



Q-1 A particle is moving with S.H.M. in a straight line. If the distances of the particles from equilibrium position are x_1 and x_2 , and the corresponding velocities are u_1 and u_2 , respectively, then the period t of S.H.M. is:

A $2\pi \frac{\sqrt{x_1^2 - x_2^2}}{\sqrt{u_1^2 + u_2^2}}$

B $2\pi \frac{\sqrt{x_1^2 + x_2^2}}{\sqrt{u_1^2 + u_2^2}}$

C $2\pi \frac{\sqrt{x_2^2 - x_1^2}}{\sqrt{u_1^2 + u_2^2}}$

D $2\pi \frac{\sqrt{x_2^2 - x_1^2}}{\sqrt{u_1^2 - u_2^2}}$

Correct Answer : D

Q-2 A particle is moving in potential $V(x) = ax^2 + \frac{b}{x^2}$, where a and b are positive constants. The angular frequency of small oscillation about minimum potential is:

A $\sqrt{8b}$

B $\sqrt{(8a)}$

C $\sqrt{(8a/b)}$

D $\sqrt{8b/a}$

Correct Answer : B

Q-3 The Lagrangian of the particle of mass m in one dimension is given by

$$L = \frac{m\dot{x}^2}{2} - bx$$

Where b is positive constant. The equation of motion is given by

A $m\ddot{x} = -b$

B $m\ddot{x} = b$

C $m\dot{x}^2 = -bx$

D $b\ddot{x} = -mx$

Correct Answer : A

Q-4 The expectation values $\langle x \rangle$ of the position of a particle trapped in a 1D box of length L , is

A $L/3$

B $L/2$

C $L/6$

D $L/4$

Correct Answer : B

Q-5 A particle is confined to the region $0 < x < L$, in one dimension. If the particle is in the first excited state, then the probability of finding the particle is maximum at:

- A $X=L/2$
C $X=L/6$

- B $X=L/3$
D $X=L/4$ and $3L/4$

Correct Answer : D

Q-6 How does the probability of an electron tunnelling through a potential barrier vary with the thickness of the barrier?

- A **It decreases inversely with thickness**
C It decreases exponentially with thickness

- B It decreases linearly with thickness
D It is independent of the barrier thickness

Correct Answer : A

Q-7 The full Schrödinger's equation in compact form is

A $H\Psi = \hbar \frac{\partial \Psi}{\partial t}$

B $H\Psi = i\hbar \frac{\partial \Psi}{\partial t}$

C $H\Psi = i \frac{\partial \Psi}{\partial t}$

D $H\Psi = i\hbar \frac{\partial \Psi}{\partial x}$

Correct Answer : B

Q-8 A variable quantity which characterizes De-Broglie waves is known as.....

A Photon

B Field

C **Wave function**

D Phonon

Correct Answer : C

Q-9 When would the wavelength associated with an electron become equal to the wavelength associated with proton:
(Given: mass of electron= 9.1095×10^{-28} g, mass of proton= 1.6725×10^{-24} g)

A $10v_e = v_p$

B $v_e = 100v_p$

C $1836v_e = v_p$

D $v_e = 1836v_p$

Correct Answer : D

Q-10 The electron can come out from the nucleus as:

A By Neutron converting into Proton

B **By Proton converting into Neutron**

C Electron never comes out from the nucleus

D Electron exist inside the nucleus

Correct Answer : B

Q-11 The emitter- base junction of a bipolar transistor in active mode is

A Always reverse biased

B **Always forward biased**

C Can be forward biased or reverse biased

D Neither forward nor reverse biased

Q-12 Which one of the following parameters is also known as inverse hybrid parameter?

- A H-parameter
 B Y-parameter
C G-parameter
 D All of these

Correct Answer : C

Q-13 The relationship between the Einstein's temperature $(\theta)_E$ and Einstein frequency ν_E is:

- A** $(\theta)_E = h\nu_E/k$
 B $(\theta)_E = \nu_E/hk$
 C $\nu_E = h(\theta)_E /k$
 D $\nu_E = hk/(\theta)_E$

Correct Answer : A

Q-14 The quantum mechanical operator for the momentum of a particle moving in one dimension is given by-

- A $i\hbar \frac{\partial}{\partial x}$
 B $-i\hbar \frac{\partial}{\partial x}$
 C $i\hbar \frac{\partial}{\partial t}$
 D $-\frac{\hbar^2}{2m} \frac{\partial^2}{\partial x^2}$

Correct Answer : B

Q-15 For irreversible process,

- A $dS < dQ/T$
 B **$dS > dQ/T$**
 C $dS = dQ/T$
 D None of the above

Correct Answer : B

Q-16 When is the output of a NOR gate high?

- A When all inputs are low**
 B When at least one input is high
 C When all inputs are high
 D When at least one input is low

Correct Answer : A

Q-17 The temperature of magnetic susceptibility of ferromagnetic substance with Curie temperature T_c is given by

- A $X = \frac{c}{T-T_c} \quad T < T_c$
 B $X = \frac{c}{T+T_c} \quad T < T_c$
C $X = \frac{c}{T-T_c} \quad T > T_c$
 D $X = \frac{c}{T+T_c} \quad T > T_c$

Correct Answer : C

Q-18 The order of magnitude of energy Gap of typical superconductor is

- A 1MeV
B 1keV
C 1eV
D **1meV**

Correct Answer : D

Q-19 What is the value of interplanar spacing of simple cubic crystal with lattice parameter a of (101) is

- A **$a/\sqrt{2}$**
B $2a/\sqrt{3}$
C $a/\sqrt{3}$
D $\sqrt{3}a/2$

Correct Answer : A

Q-20 Given the fermi energy of gold is 5.54eV, the number density of electron is

- A **$5.9 \times 10^{28} \text{ m}^{-3}$**
B $6.7 \times 10^{28} \text{ m}^{-3}$
C $5.9 \times 10^{24} \text{ m}^{-3}$
D $6.7 \times 10^{24} \text{ m}^{-3}$

Correct Answer : A

Q-21 The high temperature magnetic susceptibility of solids having ions with magnetic moment can be described by

$$X \propto \frac{1}{T + b}$$

where T is absolute temperature and b be a constant. The paramagnetic and antiferromagnetic behaviour us described by

- A $b=0, b<0$
B $b<0, b=0$
C **$b=0, b>0$**
D $b>0, b=0$

Correct Answer : C

Q-22 The radius of $^{64}_{29}\text{Cu}$ nucleus is measured as $4.8 \times 10^{-13}\text{cm}$. The radius of $^{27}_{12}\text{Mg}$ nucleus is estimated as

- A $2.86 \times 10^{-13}\text{cm}$
B $5.2 \times 10^{-13}\text{cm}$
C **$3.6 \times 10^{-13}\text{cm}$**
D $8.6 \times 10^{-13}\text{cm}$

Correct Answer : C

Q-23 The spin parity of $^{89}_{38}\text{Sr}$ according to shell model is:

- A $(5/2)^+$
B **$(7/2)^+$**
C $(5/2)^-$
D $(7/2)^-$

Correct Answer : B

Q-24 Which of the following is fermion

- A α - particle
B **^7_4Be nucleus**
C deuteron
D hydrogen atom

Q-25 The semi-empirical mass formula of binding energy of nucleus contains surface correction term. This term depends on mass number A of nucleus as

- A $A^{-1/3}$ B $A^{1/3}$
 C $A^{-2/3}$ D $A^{2/3}$

Correct Answer : D

Q-26 A Carnot's engine operating between the temperatures of 300 K and 500 K extracts 1200 J of heat from the source, then the maximum work done by engine is

- A 240 J B 520 J
 C **480 J** D 720 J

Correct Answer : C

Q-27 An air conditioner maintains room temperature at 27°C while the outside temperature is 47°C. The heat conducted through walls of room from outside to inside due to temperature difference is 7000W. The minimum work done by compressor of air conditioner per unit time is:

- A **466.6 W** B 360W
 C 380.8W D 504.2W

Correct Answer : A

Q-28 At temperature above zero, for $E \ll E_f$, the fermi dirac distribution function approaches:

- A **Unity** B zero
 C $e^{(-E/k_B T)}$ D ∞

Correct Answer : A

Q-29 Fermi energy of given metal is 1.4eV . The fermi temperature of metal is:

- A 1.6×10^5 K B 1.6×10^3 K
 C 1.6×10^6 K D **1.6×10^4 K**

Correct Answer : D

Q-30 The order of absent spectra in diffraction grating is given by:

- A **$(a+b)/a = n$** B $a/b = n$
 C $a+b = n$ D $b/a = n$

Correct Answer : A

Q-31 Fresnel half period zone differs from each other by:

- A $\pi/2$ B $\pi/4$
 C **π** D 2π

Correct Answer : C

Q-32 Polarisation cannot occur in:

- A X-ray
B radio waves
C **sound wave**
D light wave

Correct Answer : C

Q-33 The phenomenon of rotation of plane polarised light is called:

- A Dichroism
B refraction
C Double refraction
D **Optical cavity**

Correct Answer : D

Q-34 The correct relation b/w Brewster's angle i_p and refractive index μ is :

- A $\cos i_p = \mu$
B $\sin i_p = \mu$
C $\cot i_p = \mu$
D **$\tan i_p = \mu$**

Correct Answer : D

Q-35 Which is example of isobar:

- A $^{14}_{13}\text{Si}, ^{32}_{15}\text{P}$
B $^4_7\text{N}, ^{15}_7\text{N}$
C **$^{13}_6\text{C}, ^{13}_7\text{N}$**
D all of these

Correct Answer : C

Q-36 Which of following is subatomic particles:

- A Positron
B Proton
C neutrino
D **all of these**

Correct Answer : D

Q-37 Sharing of electrons between neighbouring atoms results in

- A Metallic bond
B ionic bond
C **Covalent bond**
D None of these

Correct Answer : C

Q-38 The atomic bond in NaCl is

- A **Ionic**
B covalent
C metallic
D Vander-waal

Correct Answer : A

Q-39 Mixed ionic covalent bond found in:

- A **Semiconductor**
B heat insulator
C High strength material
D None of these

Q-40 The Fermi energy level for intrinsic semiconductors lies at (300K):

- A Top of the valence band
 B Below the conduction band
C Middle of the conduction and valence bands
 D None of these

Correct Answer : C

Q-41 Nuclear magneton is given by:

- A** $\mu_N = \frac{e\hbar}{2m_p}$
 B $\mu_N = \frac{2e\hbar}{m_p}$
 C $\mu_N = \frac{e\hbar}{m_p}$
 D $\mu_N = \frac{3e\hbar}{2m_p}$

Correct Answer : A

Q-42 A deuteron nucleus is:

- A A hard bound state
B A loosely bound state
 C Not a bound state
 D None of these

Correct Answer : B

Q-43 Higher value of decay constant indicates

- A Slower decay
B Faster decay
 C Half-life period
 D None of these

Correct Answer : B

Q-44 A double slit experiment is carried out in the air and then the water is replaced by air. The diameter of fringe will:

- A Increases
B Decreases
 C Remains unchanged
 D Fringe pattern disappears

Correct Answer : B

Q-45 If N is the total number of rulings on the grating, n is the order of spectrum and λ is the wavelength of light used, then resolving power of grating is given by

- A $Nn\lambda$
 B $N\lambda/n$
C Nn
 D $N\lambda$

Correct Answer : C

Q-46 Diffraction effects are more pronounced or easier to notice in the case of sound waves than in the case of light waves because:

- A Sound travels faster than light
 B Sound waves have a smaller wavelength
C Sound waves are of longer wavelength
 D Sound waves are longitudinal

Correct Answer : C

Q-47 If the base current is 100 mA and the current gain is 20, the collector current is

- A **2 A** B 200 mA
C 2.33 A D 20 A

Correct Answer : A

Q-48 In Fresnel diffraction, the incident wavefront is

- A Hyperbolic B **Spherical**
C Linear D Elliptical

Correct Answer : B

Q-49 If the diamond has a FCC Bravais lattice, then no. of atoms in a conventional cube is having:

- A 36 atoms B 16 atoms
C **8 atoms** D none of these

Correct Answer : C

Q-50 Which of the following proves that light is having dual nature:

- A Diffraction and Interference B Reflection and refraction
C Photoelectric and Compton effects D **All of these**

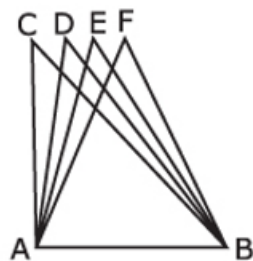
Correct Answer : D

Q-51 A train overtakes two persons who are walking in the same direction in which the train is going, at the rate of 2 kmph and 4 kmph and passes them completely in 9 and 10 seconds respectively. The length of the train is

- A 40 m B 45 m
C **50 m** D 55 m

Correct Answer : C

Q-52 Which of the following is the shortest route for travelling from A to B in the figure given below?



- A ACB B ADB
C AEB D **AFB**

Correct Answer : D

Q-53 Speed of a boat in still water is 9 km/hr. It goes 12 km down- stream and comes back to the starting point in three hours. What is the speed of water in the stream?

- A **3 km/hr** B 3.5 km/hr
C 5 km/hr D 5.5 km/hr

C 3

D 4

Correct Answer : C

Q-58 In covering a distance of 30 km, A takes 2 hours more than B. If A doubles his speed, then he would take 1 hour less than B. A's speed is:

A 5 km/h

B 7 km/h

C 9 km/h

D 10 km/h

Correct Answer : A

Q-59 Which of the following parts of the sun is easily visible only during a total solar eclipse?

A Core

B Photosphere

C Sunspots

D Corona

Correct Answer : D

Q-60 Sickle Cell Anemia is a

A Genetic Disorder

B Virus Disease

C Bacterial Disease

D None of these

Correct Answer : A



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