Id	**1**
Question	If the vectors $2\hat{i}-\hat{j}+\hat{k}, \hat{i}+2\hat{j}-3\hat{k}$ and $3\hat{i}+a\hat{j}+5\hat{k}$ are co planar then the value of 'a' will be
A	4
B	-4
C	2
D	-2
Answer	B

Id	**2**
Question	The graph of the curve $y^2=x^2+x$ is symmetric about
A	Only y – axis
B	Only x - axis
C	Both x and y axes
D	Neither x nor y axes
Answer	B

Id	**3**
Question	For a matrix $T=\begin{pmatrix}1 & i\\ 0 & 1\end{pmatrix}$ if λ_1 and λ_2 are the eigen values of T with the corresponding eigen – vectors X_1 and X_2 , then which of the following statements is true?
A	$\lambda_1=\lambda_2=1$ And matrix T can be made diagonal.
B	$\lambda_1=\lambda_2=1$ And, X_1 and X_2 are degenerate eigen vectors.
C	$\lambda_1=\lambda_2=1$ And, $X_1=\alpha X_2$ for a non – zero constant α .
D	$\lambda_1=\lambda_2=i$ And, matrix T can not be made diagonal.
Answer	C

Id	**4**
Question	If ω is non – real (imaginary) cube root of unity, then $(1+\omega)^7=$
A	$(1+\omega)$
B	ω
C	$-\omega$
D	$-(1+\omega)$
Answer	A

Id	**5**
Question	General solution of differential equation $\frac{d^2y}{dx^2}-y=0$ is
A	$y=Ce^{x}$
B	$y=Ce^{-x}$
C	$y=C_1e^{x}+C_2e^{-x}$
D	None of the above
Answer	C

Id	**6**
Question	In the Fourier service expansion of a periodic function,
A	Even functions have only a constant and cosine terms in their Fourier series expansion.
B	Even functions have a constant terms and sine terms in their Fourier series expansion.
C	Odd functions have a constant term and sine terms in their Fourier series expansion.
D	Odd functions have a constant term and cosine terms in their Fourier series expansion.
Answer	A

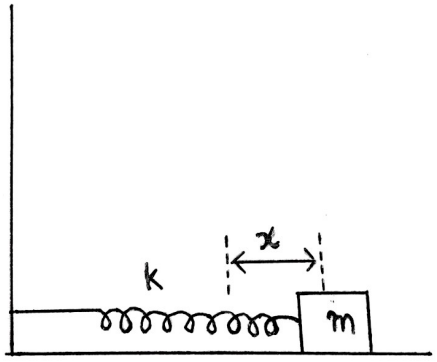
Id	**7**
Question	A mass of 2 kg is attached to one end of a horizontal spring and is undergoing simple harmonic motion. The displacement 'x' of the mass at a time t (measured in seconds)from the equilibrium position is given by $x=10^{-3}\cos(5\theta t)$. the magnitude of the force acting on the mass when it is at a distance x = 1 mm, is ...
A	0.5 N
B	0.05 N
C	5.0 N
D	50 N
Answer	C

Id	**8**
Question	A uniform disc of radius 'r' and mass 'm' is rotating with angular speed ω about its own axis. If suddenly (due to some internal reason), the mass of the disk increases to 2m, then the value of angular speed will be
A	$\omega/2$
B	2ω
C	ω
D	None of the above
Answer	A

Id	**9**
Question	For a spherical pendulum, the number pf degree of freedom is.
A	1
B	2
C	3
D	4
Answer	B

Id	**10**
Question	For a particle moving in central force field,....
A	The kinetic energy is a constant of motion
B	The potential energy is velocity dependent
C	The motion is confined in a plane.
D	Total energy is not conserved
Answer	C

Id	**11**
Question	If a coordinate corresponding to rotation is cyclic in Lagrangian, then ...
A	Kinetic energy is conserved
B	Potential energy is conserved
C	Linear momentum is conserved
D	Angular momentum is conserved
Answer	D

Id	**12**
Question	The Hamiltonian H for the spring mass system, shown in fig is 
A	$H=\frac{1}{2}m\dot{x}^2+\frac{1}{2}k\,x^2$
B	$H=\frac{p\,x^2}{2\,m}+1/2\,k\,x^2$
C	$H=\frac{p\,x^2}{2\,m}-1/2\,k\,x^2$
D	$H=\frac{p\,x^2}{2\,m}+1/2\,k\,x$
Answer	B

Id	**13**
Question	If $\hat{m}$ and $\hat{k}$ represent the directions of polarization and propagation of plane electromagnetic wave, then,
A	$\hat{n}.\hat{k}=0$
B	$\hat{n}\times\hat{k}=0$
C	$\hat{n}=\hat{k}$
D	$\hat{n}=-\hat{k}$
Answer	A

Id	**14**
Question	Two free particles of mass m each are moving with non – relativistic velocities. They have energies E_1 and E_2 and de – Broglie wavelengths λ_1 and λ_2, respectively. Which of the following statements is true?
A	$\frac{\lambda_1}{\lambda_2}=\frac{E_1}{E_2}$
B	$\frac{\lambda_1}{\lambda_2}=\frac{E_2}{E_1}$
C	$\frac{\lambda_1}{\lambda_2}=\sqrt{\frac{E_2}{E_1}}$
D	$\frac{\lambda_1}{\lambda_2}=\sqrt{\frac{E_1}{E_2}}$
Answer	C

Id	**15**
Question	The orbital angular momentum of a 2 s electron is
A	$\frac{h}{2\pi}$
B	0
C	1
D	$\frac{h}{4\pi}$
Answer	B

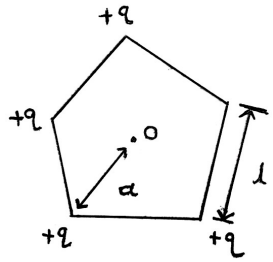
Id	**16**
Question	Which of the following transitions in hydrogen atom emits a photon of highest frequency, (n = principle quantum number)
A	n = 10 to n = 6
B	n = 6 to n = 2
C	n = 3 to n = 2
D	n = 2 to n = 1
Answer	D

Id	**17**
Question	If the potential is invariant under reflection i.e. V(x) = -V (-x), the solutions $\psi(x)$ of the one dimensional Schrodinger eigen value equation are ...
A	All either even or odd
B	All even
C	All odd
D	Neither odd nor even
Answer	A

Id	**18**
Question	The ground state of hydrogen atom is given as $\psi(r)=\left(\frac{1}{\pi a^3}\right)^{1/2} e^{-r/a}$, where 'r' is the radial coordinate and 'a' is the Bohr radius. The average value of r is ...
A	0
B	$\frac{a}{2}$
C	$\frac{5a}{2}$
D	$\frac{3a}{2}$
Answer	D

Id	**19**
Question	A free electron is placed in the path of a plane electromagnetic wave. The electron will start moving
A	Along the electric field
B	Along the magnetic field
C	Along the direction of the propagation of wave.
D	In a plane containing the magnetic field and the direction of propagation
Answer	A

Id	**20**
Question	Consider a hemisphere of radius R placed with its base on x y plane. A constant electric field $\vec{E}$, pointing in the positive $\not{Z}$ direction passes through the hemisphere. The electric flux through the hemisphere will be ….
A	$\pi R^2 \lvert\vec{E}\rvert$
B	$4\pi R^2 \lvert\vec{E}\rvert$
C	$2\pi R^2 \lvert\vec{E}\rvert$
D	0
Answer	A

Id	**21**
Question	Electrical charges +q are placed at Four vertices of a regular pentagon with sides of equal length 'l' as shown in figure. Each vertex of the pentagon is at a distance 'a' from the center of the pentagon. The magnitude of the electric field at the center of the pentagon is .. 
A	$\left(\frac{1}{\pi\in_0}\right)\frac{q}{a^2}$
B	$\left(\frac{1}{4\pi\in_0}\right)\frac{q}{l^2}$
C	$\left(\frac{1}{4\pi\in_0}\right)\frac{q}{a^2}$
D	$\left(\frac{1}{\pi\in_0}\right)\frac{q}{l^2}$
Answer	C

Id	**22**
Question	A point charge q is placed at distance 'd' from an infinite conductor of radius 'r' held at zero potential, then the surface charge density of induced charge is ...
A	$-\frac{qd}{2\pi r^4}$
B	$\frac{qd}{2\pi r^4}$
C	$\frac{qd}{2\pi r^3}$
D	$-\frac{qd}{2\pi r^3}$
Answer	D

Id	**23**
Question	In a dielectric, the polarization is ...
A	Exponential function of applied electric field
B	Linear function of applied electric field
C	Square function of applied electric field
D	Logarithmic function of applied electric field
Answer	B

Id	**24**
Question	A current of 'I' ampere flows in a circular arc of a wire whole radius is R. the wire subtends an angle 270^o at its center. The magnitude of magnetic field B at the center is -----
A	$\frac{\mu_0 I}{R}$
B	$\frac{\mu_0 I}{2R}$
C	$\frac{2\mu_0 I}{R}$
D	$\frac{3\mu_0 I}{8R}$
Answer	C

Id	**25**
Question	The magnetic induction at a distance 'd' from an infinitely long straight wire, in which current I is flowing through, using Biot Savart law is ---
A	$\frac{\mu_0}{4\pi}\hat{k}$
B	$\frac{\mu_0}{4\pi}\left(\frac{2I}{d}\right)\hat{k}$
C	$\frac{\mu_0}{4\pi}\left(\frac{I}{d}\right)$
D	None of the above
Answer	B

Id	**26**
Question	Consider a cubic crystal with lattice constant 'a' A plane intersects x – axis at 'a' and y – axis at '2a' and is parallel to $\not{Z}$ - axis. The Miller indices for this plane are
A	(0 1 2)
B	(2 1 0)
C	(1 0 2)
D	(1 2 0)
Answer	B

Id	**27**
Question	The longest wavelength x – ray that can undergo Bragg diffraction in a crystal from a given family of planes of spacing 'd' is ---
A	d
B	2d
C	d/2
D	d/4
Answer	B

Id	**28**
Question	Point defect in a crystal consist of ….
A	Only vacancies
B	Vacancies and interstitials
C	Vacancies, interstitials and impurity atoms
D	Interstitials and impurity atoms
Answer	C

Id	**29**
Question	According to Einstein model, the specific heat of a solid lower temperature
A	Remains constant
B	Drop non – linearly with increase in temperature
C	Drops linearly with decreases in temperature
D	Drops exponentially with decrease in temperature
Answer	D

Id	**30**
Question	Bonding in silicon carbide is mostly by ---
A	Ionic bond
B	Partially ionic partially covalent bonds
C	Covalent bond
D	Van der walls bond
Answer	C

Id	**31**
Question	The curie law $\left(X=\frac{C}{T}\right)$ is valid for
A	Paramagnetic substances
B	Ferromagnetic substances
C	Diamagnetic substances
D	Anti – Ferromagnetic substances
Answer	A

Id	**32**
Question	The magnetic susceptibility of super conductor is ---
A	Positive and unity
B	Negative and unity
C	Positive and small
D	Negative and small
Answer	B

Id	**33**
Question	The effective number of states in conduction bond of a semi conductor is given by
A	$N_c = 2\left[\frac{2\mathrm{m}^* kT}{h^2}\right]^{1/2}$
B	$N_c = 2\left[\frac{2\mathrm{m}^* kT}{h^2}\right]^{-1/2}$
C	$N_c = 2\left[\frac{2\pi m^* kT}{h^2}\right]$
D	$N_c = \left[\frac{2\pi m^* kT}{h^2}\right]$
Answer	C

Id	**34**
Question	The average translational kinetic energy per molecule of an ideal gas is ---
A	kT
B	$\frac{1}{2}kT$
C	3 k T
D	$\frac{3}{2}kT$
Answer	D
Id	**35**
Question	For isothermal expansion of an ideal gas, which of the following statements holds true?
A	Heat absorbed ΔQ is zero
B	Workdone ΔW by the gas is zero
C	$\Delta W = -\Delta Q$
D	$\Delta W = \Delta Q/2$
Answer	C

Id	**36**
Question	Which of the following expressions represents the combined form of the first and second laws of thermodynamics
A	$TdS = dU + PdV$
B	$dU = dQ + TdS$
C	$dQ = TdS + PdV$
D	$TdS = dU - PdV$
Answer	A

Id	**37**
Question	Given that $_3Li^7 = 7.01816\,amu$, $_3Li^6 = 6.01692\,amu$, $_0n^1 = 1.00893\,amu$ The binding energy of a neutral in a $_3Li^7$ nucleus is
A	0.51 MeV
B	1.04 MeV
C	2.08 MeV
D	7.17 MeV
Answer	B

Id	**38**
Question	Which of the following nuclear processes is forbidden?
A	$\bar{\nu} + p \rightarrow n + e^-$
B	$\pi^- \rightarrow e^- + \nu_e + \pi^0$
C	$\pi^- + p \rightarrow n + k^+ + k^-$
D	$\mu^- \rightarrow e^- + \nu\bar{e} + \nu\mu$
Answer	A

Id	**39**
Question	Estimate the binding fraction for a given $_{47}Ag^{107}$ nuclei is [Given Mass of proton = 1.007825 amu Mass of Neutron = 1.008665 amu Mass of silver = 106.905091 amu] 1 amu = 9.71.5 MeV
A	8.10 MeV / nuclear
B	8.54 MeV / nuclear
C	8.95 MeV / nuclear
D	9.25 MeV / nuclear
Answer	B

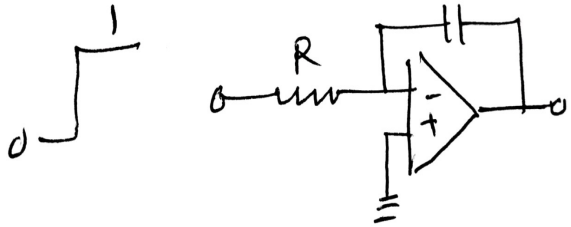
Id	**40**
Question	Which of the following statements is incorrect for the nuclear force between two nucleons?
A	It is charge independent
B	It is Spin independent
C	It is Velocity dependent
D	It has non – central component
Answer	B

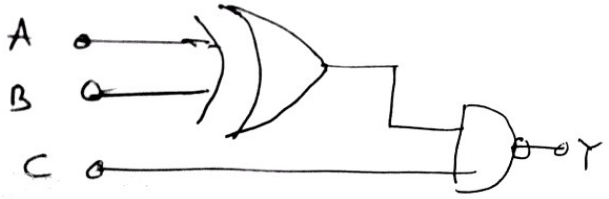
Id	**41**
Question	Nuclei which are $\beta-emitter$ lie ----
A	Below the line of $\beta-stability$
B	On the line of $\beta-stability$
C	Above the line of $\beta-stability$
D	Below the N = Z line
Answer	A

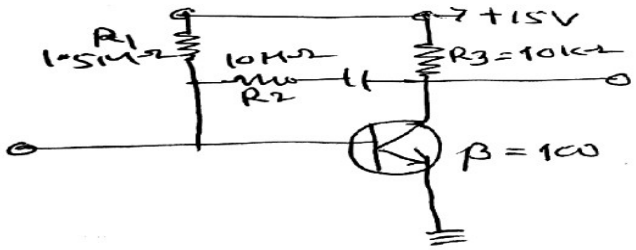
Id	**42**
Question	Estimate the size of the Gold (z=79) nucleus if it is bombarded by 2 MeV alpha (z = 2) particle.
A	$2.26\times10^{-13}\,meter$
B	$1.13\times10^{-13}\,meter$
C	$4.52\times10^{-13}\,meter$
D	$6.60\times10^{-13}\,meter$
Answer	B

Id	**43**
Question	A silicon diode dissipates 5W of power when the dc current of 2 Amp flows through it. The bulk resistance of the diode is
A	$0.6\,\Omega$
B	$0.9\,\Omega$
C	1.2Ω
D	$2.5\,\Omega$
Answer	B

Id	**44**
Question	The following Boolean equation leads to the output $A+\bar{A}\,B$
A	A
B	B
C	B+A
D	A+B
Answer	D

Id	**45**
Question	For the following op – amp circuit is 
A	A pulse
B	A triangular Waveform
C	A spike
D	A ramp
Answer	D

Id	46
Question	The Boolean expression for the output of the following logic circuit is 
A	$Y = AB + A\,\bar{B} + C$
B	$Y = \bar{A}\,\bar{B} + AB + \bar{C}$
C	$Y = A\,\bar{B} + \bar{A}\,B + C$
D	$Y = AB + \bar{A}\,B + C$
Answer	B

Id	47
Question	In the following Voltage – Controlled feedback amplifies, Calculate the feedback factor. [Neglect V BE and use re = 25 mV / IE] 
A	0.13
B	0.15
C	0.20
D	0.23
Answer	A

Id	48
Question	A resistance Potentiometer is a
A	Zero order instrument
B	First order instrument
C	Second order instrument
D	Third order instrument
Answer	A

Id	**49**
Question	In wire Wound strain gauges, the change in resistance on application of strain is mainly due to
A	Change in length of wire
B	Chang in diameter of wire
C	Change both length and diameter of wire
D	Change in resistivity
Answer	C

Id	**50**
Question	Thermocouples are ---
A	Passive transducers
B	Active transducers
C	Both active and passive transducers
D	Output transducers
Answer	B