JNUEE MSC Physics

1) The correct value of the determinant

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

is given by

[Question ID = 32500][Question Description = M.Sc.SPSM_Q001]

1. $abc\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+1\right)$

   [Option ID = 193518]
2. $(1+a)(1+b)(1+c)$

   [Option ID = 193519]
3. $abc(a+b+c+1)$

   [Option ID = 193520]
4. 0

   [Option ID = 193521]

2) Which of the following statements about properties of matrix are correct?

A. Every square matrix can be expressed as the sum of two matrices, one symmetric and other anti-symmetric.

B. Every square matrix can be expressed as the difference of two matrices, one symmetric and other anti-symmetric.

C. Every square matrix is an idempotent matrix.

D. Every square matrix is a nilpotent matrix.

[Question ID = 29795][Question Description = M.Sc.SPSM_Q002]

1. A only

   [Option ID = 193318]
2. A and C only

   [Option ID = 193319]
3. B and C only

   [Option ID = 193320]
4. B and D only

   [Option ID = 193321]

3) The value of ∇^2 operator in Spherical Polar Coordinates is given by

[Question ID = 32501][Question Description = M.Sc.SPSM_Q003]

1. $\nabla^2=\frac{1}{r^2}\frac{\partial}{\partial r}\left(r\frac{\partial}{\partial r}\right)+\frac{1}{r^2Sin\theta}\frac{\partial}{\partial\theta}\left(Sin\theta\frac{\partial}{\partial\theta}\right)+\frac{1}{r^2Sin^2\theta}\frac{\partial^2}{\partial\phi^2}$

   [Option ID = 193522]
2. $\nabla^2=\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial}{\partial r}\right)+\frac{1}{r^2Sin\theta}\frac{\partial}{\partial\theta}\left(Sin\theta\frac{\partial}{\partial\theta}\right)+\frac{1}{r^2Sin^2\phi}\frac{\partial^2}{\partial\phi^2}$

   [Option ID = 193523]
3. $\nabla^2=\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial}{\partial r}\right)+\frac{1}{r^2Sin\theta}\frac{\partial}{\partial\theta}\left(Sin\theta\frac{\partial}{\partial\theta}\right)+\frac{1}{r^2Sin^2\theta}\frac{\partial^2}{\partial\phi^2}$

   [Option ID = 193524]
4. $\nabla^2=\frac{1}{r^2}\frac{\partial}{\partial r}\left(r\frac{\partial}{\partial r}\right)+\frac{1}{r^2Sin^2\theta}\frac{\partial}{\partial\theta}\left(Sin\theta\frac{\partial}{\partial\theta}\right)+\frac{1}{r^2Sin^2\theta}\frac{\partial^2}{\partial\phi^2}$

   [Option ID = 193525]

4) Multiplication of a complex number by i (Iota) results in

[Question ID = 29796][Question Description = M.Sc.SPSM_Q004]

1. Rotation of complex number by π/2 in anticlockwise direction.

   [Option ID = 193322]
2. Rotation of complex number by π in anticlockwise direction.

   [Option ID = 193323]
3. Rotation of complex number by π/4 in clockwise direction.

   [Option ID = 193324]
4. Rotation of complex number by π in clockwise direction.

   [Option ID = 193325]

5) The area of a triangle enclosed by the complex numbers z, z-iz and iz is

[Question ID = 32502][Question Description = M.Sc.SPSM_Q005]

1. x^2+y^2

   [Option ID = 193526]
2. $\frac{1}{2}(x^2+y^2)$

   [Option ID = 193527]

3. $\frac{1}{\sqrt{2}}(x^2+y^2)$

[Option ID = 193528]

4. $\sqrt{2}(x^2+y^2)$

[Option ID = 193529]

6) Which one is the correct value of $CurlCurlCurlCurl\vec{F}$ if $\vec{F}$ is solenoidal vector

[Question ID = 32503][Question Description = M.Sc.SPSM_Q006]

1. 0

[Option ID = 193530]

2. $\vec{F}$

[Option ID = 193531]

3. $\nabla^2\vec{F}$

[Option ID = 193532]

4. $\nabla^4\vec{F}$

[Option ID = 193533]

7) A force $\vec{F}$ is conservative if

[Question ID = 32504][Question Description = M.Sc.SPSM_Q007]

1. $gard\vec{F}=0$

[Option ID = 193534]

2. $div\vec{F}=0$

[Option ID = 193535]

3. $Curl\vec{F}=0$

[Option ID = 193536]

4. None of the above

[Option ID = 193537]

8) The correct solution of the differential equation $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9y=0$ is given by

[Question ID = 32505][Question Description = M.Sc.SPSM_Q008]

1. $y=c_1e^{3x}+c_2e^{-3x}$

[Option ID = 193538]

2. $y=(c_1+c_2x)e^{3x}$

[Option ID = 193539]

3. $y=c_1Sin3x+c_2Cos3x$

[Option ID = 193540]

4. $y=c_1Sinh3x+c_2Cosh3x$

[Option ID = 193541]

9) The differential equation $M(x,y)dx+N(x,y)dy=0$ is an exact differential equation if

[Question ID = 32506][Question Description = M.Sc.SPSM_Q009]

1. $\frac{\partial M}{\partial y}+\frac{\partial N}{\partial x}=0$

[Option ID = 193542]

2. $\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}=0$

[Option ID = 193543]

3. $\frac{\partial M}{\partial x}+\frac{\partial N}{\partial y}=0$

[Option ID = 193544]

4. $\frac{\partial M}{\partial x}-\frac{\partial N}{\partial y}=0$

[Option ID = 193545]

10) The correct value of Fourier Sine transform of 1/x is

[Question ID = 32507][Question Description = M.Sc.SPSM_Q010]

1. 0

[Option ID = 193546]

2. $\sqrt{\pi/4}$

[Option ID = 193547]

3. $\sqrt{\pi/2}$

[Option ID = 193548]

4. $\sqrt{\pi}$

[Option ID = 193549]

11) The component of $\vec{A} = a_x\,\hat{i} + a_y\hat{j} + a_z\hat{k}$ along the direction of $\hat{j} - \hat{k}$ is

[Question ID = 32508][Question Description = M.Sc.SPSM_Q011]

1. $a_x/\sqrt{2}$

   [Option ID = 193550]
2. $a_y - a_z$

   [Option ID = 193551]
3. $(a_x + a_y - a_z)/\sqrt{2}$

   [Option ID = 193552]
4. $(a_y - a_z)/\sqrt{2}$

   [Option ID = 193553]

12) The component of $\vec{A} = a_x\,\hat{i} + a_y\hat{j} + a_z\hat{k}$ along the direction of $\hat{j} - \hat{k}$ is

[Question ID = 32509][Question Description = M.Sc.SPSM_Q012]

1. π/4 [Option ID = 193554]
2. π/3 [Option ID = 193555]
3. π/2 [Option ID = 193556]
4. 0 [Option ID = 193557]

13) The radius of circle $\left|\frac{z-3}{z+3}\right| = 2$ is given by

[Question ID = 32510][Question Description = M.Sc.SPSM_Q013]

1. 1

   [Option ID = 193558]
2. 2

   [Option ID = 193559]
3. 3

   [Option ID = 193560]
4. 4

   [Option ID = 173165]

14) The Laplace transform $L\{Cosh\,at\}$ is

[Question ID = 32511][Question Description = M.Sc.SPSM_Q014]

1. $\frac{s}{s^2+a^2}$

   [Option ID = 173166]
2. $\frac{s}{s^2-a^2}$

   [Option ID = 173167]
3. $\frac{a}{s^2+a^2}$

   [Option ID = 173168]
4. $\frac{a}{s^2-a^2}$

   [Option ID = 173169]

15) Consider the following statements for a particle moving in an elliptic orbit under the influence of a central force:

(a) The radius vector covers equal area in equal time.

(b) The motion takes place in a plane.

(c) The angular momentum is a constant of motion.

Which of the statements given above are correct?

[Question ID = 29797][Question Description = M.Sc.SPSM_Q015]

1. (a) and (b) only

   [Option ID = 193326]
2. (b) and (c) only

   [Option ID = 193327]
3. (a) and (c) only

   [Option ID = 193328]
4. (a), (b) and (c)

   [Option ID = 193329]

16) Billiard ball A moves with a velocity of 1.20 m/s in the +y direction on a billiard table and strikes an identical ball, B initially at rest. If A is deflected such that its velocity is (0.56 î+ 0.80 ĵ) m/s, then the final velocity of B will be

[Question ID = 29798][Question Description = M.Sc.SPSM_Q016]

1. (0.56 î + 0.40 ĵ) m/s

[Option ID = 193330]

2. (-0.56 î + 0.40 ĵ) m/s

[Option ID = 193331]

3. (0.56 î - 0.40 ĵ) m/s

[Option ID = 193332]

4. (-0.56 î - 0.40 ĵ) m/s

[Option ID = 193333]

17) Four spheres each of diameter 2a and mass m are placed with their centers on the four corners of a square of side b. The moment of inertia of the system about any side of the sphere will be

[Question ID = 32512][Question Description = M.Sc.SPSM_Q017]

1. $\frac{8}{5} ma^2 + 4 mb^2$

[Option ID = 173170]

2. $\frac{8}{5} ma^2 + 16 mb^2$

[Option ID = 173171]

3. $\frac{8}{5} ma^2 + 2 mb^2$

[Option ID = 173172]

4. $\frac{16}{5} ma^2 + 8 mb^2$

[Option ID = 173173]

18) If a planet revolves around the sun in a circular orbit of radius 'a' with a period of revolution 'T', then (k being a positive constant)

[Question ID = 32513][Question Description = M.Sc.SPSM_Q018]

1. $T = k\, a^{2/3}$

[Option ID = 173174]

2. $T = k\, a^{3/2}$

[Option ID = 173175]

3. $T = k\, a^2$

[Option ID = 173176]

4. $T = k\, a^3$

[Option ID = 173177]

19) If e is the coefficient of restitution, then which one of the following gives the condition for perfectly elastic bodies?[Question ID = 29799] [Question Description = M.Sc.SPSM_Q019]

1. e = 0 [Option ID = 193334]
2. e = 0.5 [Option ID = 193335]
3. e = 0.8 [Option ID = 193336]
4. e = 1.0 [Option ID = 193337]

20) A body moving with uniform acceleration, accelerates for first ten seconds and then retards at double the value of the acceleration uniformly for the next five seconds. The body will have the same velocity

(a) at the end of 4th and 13th seconds

(b) at the end of 9th and 12th seconds

(c) at the end of 8th and 11th seconds

Which of the above are correct?

[Question ID = 29800][Question Description = M.Sc.SPSM_Q020]

1. (a) and (b)

[Option ID = 193338]

2. (a) and (c)

[Option ID = 193339]

3. (a), (b) and (c)

[Option ID = 193340]

4. (b) and (c)

[Option ID = 193341]

21) Consider the following statements:

(a) Magnus effect is a consequence of Bernoulli's principle.

(b) A cricketer, while spinning a ball makes it to experience Magnus effect.

Which of the statements given above is/are correct?

[Question ID = 29801][Question Description = M.Sc.SPSM_Q021]

1. (a) only

[Option ID = 193342]

2. (b) only

[Option ID = 193343]

3. Both (a) and (b)

[Option ID = 193344]

4. Neither (a) nor (b)

[Option ID = 193345]

22) An elastic collision conserves[Question ID = 29802][Question Description = M.Sc.SPSM_Q022]

1. kinetic energy but not momentum [Option ID = 193346]
2. momentum but not kinetic energy [Option ID = 193347]
3. neither momentum nor kinetic energy [Option ID = 193348]
4. both kinetic energy and momentum [Option ID = 193349]

23) Consider the following statements:

(a) Volume of fluid flow in a tube in which a constant pressure difference is maintained increases when the temperature of the fluid increases.

(b) Density of the fluid decreases with the increase in temperature and there is more fluid volume per unit mass at high temperature.

Which of the statements given above is/are correct?

[Question ID = 29803][Question Description = M.Sc.SPSM_Q023]

1. (a) only

[Option ID = 193350]

2. (b) only

[Option ID = 193351]

3. Both (a) and (b)

[Option ID = 193352]

4. Neither (a) nor (b)

[Option ID = 193353]

24) A particle motion on a space-curve is governed by $x = 2\sin t$ $y = 3\cos t$ and $z = \sqrt{5}\sin t$. What is the magnitude of velocity of the particle at any time?

[Question ID = 32514][Question Description = M.Sc.SPSM_Q024]

1. $3\sqrt{2}\sin t$

[Option ID = 173178]

2. 3

[Option ID = 173179]

3. $3\sqrt{2}\cos t$

[Option ID = 173180]

4. $3\sqrt{2}$

[Option ID = 173181]

25) If I_1, I_2 and I_3 are the moments of inertia about a diameter of a thin hollow sphere, solid sphere and disc having same mass and same radius respectively, then which one of the following is correct?

[Question ID = 32515][Question Description = M.Sc.SPSM_Q025]

1. $I_1 < I_3 < I_2$

[Option ID = 173182]

2. $I_3 < I_2 < I_1$

[Option ID = 173183]

3. $I_2 < I_3 < I_1$

[Option ID = 173184]

4. $I_1 < I_2 < I_3$

[Option ID = 173185]

26) In what type of fluid, there is the maximum probability of streamline flow?

[Question ID = 29804][Question Description = M.Sc.SPSM_Q026]

1. Low density, low viscosity

[Option ID = 193354]

2. Low density, high viscosity

[Option ID = 193355]

3. High density, low viscosity

[Option ID = 193356]

4. High density, high viscosity

[Option ID = 193357]

27) Two identical drops of water are falling through air with a steady velocity v. If the drops coalesce, what will be the new velocity?

[Question ID = 32516][Question Description = M.Sc.SPSM_Q027]

1. $2v$

[Option ID = 173186]

2. $\sqrt{2}\,v$

[Option ID = 173187]

3. $(2)^{1/3}\,v$

[Option ID = 173188]

4. $(2)^{2/3}\,v$

[Option ID = 173189]

28) Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R

Assertion A: If h_1, h_2 ($h_1 > h_2$) are the heights of two satellites above the surface of earth and v_1, v_2 are their corresponding orbital speeds then $v_1 < v_2$.

Reason R: Orbital velocity of a body is inversely proportional to its distance from the center of earth.

In light of the above statement, choose the *correct* answer from the options given below

[Question ID = 31167][Question Description = N_M.Sc.SPSM_Q028]

1. Both **A** and **R** are true and **R** is the correct explanation of **A**

[Option ID = 201272]

2. Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

[Option ID = 201273]

3. **A** is true but **R** is false

[Option ID = 201274]

4. **A** is false but **R** is true

[Option ID = 201275]

29) A beam of plane-polarized light falls on a polarizer which rotates about the axis of the ray with angular velocity 21 rad/s. The flux of energy of the incident ray is 4.0 m W. The energy of light passing through the polarizer per one revolution will be

[Question ID = 26493][Question Description = M.Sc.SPSM_Q029]

1. 2.1 mJ

[Option ID = 193358]

2. 0.6 mJ

[Option ID = 193359]

3. 0.2 mJ

[Option ID = 193360]

4. 1.2 mJ

[Option ID = 193361]

30) A light source, which emits two wavelengths λ_1 = 400 nm and λ_2 = 600 nm, is used in a Young's double slit experiment. If recorded fringe widths for λ_1 and λ_2 are β_1 and β_2 and the number of fringes for them within a distance y on one side of the central maximum are m_1 and m_2, respectively, then which of the following is NOT correct

[Question ID = 26494][Question Description = M.Sc.SPSM_Q030]

1. $\beta_2 > \beta_1$

[Option ID = 193362]

2. $m_1 > m_2$

[Option ID = 193363]

3. The angular separation of fringes for λ_1 is greater than λ_2

[Option ID = 193364]

4. From the central maximum, 3rd maximum of λ_2 overlaps with 5th minimum of λ_1

[Option ID = 193365]

31) In a certain medium, the wave number k and the frequency w are related by the dispersion relation $w^2 = c^2k^2(1+\alpha k^2)$, where c and α are constants. If v_g is the group velocity and v_p is the phase velocity, then

[Question ID = 29824][Question Description = M.Sc.SPSM_Q031]

1. $v_g = v_p$

[Option ID = 173194]

2. $\frac{v_g}{v_p} = \frac{(1+\alpha k^2)}{(1+2\alpha k^2)}$

[Option ID = 173195]

3. $v_g . v_p = c^2(1+2\alpha k^2)$

[Option ID = 173196]

4. $v_g . v_p = c^2$

[Option ID = 173197]

32) A half-wave plate is an anisotropic optical element which introduces a retardation of λ/2 in the optical path length for the electric field component parallel to its optic axis, where λ is the wavelength of the incident radiation. If linearly polarized light is incident on a half-wave plate with its polarization at 45° to the optical axis, the transmitted light is (compared to the initial polarization)

[Question ID = 26495][Question Description = M.Sc.SPSM_Q032]

1. linearly polarized and rotated by 45°

[Option ID = 193366]
2. left circularly polarized

[Option ID = 193367]
3. right circularly polarized

[Option ID = 193368]
4. linearly polarized and rotated by 90°

[Option ID = 193369]

33) A receiver and a source of sonic oscillations of frequency $\nu_0 = 2000$ Hz are located on the x axis. The source swings harmonically along that axis with a circular frequency ω and an amplitude $a = 50$ cm. At what value of ω will the frequency bandwidth registered by the stationary receiver be equal to $\Delta\nu = 200$ Hz ? The velocity of sound is equal to 340 m/s.

[Question ID = 29825][Question Description = M.Sc.SPSM_Q033]
1. 17 s^{-1}

[Option ID = 173198]
2. 34 s^{-1}

[Option ID = 173199]
3. 50 s^{-1}

[Option ID = 173200]
4. 100 s^{-1}

[Option ID = 173201]

34) Assertion A :

Newton's rings are formed in the reflected system. When the space between the lens and the glass plate is filled with a liquid of refractive index greater than that of glass, the central spot of the pattern is bright.

Reason R :

The reflection in these cases will be from a denser to rarer medium and the two interfering rays are reflected under similar conditions.

[Question ID = 26496][Question Description = M.Sc.SPSM_Q034]
1. Both **A** and **R** are true and **R** is the correct explanation of **A**

[Option ID = 193370]
2. Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

[Option ID = 193371]
3. **A** is true but **R** is false

[Option ID = 193372]
4. **A** is false but **R** is true

[Option ID = 193373]

35) Six simple harmonic oscillations each of same frequency and equal amplitude are superposed. The phase difference between any two consecutive oscillations i.e. $\phi_n - \phi_{n-1} = \Delta\phi$ is constant, where ϕ_n is the phase of the n^{th} oscillation. If the resultant amplitude of the superposition is zero, what is the phase difference $\Delta\phi$?

[Question ID = 29826][Question Description = M.Sc.SPSM_Q035]
1. 2π

[Option ID = 173202]
2. $\pi/6$

[Option ID = 173203]
3. $\pi/3$

[Option ID = 173204]
4. $\pi/2$

[Option ID = 173205]

36) A different gratting of length 2.5 x 10^{-2} m is illumnated by a light with two wavelengths 5997 Å and 6003 Å. The maximum size of the grating element d (in μm) required to resolve the two wavwlength in the first order is

[Question ID = 31173][Question Description = N_M.Sc.SPSM_Q036]
1. 75

[Option ID = 201296]
2. 50

[Option ID = 201297]
3. 25

[Option ID = 201298]
4. 100

[Option ID = 201299]

37) Let λ be the wavelength of incident light. The diffraction pattern of a circular aperture of

dimension r_0 will transform from Fresnel to Fraunhofer region if the screen distance z is,

[Question ID = 29828][Question Description = M.Sc.SPSM_Q037]

1. $z \gg r_0^2/\lambda$

[Option ID = 173210]

2. $z \gg \lambda^2/r_0$

[Option ID = 173211]

3. $z \ll \lambda^2/r_0$

[Option ID = 173212]

4. $z \ll r_0^2/\lambda$

[Option ID = 173213]

38) A point isotropic source generates sound oscillations with frequency ν. At a distance r_0 from the source the displacement amplitude of particles of the medium is equal to a_0 and at the point A located at a distance r from the source the displacement amplitude is η times less than a_0. The damping coefficient γ of the wave will be

[Question ID = 29829][Question Description = M.Sc.SPSM_Q038]

1. $\frac{\ln(r_0/\eta r)}{r-r_0}$

[Option ID = 173214]

2. $\frac{\ln(\eta r_0/r)}{r-r_0}$

[Option ID = 173215]

3. $\frac{\ln(\eta r/r_0)}{r-r_0}$

[Option ID = 173216]

4. $\frac{\ln(r/\eta r_0)}{r-r_0}$

[Option ID = 173217]

39)

A point performs damped oscillations with frequency $\omega = 25\ s^{-1}$. What will be the damping coefficient if at the initial moment the velocity of the point is equal to zero and its displacement from the equilibrium position is $\eta = 1.020$ times less than the amplitude at that moment ?

[Question ID = 29830][Question Description = M.Sc.SPSM_Q039]

1. 2.5 s^{-1} [Option ID = 173218]
2. 5 s^{-1} [Option ID = 173219]
3. 25 s^{-1} [Option ID = 173220]
4. 50 s^{-1} [Option ID = 173221]

40)

A point performs harmonic oscillations along a straight line with a period $T = 0.60$ s and an amplitude $a = 10.0$ cm. What will be the mean velocity of the point averaged over the time interval during which it travels a distance $a/2$, starting from the extreme position?

[Question ID = 29831][Question Description = M.Sc.SPSM_Q040]

1. 1.0 ms^{-1} [Option ID = 173222]
2. 4.0 ms^{-1} [Option ID = 173223]
3. 2.0 ms^{-1} [Option ID = 173224]
4. 0.5 ms^{-1} [Option ID = 173225]

41) Group I contains x- and y- components of the electric field and Group II contains the type of polarization of light.

	Group I	Group II
P.	$E_x = \frac{E_0}{\sqrt{2}} cos(\omega t + kz)$ $E_y = E_0 sin(\omega t + kz)$	I. Linearly Polarized
Q.	$E_x = E_0 sin(\omega t + kz)$ $E_y = E_0 cos(\omega t + kz)$	II. Circularly Polarized
R.	$E_x = E_1 sin(\omega t + kz)$ $E_y = E_2 sin(\omega t + kz)$	III. Unpolarized
S.	$E_x = E_0 sin(\omega t + kz)$	

$E_y = E_0 sin(\omega t + kz + \pi/4)$	IV. Elliptically Polarized

Choose the **correct** answer from the options given below:

[Question ID = 29832][Question Description = M.Sc.SPSM_Q041]

1. P - 4, Q - 2, R - 4 , S - 1

   [Option ID = 173226]
2. P - 1, Q - 3 , R -1 , S - 4

   [Option ID = 173227]
3. P - 4 , Q -2 , R -1 , S - 4

   [Option ID = 173228]
4. P - 3, Q - 1 , R - 3, S - 2

   [Option ID = 173229]

42) White light, with a uniform intensity across the visible wavelength range, is perpendicularly incident on a water film, of index of refraction n2 = 1.33 and thickness L = 320 nm, that is suspended in air. At what wavelength λ is the light reflected by the film brightest to an observer?
[Question ID = 26497][Question Description = M.Sc.SPSM_Q042]

1. 567 nm [Option ID = 193374]
2. 340 nm [Option ID = 193375]
3. 493 nm [Option ID = 193376]
4. 619 nm [Option ID = 193377]

43) The magnitude of the induced e.m.f. in a conductor depends on the[Question ID = 26498][Question Description = M.Sc.SPSM_Q043]

1. flux density of the magnetic field [Option ID = 193378]
2. amount of flux cut [Option ID = 193379]
3. amount of flux-linkages [Option ID = 193380]
4. rate of change of flux-linkages [Option ID = 193381]

44) A sphere of radius R carries a polarization $\boldsymbol{P}(\boldsymbol{r}) = k\boldsymbol{r}$, where k is a constant and $\boldsymbol{r}$, is the vector from the center. The volume charge density will be

[Question ID = 29833][Question Description = M.Sc.SPSM_Q044]

1. $3k$

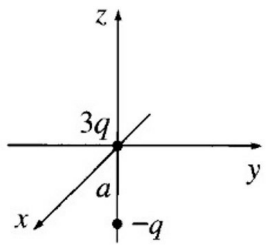
   [Option ID = 173230]
2. $-3k$

   [Option ID = 173231]
3. $2k$

   [Option ID = 173232]
4. $-2k$

   [Option ID = 173233]

45) Two point charges, $3q$ and $-q$ are separated by a distance a. For the arrangement as shown in the figure, what is the dipole moment?



[Question ID = 29834][Question Description = M.Sc.SPSM_Q045]

1. $2qa\hat{z}$

   [Option ID = 173234]
2. $qa\hat{y}$

   [Option ID = 173235]
3. $qa\hat{z}$

   [Option ID = 173236]
4. $2qa\hat{y}$

   [Option ID = 173237]

46) For a parallel plate capacitor, if the value of capacitance is $3\mu F$, applied voltage is $1000V$, then energy stored in capacitor is,

[Question ID = 29835][Question Description = M.Sc.SPSM_Q046]

1. 1.5 J [Option ID = 173238]
2. 0.15 J [Option ID = 173239]
3. 15 J [Option ID = 173240]
4. 150 J [Option ID = 173241]

47) The potential for a charge distribution is defined as,

$$V = 0, \mathbf{A} = \frac{\mu_0 k}{4c}(ct - |x|)^2 \hat{z}, \text{ for } |x| < ct, \text{ and } \mathbf{A} = 0, \text{ for } |x| > ct,$$

where k is a constant and c is the speed of light. The magnetic field will be

[Question ID = 29836][Question Description = M.Sc.SPSM_Q047]

1. $-\frac{\mu_0 k}{2}(ct - |x|)\hat{z}$

   [Option ID = 173242]
2. $\pm\frac{\mu_0 k}{4c}(ct - |x|)\hat{x}$

   [Option ID = 173243]
3. $\frac{\mu_0 k}{4}(ct - |x|)\hat{z}$

   [Option ID = 173244]
4. $\pm\frac{\mu_0 k}{2c}(ct - |x|)\hat{y}$

   [Option ID = 173245]

48) Which one remains invariant under Lorentz-Transformation?

[Question ID = 29837][Question Description = M.Sc.SPSM_Q048]

1. D'Alembertian operator $\left(\nabla^2 - \frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right)$

   [Option ID = 173246]
2. Four-dimensional spacetime interval $x^2 + y^2 + z^2 - c^2t^2$

   [Option ID = 173247]
3. $E^2 - p^2c^2$

   [Option ID = 173248]
4. All of these

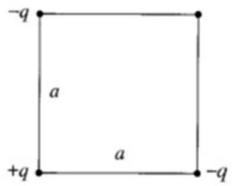
   [Option ID = 173249]

49) The transmission coefficient for glass-air interface (with refractive index $n_g = 1.5$ and $n_a = 1.0$), for normal incidence will be

[Question ID = 29838][Question Description = M.Sc.SPSM_Q049]

1. 0.96 [Option ID = 173250]
2. 0.04 [Option ID = 173251]
3. 0.84 [Option ID = 173252]
4. 0.16 [Option ID = 173253]

50) Three charges are situated at the corners of a square (side a), as shown in the below figure. How much work does it take to bring in another charge, $+q$, from far away and place it in the fourth corner?



[Question ID = 29839][Question Description = M.Sc.SPSM_Q050]

1. $\frac{q}{4\pi\epsilon_0 a}(2 + 1/\sqrt{2})$

   [Option ID = 173254]
2. $\frac{q^2}{4\pi\epsilon_0 a}(-2 + 1/\sqrt{2})$

   [Option ID = 173255]
3. $\frac{q^2}{4\pi\epsilon_0 a}(2 + 1/\sqrt{2})$

   [Option ID = 173256]
4. $\frac{q^2}{4\pi\epsilon_0}(a + 1/\sqrt{2})$

   [Option ID = 173257]

51) The Coulomb's law is an implication of which law

[Question ID = 26499][Question Description = M.Sc.SPSM_Q051]

1. Ampere's law

   [Option ID = 193382]
2. Gauss's law

   [Option ID = 193383]
3. Biot-Savart law

[Option ID = 193384]

4. Lenz law

[Option ID = 193385]

52) Find the electric field of a potential function given by $20 \log x + y$, at the point $(1, 1, 0)$

[Question ID = 29840][Question Description = M.Sc.SPSM_Q052]

1. $-\hat{i} - 20\hat{j}$

[Option ID = 173258]

2. $(\hat{i} + \hat{j})/20$

[Option ID = 173259]

3. $20\hat{i} + \hat{j}$

[Option ID = 173260]

4. $-20\hat{i} - \hat{j}$

[Option ID = 173261]

53)

The magnetic field intensity due to a solenoid of length 12 cm having 30 turns and current of 15 A is

[Question ID = 32537][Question Description = M.Sc.SPSM_Q053]

1. 175 A/m [Option ID = 173262]
2. 250 A/m [Option ID = 173263]
3. 325 A/m [Option ID = 173264]
4. 375 A/m [Option ID = 173265]

54) A solid conductor with relative permeability $\mu_r = 200$, conductivity $\sigma = 5 \times 10^6$ mho/m having outer diameter 8 mm and length 2 mm. If the total current carried by the conductor is I(t)=2 cos(π 10^4 t) A. Find the skin depth.

[Question ID = 32538][Question Description = M.Sc.SPSM_Q054]

1. 0.225 mm

[Option ID = 173266]

2. 2.25 mm

[Option ID = 173267]

3. 0.16 mm

[Option ID = 173268]

4. 1.6 mm

[Option ID = 173269]

55) The electric field in some regions is found to be $\mathbf{E} = kr^3\hat{r}$, in spherical coordinates (k is some constant). The charge density ρ will be (where ε_0 is the permittivity of free space)

[Question ID = 32539][Question Description = M.Sc.SPSM_Q055]

1. $5\varepsilon_0 kr^2$

[Option ID = 173270]

2. $5\varepsilon_0 k/r^2$

[Option ID = 173271]

3. $5k/\varepsilon_0 r^2$

[Option ID = 173272]

4. $5\varepsilon_0 kr^3$

[Option ID = 173273]

56) Alfvén's flux freezing theorem is related to magnetized fluid of

[Question ID = 26500][Question Description = M.Sc.SPSM_Q056]

1. finite conductivity

[Option ID = 193386]

2. infinite conductivity

[Option ID = 193387]

3. large viscosity

[Option ID = 193388]

4. All of these

[Option ID = 193389]

57) An ideal gas expands isothermally (at temperature T) from volume V_1 to V_2. The entropy change per mole is

[Question ID = 32540][Question Description = M.Sc.SPSM_Q057]

1. $R(V_2/V_1)$

[Option ID = 173274]

2. $R(V_1/V_2)$

[Option ID = 173275]

3. $R\ln(V_2/V_1)$

[Option ID = 173276]

4. $R\ln(V_1/V_2)$

[Option ID = 173277]

58) A gas obeys the van der Waals equation of state:

$$(P + a/v^2)\,(v - b) = RT,$$

where symbols have their usual meaning. This system exhibits two distinct phases only when

[Question ID = 32541][Question Description = M.Sc.SPSM_Q058]

1. a>0, b>0

[Option ID = 173278]

2. a=0, b>0

[Option ID = 173279]

3. a>0, b=0

[Option ID = 173280]

4. a=0, b=0

[Option ID = 173281]

59) Consider the phase diagram of a simple fluid. Which of the following statements is correct?[Question ID = 26501][Question Description = M.Sc.SPSM_Q059]

1. There is a point where a third-order phase transition is seen. [Option ID = 193390]
2. A line of first-order transitions ends in a critical point. [Option ID = 193391]
3. A line of second-order transitions separates the liquid and solid phases. [Option ID = 193392]
4. The triple point coincides with the critical point. [Option ID = 193393]

60) An engine has heat input at 127° C and releases it at 27° C. The maximum possible efficiency of this engine is

[Question ID = 26502][Question Description = M.Sc.SPSM_Q060]

1. 0.15

[Option ID = 193394]

2. 0.2

[Option ID = 193395]

3. 0.25

[Option ID = 193396]

4. 0.3

[Option ID = 193397]

61) In an adiabatic process, the pressure and volume of a monoatomic gas are related as $P \propto V^{-x}$. The value of x is

[Question ID = 32542][Question Description = M.Sc.SPSM_Q061]

1. 3/5 [Option ID = 173282]
2. 5/3 [Option ID = 173283]
3. 2/5 [Option ID = 173284]
4. 5/2 [Option ID = 173285]

62) C_P and C_V are the specific heats of a gas at constant pressure and volume, respectively. Which of the following statements is correct?

[Question ID = 32543][Question Description = M.Sc.SPSM_Q062]

1. $C_P > C_V$

[Option ID = 173286]

2. $C_P = C_V$

[Option ID = 173287]

3. $C_P < C_V$

[Option ID = 173288]

4. C_P may be greater or less than C_V, depending on the gas.

[Option ID = 173289]

63) A gas with molecules of mass m is confined to one dimension. It obeys the Maxwell-Boltzmann distribution at temperature T $\left[\beta = (k_B T)^{-1}\right]$. The average speed of the molecules is

[Question ID = 32544][Question Description = M.Sc.SPSM_Q063]

1. 0

[Option ID = 173290]

2. $\sqrt{\frac{2}{\pi m\beta}}$

[Option ID = 173291]

3. $\sqrt{\frac{4}{\pi m\beta}}$

[Option ID = 173292]

4. $\sqrt{\frac{6}{\pi m\beta}}$

[Option ID = 173293]

64) A 1-dimensional classical harmonic oscillator has mass m and spring constant b. The temperature of the system is T. Let x denote the displacement from the origin. Then, $\langle x^2 \rangle$ equals

[Question ID = 32545][Question Description = M.Sc.SPSM_Q064]

1. $k_B T/(8b)$

[Option ID = 173294]

2. $k_B T/(4b)$

[Option ID = 173295]

3. $k_B T/(2b)$

[Option ID = 173296]

4. $k_B T/b$

[Option ID = 173297]

65) An ideal gas at temperature T $[\beta = (k_B T)^{-1}]$ is confined to a surface. The most probable speed of the molecules (with mass m) is

[Question ID = 32546][Question Description = M.Sc.SPSM_Q065]

1. 0

[Option ID = 173298]

2. $\sqrt{\frac{1}{4m\beta}}$

[Option ID = 173299]

3. $\sqrt{\frac{1}{2m\beta}}$

[Option ID = 173300]

4. $\sqrt{\frac{1}{m\beta}}$

[Option ID = 173301]

66) An atom has three discrete energy levels: $0, \epsilon, 2\epsilon$ where $\epsilon > 0$. The temperature of the system is $T[\beta = (k_B T)^{-1}]$. The probability of the atom being in the highest energy level is

[Question ID = 32547][Question Description = M.Sc.SPSM_Q066]

1. $1/[1 + \exp(-\beta\epsilon) + \exp(-2\beta\epsilon)]$

[Option ID = 173302]

2. $1/[1 + \exp(\beta\epsilon) + \exp(2\beta\epsilon)]$

[Option ID = 173303]

3. $\exp(-2\beta\epsilon)/[1 + \exp(-\beta\epsilon) + \exp(-2\beta\epsilon)]$

[Option ID = 173304]

4. $\exp(2\beta\epsilon)/[1 + \exp(\beta\epsilon) + \exp(2\beta\epsilon)]$

[Option ID = 173305]

67) In a crystal, the vibrations of atoms about their fixed positions are referred to as[Question ID = 26503][Question Description = M.Sc.SPSM_Q067]

1. photons [Option ID = 193398]
2. phonons [Option ID = 193399]
3. excitons [Option ID = 193400]
4. polarons [Option ID = 193401]

68) A black-body at absolute temperature T is heated to $3T$. The rate of energy emission increases by a factor of

[Question ID = 32548][Question Description = M.Sc.SPSM_Q068]

1. 3

   [Option ID = 173306]
2. 9

   [Option ID = 173307]
3. 27

   [Option ID = 173308]
4. 81

   [Option ID = 173309]

69) Consider a gas of electrons with density n. We denote the Fermi energy as ϵ_F. Which of the following statements is correct?

[Question ID = 32549][Question Description = M.Sc.SPSM_Q069]

1. $\epsilon_F \sim n^{2/3}$

   [Option ID = 173310]
2. $\epsilon_F \sim n^{-2/3}$

   [Option ID = 173311]
3. $\epsilon_F \sim n^{1/3}$

   [Option ID = 173312]
4. $\epsilon_F \sim n^{-1/3}$

   [Option ID = 173313]

70) A magnetic ion in a magnetic field $h\hat{z}$ has energy $-\mu_B h \cos\theta$, where θ is the angle made with the $+z$-direction. The quantum states of this ion correspond to projections along the $+z$ and $-z$ directions. The average magnetization at temperature T $[\beta = (k_B T)^{-1}]$ is

[Question ID = 32550][Question Description = M.Sc.SPSM_Q070]

1. 0

   [Option ID = 173314]
2. $\mu_B \sinh(\beta\mu_B h)$

   [Option ID = 173315]
3. $\mu_B \cosh(\beta\mu_B h)$

   [Option ID = 173316]
4. $\mu_B \tanh(\beta\mu_B h)$

   [Option ID = 173317]

71) The Helium isotope $^{6}_{2}He$ is unstable. what kind of decay would you expect to undergo?

[Question ID = 26504][Question Description = M.Sc.SPSM_Q071]

1. Positive beta decay

   [Option ID = 193402]
2. Negative beta decay

   [Option ID = 193403]
3. Alpha decay

   [Option ID = 193404]
4. None of above

   [Option ID = 193405]

72) Consequence of Heisenberg uncertainty principle. which of the following is NOT correct

[Question ID = 26505][Question Description = M.Sc.SPSM_Q072]

1. An electron in a atom can not be described by a well define orbit

   [Option ID = 193406]
2. The position of atom can not be measured exactly

   [Option ID = 193407]
3. The momentum of electron can not be measured exactly

   [Option ID = 193408]
4. A harmonic Oscillator possesses a zero point energy

   [Option ID = 193409]

73) If a rod is to appear shrunken by half along its direction of motion, at what speed should rod travel?

[Question ID = 26506][Question Description = M.Sc.SPSM_Q073]

1. 1.45×10^8 m/s

   [Option ID = 193410]
2. 2.45×10^8 m/s

   [Option ID = 193411]
3. 1.45×10^7 m/s

   [Option ID = 193412]
4. 2.45×10^7 m/s

[Option ID = 193413]

74) A 100MeV electron moves along the axis of an evacuated tube of length 4m fixed to the laboratory frame. What length of the tube would be measured by the observer moving with the electron?[Question ID = 26507][Question Description = M.Sc.SPSM_Q074]

1. 2 cm [Option ID = 193414]
2. 4 cm [Option ID = 193415]
3. 6 cm [Option ID = 193416]
4. 8 cm [Option ID = 193417]

75) Find the effective mass of a photon for wavelength (λ) = 5,000 Å

[Question ID = 26508][Question Description = M.Sc.SPSM_Q075]

1. 4.4×10^{-34} kg

   [Option ID = 193418]
2. 4.4×10^{-35} kg

   [Option ID = 193419]
3. 4.4×10^{-36} kg

   [Option ID = 193420]
4. 4.4×10^{-37} kg

   [Option ID = 193421]

76) Consider the decay of muon at rest. If the energy released is divided equally among the final leptons, what will be the angle between paths of any two leptons? (neglect the mass of leptons compared to the mass of muon)

[Question ID = 26509][Question Description = M.Sc.SPSM_Q076]

1. 60^o

   [Option ID = 193422]
2. 90^o

   [Option ID = 193423]
3. 120^o

   [Option ID = 193424]
4. 150^o

   [Option ID = 193425]

77) An electron is trapped in an infinitely deep potential well of width L = 10^6 fm. Calculate the wavelength of photon emitted from the transition E4 → E3

[Question ID = 26510][Question Description = M.Sc.SPSM_Q077]

1. 4665 nm

   [Option ID = 193426]
2. 4715 nm

   [Option ID = 193427]
3. 5000 nm

   [Option ID = 193428]
4. 5515 nm

   [Option ID = 193429]

78) Calculate the maximum change in the wavelength of Compton scattered radiation.

[Question ID = 26511][Question Description = M.Sc.SPSM_Q078]

1. 0.0385 Å

   [Option ID = 193430]
2. 0.0485 Å

   [Option ID = 193431]
3. 0.0585 Å

   [Option ID = 193432]
4. 0.0685 Å

   [Option ID = 193433]

79) All vibrations producing a charge in the electric dipole moment of a molecule yield

[Question ID = 29805][Question Description = M.Sc.SPSM_Q079]

1. Raman Spectra

   [Option ID = 193434]
2. Infrared Spectra

   [Option ID = 193435]
3. Ultra-violet Spectra

   [Option ID = 193436]
4. X-ray Spectra

   [Option ID = 193437]

80) The continuous X-ray spectrum is the result of

[Question ID = 29806][Question Description = M.Sc.SPSM_Q080]

1. Auger effect

   [Option ID = 193438]
2. Compton effect

   [Option ID = 193439]
3. Photoelectric effect

[Option ID = 193440]
4. Inverse photoelectric effect

[Option ID = 193441]

81) Addition of Binary number 1001100 and 1111010 is

[Question ID = 29807][Question Description = M.Sc.SPSM_Q081]
1. 11001100

[Option ID = 193442]
2. 11000110

[Option ID = 193443]
3. 10101000

[Option ID = 193444]
4. 11100011

[Option ID = 193445]

82) If the inputs of an exclusive-NOR gate are A and B, what is the output?[Question ID = 29808][Question Description = M.Sc.SPSM_Q082]
1. A'B'+AB' [Option ID = 193446]
2. A'B'+AB [Option ID = 193447]
3. A'B+AB' [Option ID = 193448]
4. A'B+AB [Option ID = 193449]

83) Convert decimal $(0.15625)_{10}$ to binary number[Question ID = 29809][Question Description = M.Sc.SPSM_Q083]
1. $(0.11001)_2$ [Option ID = 193450]
2. $(0.00101)_2$ [Option ID = 193451]
3. $(0.11100)_2$ [Option ID = 193452]
4. $(0.00011)_2$ [Option ID = 193453]

84) If the surface leakage current is 5 nA for a reverse voltage of 60 V, what is the surface leakage current for a reverse voltage of 75 V? [Question ID = 29810][Question Description = M.Sc.SPSM_Q084]
1. 2.25 nA [Option ID = 193454]
2. 6.25 nA [Option ID = 193455]
3. 12.25 nA [Option ID = 193456]
4. 20.25 nA [Option ID = 193457]

85) A transistor has a collector current of 3 mA. If the current gain is 155, what is the base current?[Question ID = 29811][Question Description = M.Sc.SPSM_Q085]
1. 2 μA [Option ID = 193458]
2. 10 μA [Option ID = 193459]
3. 19 μA [Option ID = 193460]
4. 39 μA [Option ID = 193461]

86) Potassium is illuminated with ultraviolet light of wavelength 2500 Å. If the work function of Potassium is 2.20 eV, what is the maximum kinetic energy of the emitted electrons?

($h = 6.63 \times 10^{-34}$ Js, $c = 3 \times 10^{8}$ ms^{-1})

[Question ID = 29812][Question Description = M.Sc.SPSM_Q086]
1. 0.12 eV

[Option ID = 193462]
2. 2.76 eV

[Option ID = 193463]
3. 4.26 eV

[Option ID = 193464]
4. 8.10 eV

[Option ID = 193465]

87) How fast does a rocket ship have to go for its length to be contracted to 90% of its rest length?[Question ID = 29813][Question Description = M.Sc.SPSM_Q087]
1. 1.30×10^{8} ms^{-1} [Option ID = 193466]
2. 4.25×10^{10} ms^{-1} [Option ID = 193467]
3. 3.14×10^{12} ms^{-1} [Option ID = 193468]
4. 2.41×10^{15} ms^{-1} [Option ID = 193469]

88) A material whose K absorption edge is 0.20 Å is irradiated with 0.15 Å X-rays. What is the maximum kinetic energy of photoelectrons that are emitted from the K-shell?

($h = 6.63 \times 10^{-34}$Js, $c = 3 \times 10^{8}$ ms^{-1})

[Question ID = 29814][Question Description = M.Sc.SPSM_Q088]
1. 2.6 keV

[Option ID = 193470]
2. 10.8 keV

[Option ID = 193471]
3. 20.7 keV

[Option ID = 193472]
4. 31.5 keV

[Option ID = 193473]

89) A sample of a certain element is placed in a 0.500 T magnetic field and suitably excited. How far apart are the Zeeman components of the 550 nm spectral line of this element?

($e = 1.6 \times 10^{-19}$ C , $m_e = 9.11 \times 10^{-31}$ kg)

[Question ID = 29815][Question Description = M.Sc.SPSM_Q089]

1. 0.001 nm

[Option ID = 193474]

2. 0.007 nm

[Option ID = 193475]

3. 0.019 nm

[Option ID = 193476]

4. 0.040 nm

[Option ID = 193477]

90) What magnetic flux density B is required to observe the Zeeman effect if a spectrometer can resolve spectral lines separated by 0.45 Å at 5000 Å?

[$h = 6.63 \times 10^{-34}$Js, $c = 3 \times 10^{8}$ ms^{-1}, $(eh/4\pi m) = 5.79 \times 10^{-5}$ eV/T]

[Question ID = 29816][Question Description = M.Sc.SPSM_Q090]

1. 1.23 T (Approx.)

[Option ID = 193478]

2. 3.85 T (Approx.)

[Option ID = 193479]

3. 6.25 T (Approx.)

[Option ID = 193480]

4. 10.33 T (Approx.)

[Option ID = 193481]

91) Let's use Cu K_α (wavelength 0.154 nm) x-ray radiation to perform diffraction measurements. Find the lattice parameter of face centered cubic (fcc) nickel element when the Bragg's angle is 45° for its (220) reflection.

[Question ID = 29817][Question Description = M.Sc.SPSM_Q091]

1. 0.308 nm

[Option ID = 193482]

2. 0.352 nm

[Option ID = 193483]

3. 0.218 nm

[Option ID = 193484]

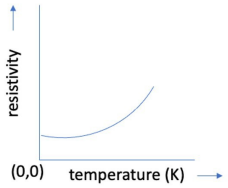
4. 0.616 nm

[Option ID = 193485]

92) Which one of the following shows the resistivity behavior of metals with temperature?Let's take a piece of silicon at room temperature (300 K) having the intrinsic carrier concentration 2.4×10^{10} per cm^3. Now we dope it with 8×10^{18} boron atoms per cm^3.

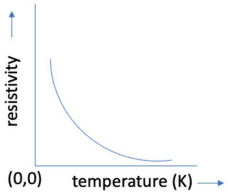
[Question ID = 32551][Question Description = M.Sc.SPSM_Q092]

1.



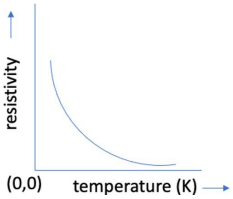
[Option ID = 173318]

2.



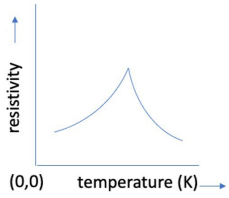
[Option ID = 173319]

3.



[Option ID = 173320]

4.



[Option ID = 173321]

93) Let's take a piece of Silicon at room temperature (300 K) having the intrinsic carrier concentration 2.4×10^{10} per cm^3. Now we dope it with 8

× 10^{18} boron per cm^3.

Find the type of semiconductor produced.

[Question ID = 29818][Question Description = M.Sc.SPSM_Q093]

1. n-type

   [Option ID = 193486]
2. p-type

   [Option ID = 193487]
3. intrinsic

   [Option ID = 193488]
4. none of the above

   [Option ID = 193489]

94) Let's take a piece of Silicon at room temperature (300 K) having the intrinsic carrier concentration 2.4 × 10^{10} per cm^3. Now we dope it with 8 × 10^{18} boron per cm^3.

Find the concentration of electrons in the sample.

[Question ID = 29819][Question Description = M.Sc.SPSM_Q094]

1. 72 cm^{-3}

   [Option ID = 193490]
2. 2.3 x 10^{-9} cm^{-3}

   [Option ID = 193491]
3. 4.3 x 10^{8} cm^{-3}

   [Option ID = 193492]
4. 3.1 x 10^{-2} cm^{-3}

   [Option ID = 193493]

95) Consider a p-n junction in unbiased condition at thermal equilibrium. Which one of the following is true?[Question ID = 29820][Question Description = M.Sc.SPSM_Q095]

1. net current flows in the direction from n to p [Option ID = 193494]
2. net current flows in the direction from p to n [Option ID = 193495]
3. no net current flows [Option ID = 193496]
4. none of the above [Option ID = 193497]

96) Consider a p-type semiconductor at 300 K (kT=0.026 eV) where the Fermi level lies 0.5 eV above the valence band (VB) and 0.4 eV below the conduction band (CB). If we increase the concentration of the acceptor atoms by 4 times, find the new position of the Fermi level.

[Question ID = 29821][Question Description = M.Sc.SPSM_Q096]

1. 0.042 eV below the CB

   [Option ID = 193498]
2. 0.036 eV below the CB

   [Option ID = 193499]
3. 0.464 eV above the VB

   [Option ID = 193500]
4. 0.536 eV above the VB

   [Option ID = 193501]

97) Which of the following crystal structure has 4 Bravais lattices?[Question ID = 29822][Question Description = M.Sc.SPSM_Q097]

1. Tetragonal [Option ID = 193502]
2. Hexagonal [Option ID = 193503]
3. Monoclinic [Option ID = 193504]
4. Orthorhombic [Option ID = 193505]

98) Find the ratio of atomic density between bcc crystal and simple cubic.

[Question ID = 32497][Question Description = M.Sc.SPSM_Q098]

1. 2:1

   [Option ID = 193506]
2. 4:1

   [Option ID = 193507]
3. 1:2

   [Option ID = 193508]
4. 1:4

   [Option ID = 193509]

99) Let's take a plane that makes an intercept of 0.3 nm, 0.4 nm, and 0.5 nm on the coordinate axes of an orthorhombic crystal system having a:b:c in the ratio of 1:2:5. Find the Miller indices of the said plane.

[Question ID = 32498][Question Description = M.Sc.SPSM_Q099]

1. (236)

   [Option ID = 193510]
2. (345)

   [Option ID = 193511]
3. (125)

   [Option ID = 193512]
4. (321)

   [Option ID = 193513]

100) When we measure the diffraction pattern of a face centered cubic (fcc) material using x-rays (λ=0.154 nm), only one peak is observed at 2θ=121°, find the interplanar spacing of next possible higher index peak.

[Question ID = 32499][Question Description = M.Sc.SPSM_Q100]

1. 0.0885 nm

   [Option ID = 193514]
2. 0.153 nm

   [Option ID = 193515]
3. 0.0765 nm

   [Option ID = 193516]
4. none of the above

   [Option ID = 193517]