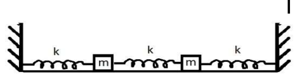
MSc Physics

Q. No.	Question	Option A	Option B	Option C	Option D
1	Multiplication of (cos 2π/3 + i sin 2π/3), (cos π/2 + i sin π/2) and (cos π/3 + i sin π/3) is	1	i	-i	-1
2	Which of the following is incorrect?	$\cosh x = \cos ix$	$\sinh x = \sin ix$	$\cos x = \cosh ix$	$i \sin x = \sinh ix$
3	For the differential A(x,y)dx + 6xydy to be exact, the function A(x,y) should be	3x	$3x^2$	3y	$3y^2$
4	The velocity vector of an object is given by 8i - 3j m/s. What is the speed of the object?	11 m/s	5 m/s	√55 m/s	√73 m/s
5	For what value of x will the two vectors a = i + 2j + 2k and b = 2i + 3j + xk be perpendicular to each other?	2	-2	4	-4
6	If a= b + λc then which of following is always true for the vectors?	$\vec{a}\times\vec{c}=\vec{b}\times\vec{c}$	$\vec{a}\times\vec{c}=\vec{b}\times\vec{c}$	$\vec{a}\cdot\vec{c}=\vec{b}\cdot\vec{c}$	$\vec{a}\cdot\vec{c}=\vec{b}\cdot\vec{c}$
7	A scalar field is given by $\varphi = xy^2z^3$. Its gradient will be:	$6yz^2$	$xy^2z^3\vec{i} + xy^2z^3\vec{j} + xy^2z^3\vec{k}$	$y^2z^3\vec{i} + 2xyz^3\vec{j} + 3xy^2z^2\vec{k}$	None of the above
8	Laplacian of a scalar field $\nabla^2 \equiv \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$ is given by	1	x+y+z	$\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$	0
9	Which of the following is not true?	$\nabla(\phi+\psi)=\nabla\phi+\nabla\psi$	$\nabla(\phi\psi)=\phi\nabla\psi+\psi\nabla\phi$	$\nabla\cdot(\phi\vec{a})=\phi\nabla\cdot\vec{a}+\vec{a}\cdot\nabla\phi$	None of the above
10	Which of the following functions can not have the Fourier series expansion?	sin x ; (-π/4 ≤ x ≤ π/4]	cos x ; (-π/4 ≤ x ≤ π/4]	tan x; (-π/4 ≤ x ≤ π/4]	cot x; (-π/4 ≤ x ≤ π/4]
11	The maximum line integral of a	Divergence of a vector field	Divergence of a scalar field	Curl of a vector field	Curl of a scalar fields

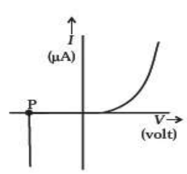
12	Which of the following is correct for the differential equation	It's a Third order first degree differential equation	It's a Third order second degree differential equation.	It's a second order third degree differential equation	It's a first order first degree differential equation
13	The essential singular point of the Simple Harmonic equation $y'' + \omega^2 y = 0$ is at:	0	1	∞	None of the above
14	The complex function $z = 2y + ix$ is differentiable at	$y = 2x$	$2y = x$	$x = 0$	None of the above
15	The branch point of the function $(z^2 - 1)^{1/2}$ is	$z = 0$	$z = i$	$z = -i$	$z = 1$
16	The ratio of intensities of two waves is 25:9. The interference of two waves would produce maximum and minimum intensities ratio	2	3	5	8
17	Two simple harmonic oscillators having same amplitudes and same frequencies but phase difference of $\pi/2$ are superimposed perpendicular to each other. What will be the shape of the motion?	straight line	circle	ellipse	None of the above
18	Two particles each having mass m are attached with the identical springs having force constants k are attached as shown in figure. What will be the larger normal mode frequency for this		k/m	2k/m	3k/m
19	The Laplace correction in the speed of sound in air is the consideration of the process to be	isothermal	isobaric	adiabatic	None of the above

20	The phase difference between the incident and reflected waves from an open end is	0	π/2	π	the wave does not reflect from open end
21	Statistical thermodynamics provide an additional interpretation of concept of	entropy	thermodynamics probability	sum of thermodynamics probability for macrostate	energy of system
22	If the system is degenerate then their degeneracy is more than one and if the system is non-degenerate then their degeneracy is	1	2	3	4
23	In which statistics number of particles are Unlimited?	Fermi Dirac Statistics	Bose Einstein Statistics	MB & BE Statistics	None of the above
24	Which conditions are required for Fermi Dirac Statistic	$n_j \geq g_j$	$n_j \leq g_j$	$n_j \neq g_j$	None of the above
25	Relation between Entropy(S) and Thermodynamic probability(Ω)	$S=K_B$	$S=K_B \log(\Omega)$	$S=\Omega$	$S=K_B$
26	thermodynamic probability for Maxwell Boltzmann statistics is	1836	1336	3.37×10^5	3.37×10^2
27	The Maxwell Boltzmann Statistical Law is given by the	$\frac{1}{e^{\frac{E}{kT}}}$	$\frac{1}{e^{1+\frac{E}{kT}}}$	$\frac{1}{e^{\alpha+n\frac{E}{kT}}}$	$\frac{1}{e^{\alpha+\frac{E}{kT}}}$
28	Phase space is a	3 dimensional space	4 dimensional space	5 dimensional space	6 dimensional space
29	The vibrational partition function equation is given by	$Q_{vib} = \left(1 + e^{-\frac{h\nu}{kT}}\right)^{-1}$	$Q_{vib} = \left(1 - e^{-\frac{h\nu}{kT}}\right)^{-1}$	$Q_{vib} = \left(1 + e^{\frac{h\nu}{kT}}\right)^{-1}$	$Q_{vib} = \left(1 - e^{\frac{h\nu}{kT}}\right)^{-1}$
30	How many different ways can two distinguishable balls can be placed in two boxes	2	4	6	8
31	the possible states of a mechanical system that has an exactly specified total energy is represented by	canonical ensemble	grand canonical ensemble	Microcanonical ensemble	partition function

32	let $\Omega(E)$ be the number of microstates accessible to the	$\omega(E) = \frac{\Omega(E)}{\delta E}$	$\omega(E) = \Omega(E)\delta E$	$\omega(E) = \frac{\Omega(E)\delta E}{2}$	$\omega(E) = \frac{\Omega(E)}{E}$
33	the number of states of a system with f degrees of freedom and whose energy lies between E and E+δE approximately varies with energy E of the system as	E^{3N}	E^{f}	$E^{N/2}$	$E^{f/2}$
34	An interaction between the systems without a change in the external parameter is known as pure	Thermal interaction	Mechanical interaction	General interaction	Mixed interaction
35	The correct expression for the number of accessible states in the energy interval E and E+δE for an ideal monoatomic gas of N molecules enclosed in volume V	$BV^{N}E^{3N}$	$BV^{N/2}E^{3N/2}$	$BVE^{3N/2}$	$BV^{N}E^{3N/2}$
36	Two distinguishable molecules are distributed in three equal sized compartments. The number of possible macrostates and microstates are	(6,6)	(6,9)	(3,6)	(9,6)
37	A jet plane starts from rest with an acceleration of $3 m/s^2$ and makes a run for 35s before taking off. What is the minimum length of the runway?	105 m	1837.5 m	2451 m	1204 m
38	The Probability of having at least one tail in five throws with a coin is	31/32	1/32	1/5	1

39	Two springs in horizontal spring mass systems have spring constants in the ratio 2:3. By what ratio should they be extended from their mean positions so that they have the same value of maximum speed? The masses of blocks are the same in both cases.	3/2	$\sqrt{3}/\sqrt{2}$	9/4	4/9
40	Suppose you place a sphere of mass 'm' and radius 'r' inside a smooth, heavy hemispherical bowl of radius of 37r placed on a horizontal table. If the sphere is given a small displacement, what is its period of oscillation	$2\pi\sqrt{(m/37rg)}$	$2\pi\sqrt{(m/rg)}$	$12\pi\sqrt{(r/g)}$	$2\pi\sqrt{(r/g)}$
41	Which of the following is the condition for the three-force theorem in mechanics	The force system should be in equilibrium only	The force systems should be non-coplanar	The system should be co-planar, parallel	The force system should be in equilibrium, co-planar, concurrent, or parallel
42	What is a free-body diagram	It's a sketch of a moving body that shows internal forces of the body and reaction forces	It's a sketch of an undisturbed body that shows external forces of the body	It's a sketch of an isolated body that shows external forces of the body and reaction forces	It's a sketch of a body in motion that shows bending forces of the body
43	The moment is the cross product of which of the following two vectors/scalars	Force and Radius scalars	Radius and Force scalars	Force and Radius vectors	Radius and Force vectors
44	Two of the things of the composite materials are to be known so that their mass moment of inertia can be varied. Which of the following is one of them	Weight of the centre of gravity	Weight of the body	Location of the centroid of gravity	Location of the centre of mass

45	The maximum height of a projectile on a horizontal plane, is	$u^2 \sin^2\alpha/2g$	$u^2 \cos^2\alpha/2g$	$u^2 \sin^2\alpha/g$	$u^2 \cos^2\alpha/g$
46	Non-coplanar non-concurrent forces are those forces which	Meet at one point, but their lines of action do not lie on the same plane	Do not meet at one point and their lines of action do not lie on the same plane	Do not meet at one point but their lines of action lie on the same plane	None of the above
47	The velocity ratio of a differential wheel and axle with 'D' as the diameter of effort wheel and d1 and d2 as the diameters of larger and smaller axles respectively, is	$D/(d_1 + d_2)$	$D/(d_1 - d_2)$	$2D/(d_1 + d_2)$	$2D/(d_1 - d_2)$
48	A particle moves along a straight line such that distance (x) traversed in 't' seconds is given by $x = t^2 (t - 4)$, the acceleration of the particle will be given by the equation	$6t^2 - 8t$	$3t^2 + 2t$	$6t - 8$	$6t - 4$
49	Which of the following statement is correct	The periodic time of a particle moving with simple harmonic motion is the time taken by a particle for one complete oscillation	The periodic time of a particle moving with simple harmonic motion is directly proportional to its angular velocity	The velocity of the particle moving with simple harmonic motion is zero at the mean position	The acceleration of the particle moving with simple harmonic motion is maximum at the mean position
50	If ‘P’ is the force acting on the body, ‘m’ is the mass of the body and ‘a’ is the acceleration of the body, then according to Newton's second law of motion,	$P + m.a = 0$	$P - m.a = 0$	$P \times m.a = 0$	$P/m.a = 0$
51	The ratio of limiting friction and normal reaction is known as	Coefficient of friction	Angle of friction	Angle of repose	Sliding friction

52	The velocity of a particle (v) moving with simple harmonic motion, at any instant is given by (where, r = Amplitude of motion, and y = Displacement of the particle from mean position.)	$\omega.\sqrt{(y^2 - r^2)}$	$\omega.\sqrt{(r^2 - y^2)}$	$\omega^2.\sqrt{(y^2 - r^2)}$	$\omega^2.\sqrt{(r^2 - y^2)}$
53	When the spring of a watch is wound, it will possess	Strain energy	Kinetic energy	Heat energy	Electrical energy
54	The moment of inertia of a thin disc of mass 'm' and radius 'r', about an axis through its center of gravity and perpendicular to the plane of the disc is	$mr^2/2$	$mr^2/4$	$mr^2/6$	$mr^2/8$
55	For a simple cubic lattice, inter planar spacing is	$d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$	$d = \frac{1}{\sqrt{h^2 + k^2 + l^2}}$	$d = \frac{a}{\sqrt{h^2 + k^2}}$	$d = \frac{a}{\sqrt{k^2 + l^2}}$
56	The co-ordination number in diamond is	4	6	8	12
57	A beam of X-rays of wavelength 0.72 Å is diffracted from KCl crystal of density 2000 kg/m^3. Assuming the crystal to be face centred cubic, the interpanalar spacing for (200) plane is	3.14 Å	3.41 Å	3.31 Å	3.33 Å
58	Which direct lattice is the reciprocal of its own reciprocal lattice.	fcc	bcc	scc	None of the above
59	Name the type of diode whose characteristics is shown in figure below	 le	ideal diode	p-n junction diode	None of the above

60	The atoms in a solid are held together by	internuclear forces	gravitational forces	interatomic forces	weak forces
61	The dispersion relation relates between	ω and K	ω and c	K and c	None of the above
62	The time between the successive collisions is termed as	mean time	relaxation time	time period	time constant
63	The band theory of solids, the band which is completely empty at 0 K is known as	conduction band	forbidden band	valence band	hyper band
64	Meissner effect is the phenomenon due to which the magnetic lines of force through a superconductor are	attracted	come close to each other	repelled away	allowed to pass through a superconductor
65	The phase difference between the input and output voltages in a common emitter arrangement is______________	180^0	90^0	270^0	0^0
66	A half wave rectifier has an input voltage of 240 V r.m.s. If the step down transformer has a turns ratio of 8:1, what is the peak load voltage. Ignore diode drop	27.5 V	86.5 V	30 V	42.5 V
67	The purpose of a coupling capacitor in a transistor amplifier is to	increase the output impedance of a transistor	protect the transistor	pass a.c. and block d.c.	provide biasing
68	Which expression mention the De Morgan's theorem		$\overline{A+B} = \bar{A}\bar{B}$	AB	
69	What is the addition of the binary number 101001+ 010011=?	10100	111100	000111	101110

70	A classification of integrated circuits with complexities of 30 to 300 equivalent gates on a single chip is known as	VLSI	SSI	LSI	MSI
71	_____is used as a fuel of nuclear reactor	C-60	P-32	I-131	U-235
72	Which statement is true for all three types of radioactive emission	They are deflected by electric fields	They ionise gases	They are completely absorbed by a thin aluminum sheet	They emit light
73	An iron rod is heated. The colors at different temperatures are noted. Which of the following colors shows that the iron rod is at the lowest temperature	red	orange	white	blue
74	For pair production phenomenon to occur the photon must have energy greater than or equal to	0.51MeV	1.02 MeV	0.32 MeV	0.64 MeV
75	The kinetic energy of the α-particle incident on the gold foil is doubled. The distance of closest approach will also	double	half	can not determine	None of the above
76	The guided terminations are used to	Increase reflection	Increase transmission	Eliminate reflection loss	Eliminate attenuation
77	Calculate the phase constant of a wave with frequency 12 rad/s and velocity 3×10^{8} m/s(in 10^{-8} order)	0.5	72	4	36
78	In the medium of free space, the divergence of the electric flux density will be	1	0	-1	infinity

79	Three charged cylindrical sheets are present in three spaces with σ = 5 at R = 2m, σ = -2 at R = 4m and σ = -3 at R = 5m. Find the flux density at R = 6m.	17/6	-17/6	13/6	-13/6
80	The skin depth of a conductor with attenuation constant of 7 neper/m is	14	49	7	1/7
81	The motion of a wave packet is similar to	photon	classical particle	quantum particle	waves
82	in an ideal gas the molecules have	k.e. only	p.e. only	both kinetic and potential energy	None of the above
83	the value of universal gas constant is	8.314 J / K mole Kelvin	8314 j / Mole k	8.314 joule/ mole k	None of the above
84	root mean square velocity of gas molecules in a vessel can be	$\sqrt{\frac{3m}{KT}}$	$\sqrt{\frac{3KT}{M}}$	$\sqrt{\frac{3T}{MK}}$	$\frac{KT}{3M}$
85	in an isothermal process the internal energy of the system	increase	decrease	remain constant	zero
86	first law of thermodynamics when applied to an adiabatic process becomes	W = du	W = Q	Q = du	w = -du
87	The neutrino and antineutrino are distinguished by	charge	rest mass	helicity	parity of ground state wavefunction
88	The accelerator used to accelerate electrons is	cyclotron	Van de Graff generator	betatron	tandem Van de Graff generator
89	the difference between C_p and and	R,γ	γ 1/R,1/	γ R, 1/	γ 1/R,
90	If temperature of sink is decreases efficiency of carnot engine is	remains constant	decreases	increases	None of the above
91	A nucleus emits a α-particle, followed by two β-particles. The final nucleus will be	An isotone of the original one	An isotope of the original one	An isobar of the original one.	None of the above

92	Nuclear force is	Spin independent	Both charge and spin independent	Spin dependent but charge independent	Charge dependent
93	The Surface-energy term appears in semi-empirical mass formula as a result of	Repulsion between the charged particles, protons, in the nucleus	Reduction of total binding energy due to nucleons on the surface of the nucleus	Excess number of neutrons in the nucleus	intrinsic nucleonic spin
94	The fact that the binding energy per nucleon is roughly a constant over most of the range of stable nuclei is a consequence of the fact that the nuclear force is	Short range	Long range	Weak	Strong
95	A particle moves in such a way that its kinetic energy just equals its rest energy. The velocity of this particle is	0.866c	c/4	c	0.707c
96	Which one of the following statements is correct?	The mass of the nucleus must be less than the sum of the masses of the constituent neutrons and protons.	The mass of the nucleus must be equal to the sum of the masses of the constituent neutrons and protons	The mass of the nucleus must be greater than the sum of the masses of the constituent neutrons and protons.	The mass of the nucleus must be equal to only the masses of the constituent neutrons
97	The nucleus which is an isotope of Cl-37 and also an isobar of Ar-18 has mass number A and atomic number Z given by	A=35, Z=18	A = 37, Z = 17	A = 39, Z = 17	A = 37, Z = 19
98	Complete the sequence of magic numbers as, 2, 8, 20, 50, ……,126, 184.	60	72	82	100
99	The volume of a nucleus in an atom is proportional to the	Mass number	Proton number	Neutron number	Electron number
100	A conservation law that is not universal but applies only to certain kinds of interactions is conservation of	lepton number	spin	charge	strangeness