fastly
(c) When coils of the solenoidal has been moved toward the stationary magnet fastly (d) When the relative velocity of the solenoidal w.r.t magnet is zero
40. Del (∇) operator is:
- (a) A scalar quantity (b) A vector quantity
(c) May be scalar or vector quantity (d) None of these

~~class~~ ~~500~~ Physics

ANSWERS

1	C	11	C	21	A	31	B
2	C	12	D	22	A	32	B
3	D	13	B	23	D	33	C
4	A	14	A	24	B	34	B
5	A	15	C	25	C	35	D
6	A	16	A	26	B	36	C
7	B	17	A	27	C	37	A
8	D	18	C	28	B	38	B
9	C	19	B	29	A	39	D
10	B	20	D	30	D	40	B