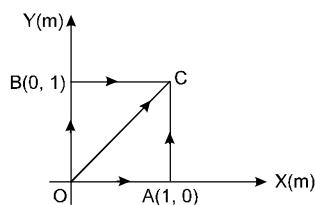


1. A particle is moving in a conservative force field point A to point B. U_A and U_B are the potential energies of the particle at points A and B and W_c is the work done in the process of taking the particle from A to B.
- (A) $W_c = U_B - U_A$ (B) $W_c = U_A - U_B$ (C) $U_A > U_B$ (D) $U_B > U_A$
2. A particle is taken from point A to point B under the influence of a force field. Now it is taken back from B to A and it is observed that the work done in taking the particle from A to B is not equal to the work done in taking it from B to A. If W_{nc} and W_c is the work done by non-conservative forces and conservative forces present in the system respectively, ΔU is the change in potential energy, Δk is the change kinetic energy, then
- (A) $W_{nc} - \Delta U = \Delta k$ (B) $W_c = -\Delta U$ (C) $W_{nc} + W_c = \Delta k$ (D) $W_{nc} - \Delta U = -\Delta k$

COMPREHENSION # 2

One of the forces acting on a certain particle depends on the particle's position in the xy-plane. This force $\vec{F}$ expressed in newtons, is given by the expression $\vec{F} = (xy\hat{i} + xy\hat{j})$ where x and y are in metres. The particle is moved from O to C through three different paths



3. The work done by this force on path OC is
- (A) $\frac{1}{2} \text{ J}$ (B) $-\frac{1}{2} \text{ J}$ (C) $\frac{2}{3} \text{ J}$ (D) $-\frac{2}{3} \text{ J}$
4. The work done by this force on path OAC is
- (A) $\frac{1}{2} \text{ J}$ (B) $-\frac{1}{2} \text{ J}$ (C) $\frac{2}{3} \text{ J}$ (D) $-\frac{2}{3} \text{ J}$
5. The work done by this force on path OBC is
- (A) $\frac{1}{2} \text{ J}$ (B) $-\frac{1}{2} \text{ J}$ (C) $\frac{2}{3} \text{ J}$ (D) $-\frac{2}{3} \text{ J}$
6. The force $\vec{F}$ is
- (A) Conservative (B) Non-Conservative
(C) Can't be determined (D) None of these
7. The potential energy function of a particle in a region of space is given as $U = (2x^2 + 3y^3 + 2z) \text{ J}$. Here x, y and z are in metres. Find the force acting on the particle at point P(1m, 2m, 3m).
- (A) $\vec{F} = -(4\hat{i} + 36\hat{j} + 2\hat{k}) \text{ N}$ (B) $\vec{F} = (4\hat{i} + 36\hat{j} + 2\hat{k}) \text{ N}$
(C) $\vec{F} = -(36\hat{i} + 4\hat{j} + 2\hat{k}) \text{ N}$ (D) $\vec{F} = -(4\hat{i} + 2\hat{j} + 36\hat{k}) \text{ N}$

The potential energy function of a particle in a region of space is given as $U = (2xy + yz)$ J. Here x , y and z are in metre. Find the force acting on the particle at a general point $P(x, y, z)$

- (A) $\vec{F} = -[2x\hat{i} + (2y + z)\hat{j} + y\hat{k}]$ (B) $\vec{F} = [2y\hat{i} + (2x + z)\hat{j} + y\hat{k}]$
 (C) $\vec{F} = -[2y\hat{i} + (2x + z)\hat{j} + y\hat{k}]$ (D) $\vec{F} = -[2y\hat{i} + (2x + y)\hat{j} + z\hat{k}]$

9. Which of the following can be negative ?

- (A) Kinetic energy (B) Potential Energy (C) Mechanical Energy (D) All of these

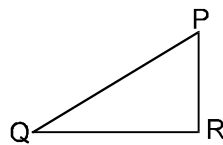
10. Which of the following may not be conserved ?

- (A) Energy (B) Potential energy (C) Mechanical energy (D) Kinetic energy

11. A long spring is stretched by ' x ' cm and its potential energy is U . If the spring is stretched by Nx cm, the potential energy stored in it will be :

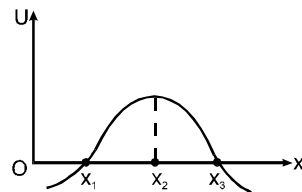
- (A) U/N (B) NU (C) N^2U (D) U/N^2

12. For the path PQR in a conservative force field (fig.), the amounts work done in carrying a body from P to Q & from Q to R are 5 J & 2 J respectively. The work done in carrying the body from P to R will be



- (A) 7 J (B) 3 J (C) $\sqrt{21}$ J (D) zero

13. In the figure shown the potential energy U of a particle is plotted against its position ' x ' from origin. Then which of the following statement is correct. A particle at



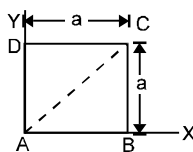
- (A) x_1 is in stable equilibrium (B) x_2 is in stable equilibrium
 (C) x_3 is in stable equilibrium (D) none of these

14. Force acting on a particle in a conservative force field is :-

- (i) $\vec{F} = (2\hat{i} + 3\hat{j})$ (ii) $\vec{F} = (2x\hat{i} + 3y^2\hat{j})$ (iii) $\vec{F} = (y\hat{i} + x\hat{j})$

Find the potential energy function if it is zero at origin is :-

15. A force $F = x^2y^2\hat{i} + x^2y^2\hat{j}$ (N) acts on a particle which moves in the XY plane.



- (a) Determine if F is conservative and
 (b) find the work done by F as it moves the particle from A to C (fig.) along each of the paths ABC, ADC, and AC.

Answers

RACE # 25

1. (B) 2. (ABC) 3. (C) 4. (A) 5. (A) 6. (B) 7. (A) 8. (C) 9. (BC)
10. (BCD) 11. (C) 12. (A) 13. (D)
14. (i) $U(x, y, z) = (-2x - 3y)$ (ii) $U(x, y, z) = -(x^2 + y^3)$ (iii) $U(x, y, z) = -xy$
15. (b) $W_{ABC} = W_{ADC} = \frac{a^5}{3} \text{ (J)}$, $W_{AC} = \frac{2a^5}{5} \text{ (J)}$