Q NO	Question	Option 1 (a)	Option 1 (b)	Option 1 (c)	Option 1 (d)
1	For a linear harmonic oscillator	energy levels vary as n squared	energy levels are equally spaced	the system is unbounded	none of the above
2	Which of the following statements are INCORRECT for particle in a box?	Wave function can be normalized	Wave function cannot be normalized	Wave function is zero at the box boundaries	Energy levels are quantized
3	The transmission probability for a particle incident on a potential barrier	increases with increase in the incident energy	increases with decrease in potential barrier	decreases with increase in potential width	All of the above
4	Consider C atom (mass number = 12). Which of the following are true?	It will follow classical statistics	It will follow Fermi-Dirac statistics	It will follow Bose-Einstein statistics	None of the above
5	Which of the following systems will have scattering states?	Harmonic oscillator	Particle in a box	Particle incident on a potential barrier	Hydrogen atom with total energy being negative
6	In quantum mechanical scattering problems, the method of partial waves is best suited for	very high incident energies	very low incident energies	all incident energies	all central potentials
7	What will be the entropy of a thermodynamic system for which the number of microstates is equal to one?	Infinite	Zero	One	Any arbitrary value
8	The phase boundary separating the solid phase from liquid phase in case of water has	Positive slope	Negative slope	It can be positive or negative	Zero
9	The contribution of electrons to the specific heat of metals	remains constant with temperature	is linearly proportional to temperature	is cubically proportional to temperature	is independent of temperature
10	In a first order phase transition, at the transition temperature, specific heat of the system	diverges and its entropy remains the same	diverges and its entropy has finite discontinuity	remains unchanged and its ent ropy has finite discontinuity	has finite discontinuity and its entropy diverges
11	The order of magnitude o f the energy gap of a typical superconducto r is	1 MeV	1 K eV	1 eV	1 meV
12	For a three-dimensional crystal having N primitive unit cells with a basis of p atoms, the number of optical branches is	3	3p	3p - 3	3N - 3p

Q NO	Question	Option 1 (a)	Option 1 (b)	Option 1 (c)	Option 1 (d)
13	Which one of the following sets corresponds to fundamental particles?	proton, electron and neutron	proton, electron and photon	electron, photon and neutrino	quark, electron and meson
14	A plane electromagnetic wave traveling in free space is incident normally on a glass plate of refractive index 3/2. If there is no absorption by the glass, its reflectivity is	4%	16%	20%	50%
15	If the radius of the atom in a crystal, crystallizing in the simple cubic structure, then the nearest neighbour distance is	r/2	4r	2r	none of these
16	The coordination number in the case of simple cubic crystal structure is	12	6	2	1
17	lambda point of the liquid helium is	0.3K	2.19K	5.2K	42K
18	Which law of thermodynamics suggests that there is tendency for equalization of the temperature throughout the system	zeroth law	first law	second law	none of these
19	The efficiency of a heat engine can never be	10.00%	20.00%	60.00%	100.00%
20	Which of the following is suitable statistics for photons	F.D.	B.E.	M.B.	none of these
21	The minimum vibrational energy of an oscillator is	hv/2	hv	3hv/2	zero
22	A type 1 superconducting material when placed in a magnetic field will	Expel all the magnetic lines of forces passing through it	Attract the magnetic field toward its centre	Not influence the magnetic field	None of above
23	Mobility of electron is	Reciprocal of conductivity	Flow of electron per unit electric field	Average electron drift velocity per unit electric field	None of above
24	Which of the following materials does not have permanent dipoles?	Ferromagnetic	Antiferromagnetic	paramagnetic	diamagnetic
25	Boundary between two pairs of a closest packing having alternate staking sequence is called	Grain defect	Staking Fault	Screw Dislocation	Lineage Boundary
26	An amplitude of light passing from vacuum to metal varies as	Does not change.	Amplitude exponentially decreases with distance.	Amplitude exponentially increases with distance.	Amplitude remains same.

Q NO	Question	Option 1 (a)	Option 1 (b)	Option 1 (c)	Option 1 (d)
27	What force is responsible for the radioactive decay of the nucleus?	Gravitational force	Weak Nuclear force	Strong Nuclear force	Electromagnetic force
28	When nucleons form a stable nucleus, binding energy is:	created from nothing .	transformed into visible light.	released as high energy photons or particles	absorbed as high energy photons or particles
29	Which of the following rays are emitted during radioactivity?	Alpha-rays	Beta-rays	Gamma-rays	All of the above
30	The difference in the mass of the resultant nucleus and the sum of the masses of two parent nuclear particle is known as	mass defect	solid defect	weight defect	nucleus defect
31	Proton has the charge	1637 times of an electron	1737 times of an electron	1837 times of an electron	1937 times of an electron
32	The isospin and the strangeness of omega baryon are:	1, -3	0, -3	1, 3	0, 3
33	Which one of the following three quark-state (qqq) denoted by X CANNOT be a possible baryon?	X^{2+}	X^{1+}	X^{-1}	X^{-2}
34	The doublets observed in alkali spectra are due to	Screening of the K- electron.	Spin-orbit interaction of the electron.	Presence of isotop	None of these.
35	Which one of the following sets corresponds to fundamental particles?	proton, electron an	proton, electron and	electron, photon a	quarks, electron and meson.
36	Which one of the following quantity is invariant under Lorentz transformation?	Time	Charge	Length	Electric field
37	Which one of the following is a fermion?	Be nucleus (A=7, Z=4).	alpha particle	Hydrogen atom	Deuteron
38	What will be the value of net force between the two atoms at equilibrium?	Minimum	Maximum	0	Negative
39	As the temperature approaches zero, the lattice contribution to heat capacity of solids approaches to	Infinity	Zero	Finite value	None of these
40	The band gap of a superconductor	Decreases with decreasing temperature	Remained temperature independent	Decreases with increasing temperature	None of the above

Q NO	Question	ANSWER (a,b,c or d)
1	For a linear harmonic oscillator	b
2	Which of the following statements are INCORRECT for particle in a box?	b
3	The transmission probability for a particle incident on a potential barrier	d
4	Consider C atom (mass number = 12). Which of the following are true?	c
5	Which of the following systems will have scattering states?	c
6	In quantum mechanical scattering problems, the method of partial waves is best suited for	b
7	What will be the entropy of a thermodynamic system for which the number of microstates is equal to one?	b
8	The phase boundary separating the solid phase from liquid phase in case of water has	b
9	The contribution of electrons to the specific heat of metals	b
10	In a first order phase transition, at the transition temperature, specific heat of the system	b
11	The order of magnitude o f the energy gap of a typical superconducto r is	d
12	For a three-dimensional crystal having N primitive unit cells with a basis of p atoms, the number of optical branches is	c
13	Which one of the following sets corresponds to fundamental particles?	c
14	A plane electromagnetic wave traveling in free space is incident normally on a glass plate of refractive index 3/2. If there is no absorption by the glass, its reflectivity is	a
15	If the radius of the atom in a crystal, crystallizing in the simple cubic structure, then the nearest neighbour distance is	a
16	The coordination number in the case of simple cubic crystal structure is	b
17	lambda point of the liquid helium is	b
18	Which law of thermodynamics suggests that there is tendency for equalization of the temperature throughout the system	a
19	The efficiency of a heat engine can never be	d
20	Which of the following is suitable statistics for photons	b
21	The minimum vibrational energy of an oscillator is	a
22	A type 1 superconducting material when placed in a magnetic field will	a
23	Mobility of electron is	c
24	Which of the following materials does not have permanent dipoles?	d
25	Boundary between two pairs of a closest packing having alternate staking sequence is called	b
26	An amplitude of light passing from vacuum to metal varies as	b
27	What force is responsible for the radioactive decay of the nucleus?	b
28	When nucleons form a stable nucleus, binding energy is:	c
29	Which of the following rays are emitted during radioactivity?	d

Q NO	Question	ANSWER (a,b,c or d)
30	The difference in the mass of the resultant nucleus and the sum of the masses of two parent nuclear particle is known as	a
31	Proton has the charge	c
32	The isospin and the strangeness of omega baryon are:	b
33	Which one of the following three quark-state (qqq) denoted by X CANNOT be a possible baryon?	d
34	The doublets observed in alkali spectra are due to	b
35	Which one of the following sets corresponds to fundamental particles?	c
36	Which one of the following quantity is invariant under Lorentz transformation?	b
37	Which one of the following is a fermion?	a
38	What will be the value of net force between the two atoms at equilibrium?	c
39	As the temperature approaches zero, the lattice contribution to heat capacity of solids approaches to	c
40	The band gap of a superconductor	c