

Banaras Hindu University

Question Paper Name:	481 18th May 2019 Shift 1
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Share Answer Key With Delivery Engine:	Yes
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MSc Physics

Group Number :	1
Group Id :	45489318
Group Maximum Duration :	0
Group Minimum Duration :	120
Revisit allowed for view? :	No
Revisit allowed for edit? :	No
Break time:	0
Group Marks:	360

MSc Physics

Section Id :	45489318
Section Number :	1
Section type :	Online
Mandatory or Optional:	Mandatory
Number of Questions:	120
Number of Questions to be attempted:	120
Section Marks:	360
Display Number Panel:	Yes
Group All Questions:	No

Sub-Section Number:	1
Sub-Section Id:	45489318
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 4548932001 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

When a wire is stretched to double its length :

Options :

1. Its radius is halved

2. Longitudinal strain is unity
3. Stress is equal to two times Young's modulus
4. Young's modulus is equal to thrice the energy per unit volume

Question Number : 2 Question Id : 4548932002 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The path of a particle situated on the rim of a wheel moving along a surface (wheel is rotating) as observed by an observer standing on the earth near the wheel will be :

Options :

1. circular
2. linear
3. cycloidal
4. elliptical

Question Number : 3 Question Id : 4548932003 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The acceleration of a frame of reference, fixed on the earth's surface at the equator and rotating with the earth, once a day will be :

Options :

1. $3.4 \times 10^{-2} \text{ m/sec}^2$
2. 0.004 m/sec^2
3. $7.15 \times 10^7 \text{ m/sec}^2$
4. 61.2 m/sec^2

Question Number : 4 Question Id : 4548932004 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If a particle is fixed on a rotating frame of reference, the fictitious force acting on the particle will be :

Options :

1. Coriolis force only
2. Centrifugal force only
3. Coriolis as well as centrifugal force
4. None of the three

Question Number : 5 Question Id : 4548932005 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A particle collides elastically with another particle at rest. If the masses of the particles be m_1 and m_2 respectively, then the fraction of kinetic energy transferred to the second will be maximum when :

Options :

1. $\frac{m_2}{m_1} = 1$
2. $\frac{m_2}{m_1} = 2$
3. $\frac{m_2}{m_1} = 0.5$
4. $\frac{m_2}{m_1} = 3$

Question Number : 6 Question Id : 4548932006 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If the volume of a cube of side L_0 is L_0^3 as observed by an observer at rest relative to it, the volume as observed from a reference frame moving with uniform velocity $0.8c$ in a direction parallel to an edge of the cube will be :

Options :

1. L_0^3

2. $0.6L_0^3$

3. $0.216L_0^3$

4. $0.512 L_0^3$

Question Number : 7 Question Id : 4548932007 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A clock keeps correct time. With what speed should it be moved relative to an observer so that it may seem to loose 20 sec in 100 sec ?

Options :

1. 0.6×10^8 m/sec

2. 1.8×10^8 m/sec

3. 0.64×10^8 m/sec

4. 2×10^8 m/sec

Question Number : 8 Question Id : 4548932008 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

With what velocity an electron should move so that its kinetic energy equals its rest mass energy ?

Options :

1. $\frac{2}{3}C$

2. $\frac{\sqrt{3}}{4}C$

3. $\frac{\sqrt{3}}{2}C$

4. $\frac{C}{2}$

Question Number : 9 Question Id : 4548932009 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Which of the following values of Poisson's ratio can *not* be possible ?

Options :

1. 0.3

2. -1.5

3. -0.8

4. 0.4

Question Number : 10 Question Id : 4548932010 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If two cylinders (one hollow and other solid) of same length, mass and material are given, then, to twist the cylinders through the same angle :

Options :

1. More torque is needed for the hollow cylinder than the solid one

2. More torque is needed for the solid cylinder than the hollow one

3. Couple per unit twist for solid cylinder will be more than the hollow one

4. Couple per unit twist for solid as well as hollow cylinders will be the same

Question Number : 11 Question Id : 4548932011 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If in a capillary tube the rate of flow of a liquid is measured by collecting 100 ml of liquid in 100 sec in a measuring flask. If the least count of the volume of the measuring flask be 1 ml and the least count of the stop watch used for measuring the time be 0.01 sec, then the uncertainty in the rate of flow of the liquid will be :

Options :

1. 1.01×10^{-2}
2. 1.01
3. 10^{-6}
4. 10^{-4}

Question Number : 12 Question Id : 4548932012 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If in a ballistic galvanometer, θ_0 be the throw in the absence of damping and θ_1 be the first throw after $\frac{T}{4}$ sec (where T is the time period of oscillations in ballistic galvanometer) then the correct relation between, θ_0 , θ_1 & logarithmic decrement λ of the galvanometer will be :

Options :

1. $\theta_1 = \theta_0(1 + \lambda/2)$
2. $\theta_0 = \theta_1 \left(1 + \frac{\lambda}{2}\right)$
3. $\theta_1 = \theta_0 e^{\lambda/2}$
4. $\theta_0 = \theta_1 e^{-\lambda/2}$

Question Number : 13 Question Id : 4548932013 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

States of thermodynamic equilibrium can be described in terms of :

Options :

1. Macroscopic thermodynamic coordinates
2. Macroscopic thermodynamic coordinates that involve time also
3. Microscopic coordinates
4. Microscopic coordinates that involve time also

Question Number : 14 Question Id : 4548932014 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The ratio of isobaric volume expansivity and isothermal compressibility is given as :

Options :

1. $\left(\frac{\partial P}{\partial T}\right)_V$

2. $\left(\frac{\partial V}{\partial T}\right)_P$

3. $\left(\frac{\partial P}{\partial V}\right)_T$

4. $\left(\frac{\partial T}{\partial P}\right)_V$

Question Number : 15 Question Id : 4548932015 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

During a quasi static process :

Options :

1. The system is not in thermodynamic equilibrium

2. The system is at all times infinitesimally near a state of thermodynamic equilibrium

3. The system is far away from a state of thermodynamic equilibrium

4. None of the three

Question Number : 16 Question Id : 4548932016 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Mathematical formulation of the first law contains the idea of :

Options :

1. The existence of an internal energy function
2. The principle of the conservation of energy
3. The definition of heat as energy in transit by virtue of a temperature difference
4. All of the three

Question Number : 17 Question Id : 4548932017 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

One liter atmosphere equals :

Options :

1. 101 Joule
2. 8.31 Joule
3. 0.082 Joule
4. 1.01×10^5 Joule

Question Number : 18 Question Id : 4548932018 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

At 4°C for water, $C_p = C_v$ because :

Options :

1. $\left(\frac{\partial P}{\partial V}\right)_T = 0$

2. $\left(\frac{\partial V}{\partial T}\right)_P = 0$

3. $\left(\frac{\partial P}{\partial T}\right)_V = 0$

4. None of the three

Question Number : 19 Question Id : 4548932019 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In the inversion curve for a gas, in the region of cooling :

Options :

1. Joule-Kelvin coefficient is negative

2. Joule-Kelvin coefficient is positive

3. Joule-Kelvin coefficient is zero

4. None of the three

Question Number : 20 Question Id : 4548932020 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

At constant temperature, the internal energy of a Van der Waals gas :

Options :

1. Remains constant

2. Is proportional to volume V of the gas

3. Is inversely proportional to the volume V of the gas

4. Is independent of volume of the gas

Question Number : 21 Question Id : 4548932021 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Which of the following is *not* correct for the first order phase transition ?

Options :

1. There is change in entropy during phase transition
2. Volume changes during phase transition
3. Gibbs function changes discontinuously at phase transition temperature
4. First order derivatives of Gibb's function change discontinuously at phase transition temperature

Question Number : 22 Question Id : 4548932022 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Specific heat of saturated steam is :

Options :

1. Positive
2. Negative
3. Zero
4. 1 cal/gm-degree

Question Number : 23 Question Id : 4548932023 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Which of the following statements is *correct* ?

Options :

1. Absolute zero temperature can be achieved by isothermal magnetization only
2. Absolute zero temperature can be achieved by adiabatic demagnetization only

3. Absolute zero temperature can not be achieved by finite number of isothermal magnetization followed by adiabatic demagnetization
4. None of the three

Question Number : 24 Question Id : 4548932024 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If a black body radiation enclosure expands, so that its volume becomes 64 times, the temperature of enclosure becomes :

Options :

1. one fourth
2. four times
3. 16 times
4. 8 times

Question Number : 25 Question Id : 4548932025 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In interference with coherent sources, the fringe width varies as :

Options :

1. Directly as wavelength
2. Inversely as wavelength
3. Directly as the separation between slits
4. Inversely as the distance between the slits and screen

Question Number : 26 Question Id : 4548932026 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In Newton's rings experiment with two different media between the glass surfaces, the n th rings have diameters as 10 : 7. The ratio of the refraction indices of two media are :

Options :

1. 7 : 10
2. 49 : 100
3. 10 : 7
4. 100 : 49

Question Number : 27 Question Id : 4548932027 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Broad sources are required in :

Options :

1. Biprism experiment
2. Newton's ring experiment
3. Both Biprism experiment and Newton's ring experiment
4. None of the three

Question Number : 28 Question Id : 4548932028 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A movable mirror of Michelson's interferometer is moved through a distance of 0.06 mm then 200 fringes cross the field of view. The wavelength of light is :

Options :

1. 6000 Å
2. 4000 Å
3. 8000 Å
4. 3000 Å

Question Number : 29 Question Id : 4548932029 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The radius of the first zone in a zone plate of focal length 40 cm for light of wavelength 4000 \AA is :

Options :

1. 0.4 cm
2. 0.04 cm
3. 0.16 cm
4. 0.010 cm

Question Number : 30 Question Id : 4548932030 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In the diffraction pattern due to a single slit, the width of the central maximum will be :

Options :

1. Larger for narrow slit
2. Less for narrow slit
3. Larger for wide slit
4. Less for wide slit

Question Number : 31 Question Id : 4548932031 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

When a single slit is replaced by double slit arrangement, the intensity of central maximum is increased by :

Options :

1. 2 times
2. 4 times

3. 8 times

4. 16 times

Question Number : 32 Question Id : 4548932032 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In a plane transmission grating the angle of diffraction for the second order principal maxima for wavelength 5000\AA is 30° . The number of lines per cm of the grating surface is :

Options :

1. 10000

2. 7500

3. 5000

4. 1500

Question Number : 33 Question Id : 4548932033 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If N is the total no. of rulings on the grating, n is the order of spectrum and λ is the wavelength of light, then, the resolving power of grating is :

Options :

1. $Nn\lambda$

2. Nn

3. $N\lambda/n$

4. N/n

Question Number : 34 Question Id : 4548932034 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The minimum number of lines in plane diffraction grating required to just resolve the sodium doublet (5890\AA and 5896\AA) in first order is :

Options :

1. 982
2. 491
3. 1964
4. 246

Question Number : 35 Question Id : 4548932035 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Circularly polarized light is produced if the amplitudes of the ordinary and extraordinary rays are equal and there is phase difference of :

Options :

1. 180°
2. 90°
3. 45°
4. 0°

Question Number : 36 Question Id : 4548932036 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Which of the following is optically active substance ?

Options :

1. Calcite
2. Tourmaline
3. Quartz
4. Sodium Chloride

Question Number : 37 Question Id : 4548932037 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Polarization \vec{P} and electric susceptibility χ are related as :

Options :

1. $\vec{P} = \epsilon_0 \chi \vec{E}$

2. $\vec{P} = \chi \vec{E}$

3. $\vec{P} = \epsilon_0^{-1} \chi \vec{E}$

4. $\vec{P} = \frac{\epsilon_0}{\chi} \vec{E}$

Question Number : 38 Question Id : 4548932038 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The Clausius-Mossotti relation holds best for :

Options :

1. Solids

2. Polar molecules

3. Gases & dilute solutions

4. Concentrate solutions

Question Number : 39 Question Id : 4548932039 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The polarizability of atoms in the air molecule is $9.7 \times 10^{-41} \text{ cm}^2/\text{V}$. The radius of the atom of an air molecule is :

Options :

1. $9.6 \times 10^{-11} \text{ m}$

2. $9.6 \times 10^{-12} \text{ m}$

3. $9.6 \times 10^{-13} \text{ m}$

4. $9.6 \times 10^{-14} \text{ m}$

Question Number : 40 Question Id : 4548932040 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Using Langevin's theory, the susceptibility χ of a paramagnetic substance is given by :

Options :

1. $\chi = \frac{m^2 N \mu_0}{3kT}$

2. $\chi = \frac{m^2 \mu_0}{3kT}$

3. $\chi = \frac{m^2 N \mu_0 T}{k}$

4. $\chi = \frac{m^2 N \mu_0}{2kT}$

Question Number : 41 Question Id : 4548932041 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Above Curie temperature, the ferromagnetic material behaves as :

Options :

1. Paramagnetic material

2. Diamagnetic material

3. Ferrimagnetic material

4. Antiferromagnetic material

Question Number : 42 Question Id : 4548932042 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The loss of energy due to hysteresis when 5 kg of iron is subjected for 1 hour to cyclic magnetic changes of frequency 25 cycles/sec, if the hysteresis loop represents a loss of $2.5 \times 10^3 \text{ erg cm}^{-3} \text{ cycle}^{-1}$ and density of iron is 7.8 gm cm^{-3} , is :

Options :

1. $1.14 \times 10^3 \text{ J}$

2. $1.24 \times 10^3 \text{ J}$

3. $1.34 \times 10^3 \text{ J}$

4. $1.44 \times 10^3 \text{ J}$

Question Number : 43 Question Id : 4548932043 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A solenoid has length l , number of turns N and area of cross-section A . Its self inductance L is :

Options :

1. $L = \frac{\mu_0 N^2 A}{l}$

2. $L = \frac{\mu_0 N A}{l}$

3. $L = \frac{\mu_0 N^2}{l}$

4. $L = \frac{\mu_0^2 N A}{l}$

Question Number : 44 Question Id : 4548932044 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Two inductors L_1 and L_2 are connected in such a way that their fluxes are in the opposite directions. The total inductance L will be :

Options :

1. $L = L_1 + L_2 + M$
2. $L = L_1 + L_2 + 2M$
3. $L = L_1 + L_2 - 2M$
4. $L = L_1 + L_2 - M$

Question Number : 45 Question Id : 4548932045 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A coil of inductance 2 mH and resistance 15Ω is connected in parallel with a capacitor of $0.01 \mu\text{F}$. The peak oscillator current at resonance is :

Options :

1. 1.14 mA
2. 1.41 mA
3. 2.14 mA
4. 2.41 mA

Question Number : 46 Question Id : 4548932046 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The de-Broglie wavelength λ associated with an electron of energy V electron volt is :

Options :

1. $\lambda = \frac{1.227}{\sqrt{V}} \text{ nm}$
2. $\lambda = \frac{0.1227}{\sqrt{V}} \text{ nm}$
3. $\lambda = \frac{1.227}{V} \text{ nm}$

$$4. \quad \lambda = \frac{12.27}{\sqrt{V}} \text{ nm}$$

Question Number : 47 Question Id : 4548932047 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The spacing between principal planes of NaCl crystal is 2.82 \AA . The first order Bragg reflection occurs at an angle of 10° . The wavelength of X-rays is :
Given $\sin 10^\circ = 0.1736$

Options :

1. $0.98 \times 10^{-7} \text{ m}$

2. $0.98 \times 10^{-8} \text{ m}$

3. $0.98 \times 10^{-9} \text{ m}$

4. $0.98 \times 10^{-10} \text{ m}$

Question Number : 48 Question Id : 4548932048 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A photon recoils back after striking an electron at rest. The change in the wavelength of the photon is :

Options :

1. 0.048 \AA

2. 0.024 \AA

3. 0.48 \AA

4. 0.24 \AA

Question Number : 49 Question Id : 4548932049 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Given the Bessel function : $J_0(x) = 1 - \frac{x^2}{2^2} + \frac{x^4}{2^2 \cdot 2^4} - \frac{x^6}{2^2 \cdot 2^4 \cdot 2^6} + \dots$, $J_1(x)$ is given by:

Options :

1. $-\frac{x}{2} + \frac{x^3}{2^2 \cdot 4} - \frac{x^5}{2^2 \cdot 2^4 \cdot 6} + \dots$

2. $1 + \frac{x^2}{2^2} + \frac{x^4}{2^2 \cdot 4^2} + \frac{x^6}{2^2 \cdot 2^4 \cdot 6^2} + \dots$

3. $\frac{x}{2} - \frac{x^3}{2^2 \cdot 4} + \frac{x^5}{2^2 \cdot 2^4 \cdot 6} - \dots$

4. None of the three

Question Number : 50 Question Id : 4548932050 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Displacement x^j is a contravariant vector. The work done by a force is an invariant scalar. Therefore, force and hence momentum are :

Options :

1. Both covariant vectors

2. Both contravariant vectors

3. A mixed tensor of rank 2 and a contravariant vector respectively

4. A covariant vector and a contravariant vector respectively

Question Number : 51 Question Id : 4548932051 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The unit vectors $\hat{\theta}$ and $\hat{\phi}$ (where θ and ϕ are the polar and the azimuthal angles, respectively), in the spherical coordinate system, under the operation of inversion (i.e., reflection through the origin) have :

Options :

1. even parity and odd parity, respectively

2. both odd parity
3. odd parity and even parity, respectively
4. both even parity

Question Number : 52 Question Id : 4548932052 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

$$\int_0^{\infty} e^{-x} \frac{d}{dx} [\delta(x^2 - 4)] dx =$$

Options :

1. $\frac{1}{4e^2}$
2. 1
3. $-\frac{1}{4e^2}$
4. $\frac{1}{4}(e^2 + e^{-2})$

Question Number : 53 Question Id : 4548932053 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

One solution (about $x = 0$) of the differential equation $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 4y = 0$ is

$y_1(x) = c_1 x^2$, with c_1 a constant. A second linearly independent solution (with another constant c_2) is :

Options :

1. $c_1 x^2$
2. $c_2 x^2 \ln(x)$
3. $\frac{c_2}{x}$

4. $c_2 \ln(x)$

Question Number : 54 Question Id : 4548932054 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The only possible real eigen value of a Skew-Hermitian matrix is :

Options :

1. 1

2. -1

3. 0

4. none, i.e., no real eigen values

Question Number : 55 Question Id : 4548932055 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The matrix, $A = \frac{1}{3} \begin{pmatrix} -2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & -2 & 2 \end{pmatrix}$ is :

Options :

1. Symmetric

2. Skew-symmetric

3. Singular

4. Orthogonal

Question Number : 56 Question Id : 4548932056 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The trigonometric identity for $\sin^3(x)$ can be interpreted as Fourier series expansion for that function. The first non-zero Fourier coefficient in that expansion is :

Options :

1. 0.25
2. 0.75
3. 1
4. -0.5

Question Number : 57 Question Id : 4548932057 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The moment of Inertia of a solid circular cylinder of radius a and height h about the axis of the cylinder is :

Options :

1. independent of a
2. independent of h
3. independent of both a and h
4. independent of its mass

Question Number : 58 Question Id : 4548932058 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A term of the type $\frac{\partial T}{\partial q_k}$, where T and q_k are the kinetic energy and a generalized coordinate, respectively, if occurring in equation of motion of a system is called a :

Options :

1. generalized momentum
2. generalized velocity

3. fictitious force
4. potential

Question Number : 59 Question Id : 4548932059 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

For inverse square law forces, the mathematical statement of the virial theorem is (here $\langle T \rangle$ and $\langle V \rangle$ are the averages of kinetic and potential energies) :

Options :

1. $2\langle T \rangle = -\langle V \rangle$
2. $2\langle T \rangle = \langle V \rangle$
3. $\langle T \rangle = \langle V \rangle$
4. $\langle T \rangle = -2\langle V \rangle$

Question Number : 60 Question Id : 4548932060 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The types of constraints on the mechanical system consisting of a cylinder rolling (and possibly sliding) down an inclined plane of angle α are :

Options :

1. scleronomic and holonomic
2. scleronomic and non-holonomic
3. rheonomic and non-holonomic
4. rheonomic and holonomic

Question Number : 61 Question Id : 4548932061 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The magnitude of Coriolis acceleration (expressed in terms of g , the acceleration due to earth's gravity) for a particle of mass m moving with a velocity 10^4 cm/s horizontally along earth's surface at the north pole is about :

Options :

1. $1.5 g$
2. g
3. $0.0015 g$
4. $0.15 g$

Question Number : 62 Question Id : 4548932062 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The distance between the Sun and the Earth is 1 astronomical unit (1 AU). Jupiter takes about 11.9 earth years to orbit around the Sun. The distance between the Sun and Jupiter, in AU, is about :

Options :

1. 3.5
2. 5.2
3. 11.9
4. 7.2

Question Number : 63 Question Id : 4548932063 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Two identical atoms of mass m are bound to each other by the Lennard-Jones

potential, $V = \left[\left(\frac{r_0}{r} \right)^{12} - 2 \left(\frac{r_0}{r} \right)^6 \right]$. The frequency of small oscillations about the

equilibrium is :

Options :

1. $\sqrt{\frac{\epsilon}{2mr_0^2}}$

2. $6\sqrt{\frac{2\epsilon}{mr_0^2}}$

3. $12\sqrt{\frac{\epsilon}{mr_0^2}}$

4. $\frac{\pi}{2} \sqrt{\frac{\epsilon}{mr_0^2}}$

Question Number : 64 Question Id : 4548932064 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The Lagrangian of a simple pendulum, consisting of a bob of mass m suspended by a string of length l , executing oscillations of amplitude θ about the equilibrium position is given by :

Options :

1. $m\dot{\theta}^2 - \frac{g}{l}\sin\theta$

2. $\frac{1}{2}ml^2\dot{\theta}^2 - mgl\cos\theta$

3. $\frac{1}{2}ml^2\dot{\theta}^2 - mgl(1 + \cos\theta)$

4. $\frac{1}{2}ml^2\dot{\theta}^2 - mgl(1 - \cos\theta)$

Question Number : 65 Question Id : 4548932065 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

An electron is confined to a box of length L . If the length of the box changes to $2L$, how would the uncertainty of momentum of electron will change :

Options :

1. It will be twice
2. It will be half
3. It will remain same
4. It will be one fourth

Question Number : 66 Question Id : 4548932066 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Which of the following is a Hermitian Operator ?

Options :

1. $\hat{x}\hat{p}_x$
2. $\frac{d}{dx}$
3. $i\frac{d^2}{dx^2}$
4. $-\frac{d^2}{dx^2}$

Question Number : 67 Question Id : 4548932067 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Which one of the following is *not* a linear operator ?

Options :

1. \hat{x}^3
2. Parity
3. Time reversal
4. $i\hat{p}$

Question Number : 68 Question Id : 4548932068 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The de-Broglie wavelength of a 10 KeV electron is equal to :

Options :

1. 12.3\AA

2. 1.23\AA

3. 0.123\AA

4. 123\AA

Question Number : 69 Question Id : 4548932069 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The value of $\langle \frac{1}{r} \rangle$ in the $\psi_{1,0,0}(r, \theta, \phi)$ state of a hydrogen atom is (a_0 is Bohr radius) :

Options :

1. a_0

2. $\frac{1}{a_0}$

3. 0

4. $\frac{1}{2a_0}$

Question Number : 70 Question Id : 4548932070 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

$\Psi_{n,l,m}(r, \theta, \phi)$ is the eigen function of the hydrogen atom problem. The eigen values of the operator $\sin\left(a\frac{\partial}{\partial\phi}\right)$ corresponding to the eigen function $\Psi_{3,2,-2}(r, \theta, \phi)$ is :

Options :

1. $\sin(2a)$
2. $-\sin(2a)$
3. $\sinh(2a)$
4. $-\sinh(2a)$

Question Number : 71 Question Id : 4548932071 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Number of bound states for the system $V(x) = -V_0\delta(x-a), V_0 > 0$ is :

Options :

1. 1
2. 0
3. infinite
4. depends on the value of V_0a^2

Question Number : 72 Question Id : 4548932072 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Which of the following is *not* correct about Pauli-Spin matrices

$$\vec{\sigma} = \sigma_x \hat{i} + \sigma_y \hat{j} + \sigma_z \hat{k} ?$$

Options :

1. $\{\sigma_x, \sigma_y\} = 0$
2. $\sigma_x \sigma_y = -i\sigma_z$

3. $\text{Tr}(\sigma) = 0$

4. $\sigma^2 = I$

Question Number : 73 Question Id : 4548932073 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The depletion region is created by :

Options :

1. Ionization only

2. Diffusion only

3. Recombination only

4. All the three viz. ionization, diffusion and recombination

Question Number : 74 Question Id : 4548932074 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If the peak value of rectified voltage from a full wave rectifier is 15V, the approximate value of average rectified voltage will be :

Options :

1. 9.50 volt

2. 4.75 volt

3. $\frac{15}{\sqrt{2}}$ volt

4. $15\sqrt{2}$ volt

Question Number : 75 Question Id : 4548932075 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A certain transistor is to be operated with $V_{CE} = 6V$. If its maximum power rating is 250 mW, what is the maximum collector current that it can handle ?

Options :

1. 1.5 mA
2. 1.5 A
3. 41.7 mA
4. 4.17 A

Question Number : 76 Question Id : 4548932076 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A certain JFET has transconductance 4mS with an external ac drain resistance $1.5\text{ k}\Omega$, what is the ideal voltage gain ?

Options :

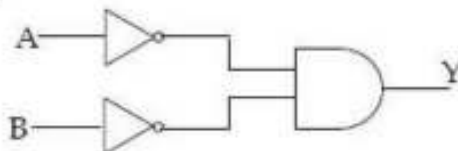
1. 60
2. 6
3. 3.75×10^5
4. 2.6×10^{-6}

Question Number : 77 Question Id : 4548932077 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

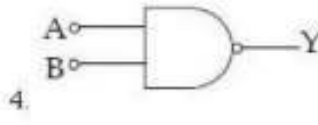
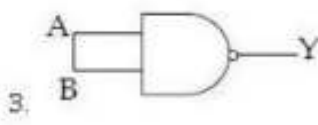
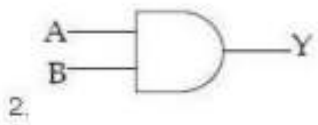
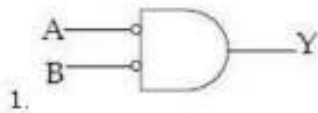
Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The correct equivalent symbol for the AND gate with inverted inputs shown below will be :



Options :

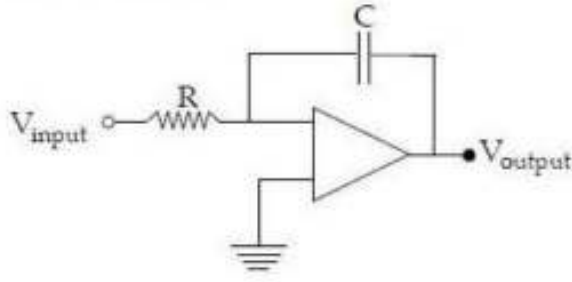


Question Number : 78 Question Id : 4548932078 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The circuit shown is used for :



Options :

1. Differentiation
2. Integration
3. Square wave generation
4. Summing

Question Number : 79 Question Id : 4548932079 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Radio waves in the frequency range 3 MHz – 30 MHz propagate through which mode of propagation ?

Options :

1. Surface mode
2. Space wave mode
3. Sky wave or ionospheric mode
4. Ground mode

Question Number : 80 Question Id : 4548932080 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

At cut off the JFET channel is :

Options :

1. At its widest point
2. Completely closed by depletion region
3. Extremely narrow
4. Reverse biased

Question Number : 81 Question Id : 4548932081 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The divergence of the vector field $\vec{P} = x^2yz\hat{i} + xy\hat{j}$ is :

Options :

1. $2xyz + x$
2. $2xy + z$
3. $xz + yz$
4. $x^2y + xz$

Question Number : 82 Question Id : 4548932082 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The work done by the force $\vec{F} = (4\hat{i} - 3\hat{j} + 2\hat{k})$ N in giving a 1 nC charge a displacement of $(10\hat{i} + 2\hat{j} - 7\hat{k})$ m is :

Options :

1. 100 nJ
2. 60 nJ
3. 64 nJ
4. 20 nJ

Question Number : 83 Question Id : 4548932083 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

What is the major factor for determining whether a medium is free space, lossless dielectric, loss of dielectric or good conductor ?

Options :

1. Attenuation constant
2. Constitutive parameters (σ, ϵ_1, μ)
3. Loss tangent
4. Reflection coefficient

Question Number : 84 Question Id : 4548932084 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The dominant mode for rectangular waveguide is :

Options :

1. TE_{11}

2. TM_{11}

3. TE_{101}

4. TE_{10}

Question Number : 85 Question Id : 4548932085 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In a waveguide, which condition always holds good ?

Options :

1. Phase velocity = C

2. Phase velocity greater than C

3. Phase velocity less than C

4. Group velocity = C

Question Number : 86 Question Id : 4548932086 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In a radio wave if $E_0 = 10^{-4}$ V/m, then, the magnitude of magnetic field and pointing vector is :

Options :

1. 3.3×10^{-13} W/m², 1.3×10^{-11} Watt/m²

2. 10^{-4} W/m², 1.3×10^{-11} Watt/m²

3. 3.3×10^{-13} W/m², 1.3×10^{11} Watt/m²

4. 3.3×10^{13} W/m², 1.3×10^{11} Watt/m²

Question Number : 87 Question Id : 4548932087 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In the TM mode :

Options :

1. Magnetic field is always zero
2. Electric field is always perpendicular to propagation
3. Magnetic field is always parallel to direction of propagation
4. Magnetic field is always perpendicular to direction of propagation

Question Number : 88 Question Id : 4548932088 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The magnetic flux density created by an infinitely long conductor carrying a current I at a radial distance R is :

Options :

1. $\frac{\mu_0 I}{2\pi R}$
2. $\frac{1}{2\pi R}$
3. $\frac{\mu_0 I}{2\pi R^3}$
4. $\frac{4\pi R^2 I}{3}$

Question Number : 89 Question Id : 4548932089 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Consider a system of 3 fermions which can occupy any of the 4 available energy states with equal probability. The entropy of the system :

Options :

1. $k_B \ln 2$

2. $2k_B \ln 2$

3. $2k_B \ln 4$

4. $3k_B \ln 4$

Question Number : 90 Question Id : 4548932090 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load : No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

For a two dimensional free electron gas, the electron density n and Fermi energy ϵ_F are related as :

Options :

1. $n = \frac{(2m\epsilon_F)^{3/2}}{3\pi^2\hbar^3}$

2. $n = \frac{m\epsilon_F}{\pi\hbar^2}$

3. $n = \frac{m\epsilon_F}{2\pi\hbar^2}$

4. $n = \frac{(2m\epsilon_F)^{3/2}}{\pi\hbar}$

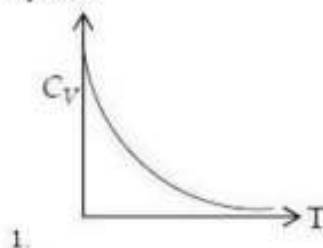
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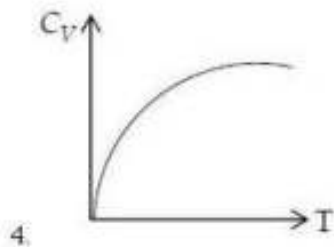
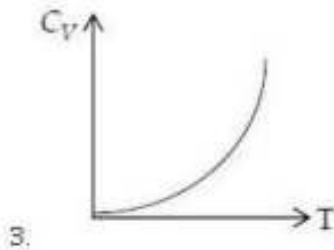
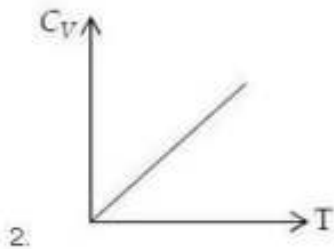
Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Partition function for a gas of photons is given as $z \propto e^{-AT^3}$. The specific heat of photon gas varies with temperature as :

Options :





Question Number : 92 Question Id : 4548932092 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Phase space area of a 1-d SHO with mass m , angular frequency ω and having energy between E and $2E$ is :

Options :

1. $\frac{2\pi E}{\omega}$

2. $\frac{4\pi E}{\omega}$

3. $\frac{\pi E}{\omega}$

4. 0

Question Number : 93 Question Id : 4548932093 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Consider a linear collection of N independent spin $1/2$ particles, each at fixed location. The entropy of the system is :

Options :

- 0
- $\frac{NK_B}{2}$
- $\frac{NK_B}{2} \ln 2$
- $NK_B \ln 2$

Question Number : 94 Question Id : 4548932094 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The distribution function $f(E)$ for a photon gas is given by :

Options :

- $e^{-E/K_B T}$
- $(e^{E/K_B T} + 1)^{-1}$
- $(e^{E/K_B T} - 1)^{-1}$
- $(e^{-E/K_B T} + 1)^{-1}$

Question Number : 95 Question Id : 4548932095 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If the entropy of a system remains constant in a thermodynamic process, the process is known as :

Options :

- isobaric

2. adiabatic
3. isochoric
4. isothermal

Question Number : 96 Question Id : 4548932096 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

A micro canonical ensemble represents :

Options :

1. A system in contact with heat reservoir
2. An isolated system in equilibrium
3. A system that can exchange particles with its surroundings
4. A system under constant external pressure

Question Number : 97 Question Id : 4548932097 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If the volume of a cubic unit cell in Bravais lattice is V , the volume of the unit cell in reciprocal lattice will be :

Options :

1. $\frac{2\pi}{V}$
2. $\frac{8\pi^3}{V}$
3. $\frac{V}{8\pi^3}$
4. $\frac{V}{2\pi}$

Question Number : 98 Question Id : 4548932098 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The number of molecules present in the unit cell of sodium chloride is :

Options :

1. 5
2. 2
3. 4
4. 8

Question Number : 99 Question Id : 4548932099 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Density of states for a one dimensional Fermi system is proportional to :

Options :

1. E
2. $E^{1/2}$
3. $E^{-1/2}$
4. a constant

Question Number : 100 Question Id : 4548932100 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If E_H , J_x and B_z are the Hall field, current density and magnetic field strength respectively, then Hall coefficient is given by :

Options :

1. $R_H = \frac{E_H / J_x}{B_z}$

2. $R_H = \frac{J_s / E_H}{B_Z}$

3. $R_H = \frac{B_Z}{E_H / J_s}$

4. None of the three

Question Number : 101 Question Id : 4548932101 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

When a small magnetic field H is applied to a magnetic material, the intensity of magnetization is proportional to :

Options :

1. H^{-2}

2. $H^{1/2}$

3. H

4. H^2

Question Number : 102 Question Id : 4548932102 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

In an orthorhombic crystal, a lattice plane cuts intercepts of lengths $3a$, $-2b$ & $3c/2$ along three axes. The Miller indices of the plane are :

Options :

1. $(2 \bar{3} 4)$

2. $(1 3 4)$

3. $(2 3 4)$

4. $(3 4 2)$

Question Number : 103 Question Id : 4548932103 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The continuous X-ray spectrum is the result of :

Options :

1. Compton effect
2. Photoelectric effect
3. Inverse photoelectric effect
4. Raman effect

Question Number : 104 Question Id : 4548932104 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Using Debye's theory, atomic heat capacity of a solid at constant volume, C_V at high temperature is given by :

Options :

1. $C_V = R$
2. $C_V = 2R$
3. $C_V = 3R$
4. $C_V = \frac{3}{2}R$

Question Number : 105 Question Id : 4548932105 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The orbital magnetic dipole moment of an electron in hydrogen like atom is $\sqrt{2} \mu_B$. What is the state of the electron ?

Options :

1. S

2. P
3. D
4. F

Question Number : 106 Question Id : 4548932106 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

About Stern-Gerlach Experiment, which one is *not* true ?

Options :

1. It is possible with both atoms and ions
2. Gives evidence of electron spin
3. It is observed with atoms whose ground state is 1S_0
4. It is observed with atoms whose ground state is $^2S_{1/2}$

Question Number : 107 Question Id : 4548932107 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

Lamb-Rutherford experiment showed that in hydrogen atom :

Options :

1. $2^2S_{1/2}$ state has greater energy than $2^2P_{1/2}$ state
2. $2^2P_{1/2}$ state has greater energy than $2^2S_{1/2}$ state
3. $2^2S_{1/2}$ and $2^2P_{1/2}$ states have the same energy
4. $2^2P_{1/2}$ state has lower energy than $2^2P_{3/2}$ state

Question Number : 108 Question Id : 4548932108 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The doublet splitting of the first excited state of H-atom due to spin orbit interaction (${}^2P_{3/2} \rightarrow {}^2P_{1/2}$) is 0.365 cm^{-1} . What is the corresponding separation for L_i^{++} atom?

Options :

1. 1.095 cm^{-1}
2. 3.285 cm^{-1}
3. 9.855 cm^{-1}
4. 29.565 cm^{-1}

Question Number : 109 Question Id : 4548932109 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The ground state spectroscopic term for ${}^{17}\text{Cl}$ atom is :

Options :

1. 3P_0
2. ${}^2P_{1/2}$
3. ${}^2P_{3/2}$
4. ${}^2S_{1/2}$

Question Number : 110 Question Id : 4548932110 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The separation between adjacent energy levels of a normal multiplet is in the ratio 3 : 5. According to the Lande interval rule, what is the value of L ?

Options :

1. $L = 1$
2. $L = 2$

3. $L = 3$

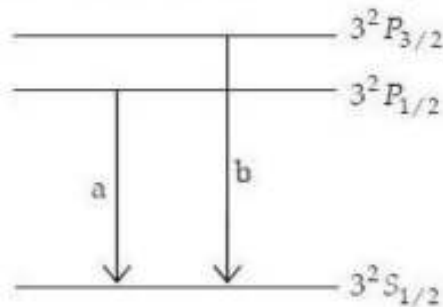
4. $L = 4$

Question Number : 111 Question Id : 4548932111 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The following transitions lead to the two components of sodium yellow line :



The ratio of intensities of the two lines b and a , $I_b : I_a$ is :

Options :

1. $1 : 2$

2. $2 : 1$

3. $3 : 2$

4. $2 : 3$

Question Number : 112 Question Id : 4548932112 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The value of Lande g -factor for $^2P_{3/2}$ state is :

Options :

1. 2

2. $2/3$

3. $3/2$

4. 4/3

Question Number : 113 Question Id : 4548932113 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The beam profile of a laser operating in TEM_{00} (fundamental mode) is :

Options :

1. Lorentzian
2. Voigt
3. Gaussian
4. Triangular

Question Number : 114 Question Id : 4548932114 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The spacing between two adjacent longitudinal modes in a plane laser resonator having separation between two mirrors, $d = 10$ cm is :

Options :

1. 1000 MHz
2. 1500 MHz
3. 2000 MHz
4. 3000 MHz

Question Number : 115 Question Id : 4548932115 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

For fission to take place, neutrons must have :

Options :

1. very very low energy

2. thermal energy
3. very high energy
4. no kinetic energy

Question Number : 116 Question Id : 4548932116 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The activity of a sample of radioactive material is A_1 at time t_1 and A_2 at time t_2 ($t_2 > t_1$). Its mean life is T , then :

Options :

1. $A_1 t_1 = A_2 t_2$
2. $\frac{A_1 - A_2}{t_2 - t_1} = \text{constant}$
3. $A_2 = A_1 e^{(t_1 - t_2)/T}$
4. $A_2 = A_1 e^{(t_1/t_2)T}$

Question Number : 117 Question Id : 4548932117 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
 No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

200 MeV of energy is obtained in the fission of one nucleus of ^{235}U . A reactor is generating 1000 kW power. The rate of nuclear fission in the reactor is :

Options :

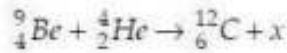
1. 1000
2. 2×10^8
3. 3.125×10^{16}
4. 931

Question Number : 118 Question Id : 4548932118 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The particle x in the following nuclear reaction is :



Options :

1. electron
2. proton
3. neutron
4. photon

Question Number : 119 Question Id : 4548932119 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

If M is the mass of nucleus and A its atomic mass, then the packing fraction is :

Options :

1. $\frac{M-A}{M+A}$
2. $\frac{M-A}{M}$
3. $\frac{M-A}{A}$
4. $\frac{M+A}{M-A}$

Question Number : 120 Question Id : 4548932120 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical Allowed Progression : Yes Number of Replay : 999 Play On Load :
No Control Enable : Yes

Correct Marks : 3 Wrong Marks : 1

Question Label : Multiple Choice Question

The nuclei ${}_6\text{C}^{13}$ and ${}_7\text{N}^{14}$ can be described as :

Options :

1. isobars
2. isotones
3. isotopes of carbon
4. isotopes of nitrogen