Test Your fiziks concepts!

Topic: Electromagnetic Theory

(For CSIR NET-JRF, GATE, JEST and TIFR Aspirants)

Q. The work done in moving a $-5\,\mu C$ charge in an electric field $\vec{E}=\left(8r\sin\theta\hat{r}+4r\cos\theta\hat{\theta}\right)V/m$ from a point $A(r,\theta)=\left(10,\frac{\pi}{6}\right)$ to a point $B(r,\theta)=\left(10,\frac{\pi}{2}\right)$, is:

(a) $3\,mJ$ (b) $2\,mJ$ (c) $1\,mJ$ (d) $0.5\,mJ$

Ans.: (c)

Solution.: $r=10,\theta:\pi/6\to\pi/2,dr=0$

$$W=\int\vec{F}\cdot d\vec{l}=\int q\vec{E}\cdot d\vec{l}=-5\times10^{-6}\int\left[8r\sin\theta\hat{r}+4r\cos\theta\hat{\theta}\right]\cdot\left(dr\hat{r}+rd\theta\hat{\theta}\right)$$

$$=-5\times10^{-6}\int_{\pi/6}^{\pi/2}\left[4r^2\cos\theta d\theta\right]=-5\times10^{-6}\times4\times(10)^2\left[-\sin\theta\right]_{\pi/6}^{\pi/2}$$

$$=-20\times10^{-4}\left[-\sin\frac{\pi}{2}+\sin\frac{\pi}{6}\right]=-20\times10^{-4}\left(-1+\frac{1}{2}\right)=1\,mJ$$

Note:

For detailed solutions, visit the *Free Download* section at www.physicsbyfiziks.com

Test Your fiziks concepts!

Topic: Solid State Physics

(For IIT-JAM, JEST, TIFR and CUET Aspirants)

Q. Brillouin zone is:

(A) Wigner-Seitz cell of reciprocal lattice

(B) Primitive unit cell

(C) The locus of all k-values in the reciprocal lattice which are Bragg reflected

(D) Wigner-Seitz cell of direct lattice

The correct statement are:

(a) A, B and D only (b) A, B and C only

(c) A, B, C and D (d) B, C and D only

Ans.: (b)

Note:

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Test Your fiziks concepts!

Topic: Mechanics

(For PGT: KVS, NVS, DSSSB, State Education Boards, etc.)

Q. For a force $\vec{F}$ to be conservative, the relations to be satisfied are:

(A) $\frac{\partial F_y}{\partial x}-\frac{\partial F_x}{\partial y}=0$ (B) $\frac{\partial F_z}{\partial y}-\frac{\partial F_y}{\partial z}=0$

(C) $\frac{\partial F_x}{\partial z}-\frac{\partial F_z}{\partial x}=0$ (D) $\frac{\partial F_y}{\partial x}-\frac{\partial F_x}{\partial y}=\frac{\partial F_z}{\partial y}-\frac{\partial F_y}{\partial z}=\frac{\partial F_x}{\partial z}-\frac{\partial F_y}{\partial x}\neq 0$

Choose the correct answer from the options given below:

(a) A and B only (b) A, B and C only

(c) B, C and D only (d) A, B, C and D only

Ans.: (b)

Solution.: For conservative force $\vec{\nabla}\times\vec{F}=0\Rightarrow\begin{vmatrix}\hat{x} & \hat{y} & \hat{z}\\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z}\\ F_x & F_y & F_z\end{vmatrix}=0$

Note:

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Test Your fiziks concepts!

Topic: Electromagnetic Theory

(For CSIR NET-JRF, GATE, JEST and TIFR Aspirants)

Q. A small charged spherical shell of radius $0.01m$ is at a potential of $30V$. The electrostatic energy of the shell is

(a) 10^{-10} J (b) 5×10^{-10} J (c) 5×10^{-9} J (d) 10^{-9} J

Ans.: (b)

Solution.: $V=\dfrac{q}{4\pi\varepsilon_0 R}$ and $W=\dfrac{q^2}{8\pi\varepsilon_0 R}$.

Thus, $W=\dfrac{\left(4\pi\varepsilon_0 VR\right)^2}{8\pi\varepsilon_0 R}=\dfrac{4\pi\varepsilon_0 V^2R}{2}=\dfrac{900\times10^{-2}}{9\times10^9\times2}=0.5\times10^{-9}=5\times10^{-10}$ Joules

Note:

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Test Your fiziks concepts!

Topic: Solid State Physics

(For IIT-JAM, JEST, TIFR and CUET Aspirants)

Q. Arrange the following in ascending order in accordance to coordination number

(A). Face centered cubic structured *Au*

(B). Body centered cubic structured *Na*

(C). Diamond

(D). *NaCl*

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

(a). (A), (B), (D), (C)

(b). (A), (B), (C), (D)

(c). (B), (A), (D), (C)

(d). (C), (B), (D), (A)

Ans.: (d)

Note:

For detailed solutions, visit the *Free Download* section at www.physicsbyfiziks.com

Test Your fiziks concepts!

Topic: Mechanics

(For PGT: KVS, NVS, DSSSB, State Education Boards, etc.)

Q. For a system of particles, if the external net force acting on the system is zero, the system's center of mass is:

(a) at rest
(b) moving at a constant velocity
(c) accelerating
(d) rotating

Ans.: (b)

Solution.: The center of mass of a system behaves like a point particle with the total mass of the system, subject to Newton's second law: $M\vec{a}_{cm} = \vec{F}_{ext}$

If the **net external force** $\vec{F}_{ext}$ is zero, then: $\vec{a}_{cm} = 0$

This means the velocity of the center of mass is constant. It could be zero (rest) or non-zero (constant velocity)-both are special cases of constant velocity.

Note:

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