

Answer Key :Physics

Type: Physics

1) An example of a boson is a:

Options:

- 1.photon
- 2.electron
- 3.neutrino
- 4.proton

Correct Option: 1

Type: Physics

2) All leptons interact with each other via the:

Options:

- 1.strong force
- 2.weak force
- 3.electromagnetic force
- 4.none of these

Correct Option: 2

Type: Physics

3) Which one of the following represents a fusion reaction that would yield large amounts of energy?

Options:

- 1. A) $^{238}\text{U}_{92} + ^1_0\text{n} \rightarrow ^{90}\text{Kr}_{36} + ^{146}\text{Cs}_{55} + ^2_1\text{H} + ^1_0\text{n}$
- 2. B) $^{239}\text{Pu}_{92} + ^1_0\text{n} \rightarrow ^{96}\text{Sr}_{38} + ^{141}\text{Ba}_{56} + 3^1_0\text{n}$
- 3. C) $^{238}\text{U}_{92} \rightarrow ^{234}\text{Th}_{90} + ^4_2\text{He}$
- 4. D) $^3_1\text{H} + ^2_1\text{H} \rightarrow ^4_2\text{He} + ^1_0\text{n}$

Correct Option: 4

Type: Physics

4) Tokamaks confine deuteron plasmas using:

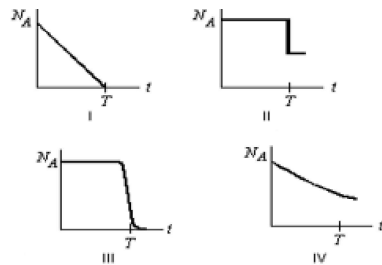
Options:

- 1.thick steel walls
- 2.magnetic fields
- 3.laser beams
- 4.vacuum tubes

Correct Option: 2

Type: Physics

5) Radioactive element A decays to the stable element B with a half-life T. Starting with a sample of pure A and no B, which graph below correctly shows the number of A atoms, N_A , as a function of time t?



Options:

- 1.I
- 2.II
- 3.III
- 4.IV

Correct Option: 4

Type: Physics

6) Starting with a sample of pure ^{66}Cu , $7/8$ of it decays into Zn in 15 minutes. The corresponding half-life is:

Options:

- 1.15 minutes
- 2.5 minutes
- 3.7 minutes
- 4.10 minutes

Correct Option: 2

Type: Physics

7) For a metal at absolute temperature T , with Fermi energy E_f , the occupancy probability is given by:

Options:

- 1. A) $e^{(E-E_F)/kT}$
- 2. B) $e^{-(E-E_F)/kT}$
- 3. C) $\frac{1}{e^{(E-E_F)/kT} + 1}$
- 4. D) $\frac{1}{e^{-(E-E_F)/kT} + 1}$

Correct Option: 3

Type: Physics

8) If the density of states is $N(E)$ and the occupancy probability is $P(E)$, then the density of unoccupied states is:

Options:

- 1. $N(E) + P(E)$
- 2. $N(E)/P(E)$
- 3. $N(E) - P(E)$
- 4. $N(E)P(E)$

Correct Option: 4

Type: Physics

9) A given doped semiconductor can be identified as p or n type by:

Options:

- 1. A) measuring its electrical conductivity
- 2. measuring its magnetic susceptibility
- 3. measuring its coefficient of resistivity
- 4. performing a Hall effect experiment

Correct Option: 4

Type: Physics

10) The ratio of wavelength of $K\mu$ x-ray line for Nb ($Z = 41$) to that of Ga ($Z = 31$) is

Options:

- 1.A) 9/16
- 2.B) 16/9
- 3.C) 3/4
- 4.D) 4/3

Correct Option: 1

Type: Physics

11) What does the confinement principle state

Options:

- 1.Confinement leads to quantization.
- 2.It is very unlikely that a particle in a potential well can tunnel through the energy barrier.
- 3.The smaller the volume of space a particle occupies, the faster it must move.
- 4.A particle can only be confined in an infinitely deep potential well.

Correct Option: 1

Type: Physics

12) The units of the Planck constant h are those of:

Options:

- 1.energy
- 2.power
- 3.momentum
- 4.angular momentum

Correct Option: 4

Type: Physics

13) The intensity of a light beam with a wavelength of 500 nm is 2000 W/m^2 . The photon flux (in number/ $\text{m}^2 \cdot \text{s}$) is about:

Options:

- 1.5×10^{17}
- 2.5×10^{19}
- 3.5×10^{21}
- 4.5×10^{23}

Correct Option: 3

Type: Physics

14) Rank following electromagnetic radiations according to the energies of their photons, from least to greatest. 1. blue light 2. yellow light 3. x-rays 4. radio waves

Options:

- 1.1, 2, 3, 4
- 2.4, 2, 1, 3
- 3.4, 1, 2, 3
- 4.3, 2, 1, 4

Correct Option: 2

Type: Physics

15) Normal Zeeman effect is observed only in atoms with an even number of electrons because

Options:

- 1.No net electron spin is required for normal Zeeman effect is to have
- 2.Net electron spin is required for normal Zeeman effect is to have
- 3.Total number of electrons must be odd in order to have net electron spin for observing normal Zeeman effect
- 4.None

Correct Option: 1

Type: Physics

16) At what temperature would one in a thousand of the atoms in a gas of atomic hydrogen be in the $n=2$ energy level?

Options:

- 1.14300 K
- 2.1430 K

- 3.143 K
- 4.14.3 K

Correct Option: 1

Type: Physics

17) A particle is in a cubic box with infinitely hard walls whose edges are L long .The wave functions of the particle are given as following. The value of the normalization constant A will be

$$\psi = A \sin \frac{n_x \pi x}{L} \sin \frac{n_y \pi y}{L} \sin \frac{n_z \pi z}{L} \quad \begin{array}{l} n_x = 1, 2, 3, \dots \\ n_y = 1, 2, 3, \dots \\ n_z = 1, 2, 3, \dots \end{array}$$

Options:

- 1. $(2/L)^{3/2}$
- 2. $(2/L)^{1/2}$
- 3. $(2/L)^{5/2}$
- 4. None

Correct Option: 1

Type: Physics

18) the possible values of the magnetic quantum number of an atomic electron whose orbital quantum number is l = 4?

Options:

- 1.8
- 2.7
- 3.6
- 4.9

Correct Option: 4

Type: Physics

19) For an ideal gas at temperature T, the most probable speed (v_{mp}), average speed (v_{avg}), and rms speed (v_{rms}) satisfy which relation?

Options:

- 1. (A) $v_{rms} < v_{avg} < v_{mp}$
- 2. (B) $v_{mp} < v_{avg} < v_{rms}$
- 3. (C) $v_{avg} < v_{mp} < v_{rms}$
- 4. None

Correct Option: 2

Type: Physics

20) The Fermi energy of silver is 5.51 eV. What is the approximate average energy of free electrons in silver at 0K

Options:

- 1. 2.2 eV
- 2. 2.55 eV
- 3. 3.33 eV
- 4. 4.1 eV

Correct Option: 3

Type: Physics

21) Two vectors are orthogonal if:

Options:

- 1. their cross product is zero
- 2. their magnitudes are equal
- 3. their dot product is zero
- 4. they are parallel

Correct Option: 3

Type: Physics

22) $f(z)=u(x,y)+iv(x,y)$ is analytic, then the Cauchy–Riemann equations are satisfied. These equations ensure:

Options:

- 1.orthogonality only
- 2.analyticity of complex function
- 3.periodicity
- 4.linearity only

Correct Option: 2

Type: Physics

23) Fourier analysis mainly expresses a function as:

Options:

- 1.polynomial expansion
- 2.linearity
- 3.sum of sine and cosine functions
- 4.matrix form

Correct Option: 3

Type: Physics

24) Lagrange Equation for SHM

Options:

- 1. $mx''+kx=0$
- 2. $mx''-kx=0$
- 3. $mx'+kx=0$
- 4. $mx''+kx'=0$

Correct Option: 1

Type: Physics

25) In cyclic coordinate problem, the system has Lagrangian as following. Which quantity is conserved?

$$L = \frac{1}{2}m(\dot{r}^2 + r^2\dot{\theta}^2) - V(r)$$

Options:

- 1.tangential momentum
- 2.total force

- 3.angular momentum
- 4.potential energy

Correct Option: 3

Type: Physics

26) Under a central force, motion always lies in:

Options:

- 1.a straight line
- 2.three-dimensional spiral
- 3.a plane
- 4.random trajectory

Correct Option: 3

Type: Physics

27) The above Poisson Bracket after evaluation will be

$$\{x^2, p^2\}$$

Options:

- 1.0
- 2.4xp
- 3.2xp
- 4.xp

Correct Option: 2

Type: Physics

28) A superconductor has London penetration depth 40 nm. At what depth does the magnetic field reduce to approximately 37% of its surface value?

Options:

- 1.20 nm
- 2.40 nm
- 3.80 nm
- 4.120 nm

Correct Option: 2

Type: Physics

29) In a diode, if forward voltage is increased slightly, then diode current will

Options:

- 1.increases linearly
- 2.decreases exponentially
- 3.increases exponentially
- 4.remains unchanged

Correct Option: 3

Type: Physics

30) For an ideal op-amp:

Options:

- 1.input impedance is zero
- 2.gain is zero
- 3.input current is zero
- 4.output resistance is infinite

Correct Option: 3