

QUIZ CUBES

Class 11/12 | AP Physics | IIT JEE | NEET



PHYSICS
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Work Done by an External Force

Q1: A child kicks a soccer ball across a field. If the force of the kick is considered an external force, what happens to the ball's mechanical energy due to this action?

- A) It decreases because of the friction with the ground.
- B) It increases due to the work done by the external force.
- C) It remains constant as gravity balances the external force.
- D) It converts entirely into potential energy.

Q2: When a gardener pulls a watering can upward, lifting it from the ground, which form of energy increases due to the work done by the non-conservative force?

- A) Kinetic energy
- B) Potential energy
- C) Thermal energy
- D) Electromagnetic energy

Q3: A roller coaster moves from the top of a hill to the bottom. If the height of the hill is 100 meters and the mass of the roller coaster is 500 kg, calculate the change in potential energy. ($g = 9.8 \text{ m/s}^2$)

- A) 490,000 J
- B) 49,000 J
- C) 4,900 J
- D) 490 J



Q4: In a physics lab experiment, a student compresses a spring to launch a marble. What does this demonstrate about the work done by non-conservative forces?

- A) It only changes the marble's potential energy.
- B) It results in an increase in thermal energy.
- C) It transforms into kinetic energy of the marble.
- D) It is completely lost due to air resistance.

Q5: If a person applies a horizontal force to push a box on a surface with friction, and the box's velocity changes, what does this say about the work done by the person?

- A) It is equal to the change in kinetic energy plus the thermal energy generated.
- B) It is completely converted into potential energy.
- C) It has no effect on the box's energy.
- D) It decreases the box's total mechanical energy.

Q6: When an apple falls from a tree to the ground, the work done by gravity leads to an increase in which type of energy?

- A) Potential energy
- B) Kinetic energy
- C) Chemical energy
- D) Elastic energy

Q7: In a science museum, a display shows a ball rolling down an inclined plane and then up another inclined plane of different height. If friction is negligible, what happens to the ball's energy as it moves from the higher plane to the lower plane and then up to the lower height?

- A) Its potential energy decreases while its kinetic energy increases, then decreases.
- B) Its kinetic energy remains constant throughout the motion.
- C) Its potential energy remains constant while its kinetic energy fluctuates.
- D) Its total mechanical energy increases due to work done by gravity.



Q8: If a projectile is launched with an initial kinetic energy and reaches a maximum height, what can be said about the work done by conservative forces?

- A) It increases the projectile's kinetic energy.
- B) It is equal to the negative change in potential energy.
- C) It has no effect on the projectile's energy.
- D) It decreases the projectile's mechanical energy.

Q9: In a scenario where friction is not negligible, a car accelerates on a road. How does the work done by the car's engine (external force) relate to the car's energy transformation?

- A) It is converted into potential energy only.
- B) It increases both kinetic and thermal energy.
- C) It results in a decrease in total mechanical energy.
- D) It is stored as chemical energy in the car's battery.

Q10: When a person standing on a skateboard pushes against a wall, the skateboard moves in the opposite direction. This action increases the skateboarder's:

- A) Potential energy due to height.
- B) Kinetic energy due to motion.
- C) Thermal energy due to friction.
- D) Chemical energy due to metabolism.



Answers UnCubed

1. B) It increases due to the work done by the external force.

- Explanation: The external force applied by the child increases the ball's kinetic energy, demonstrating how non-conservative forces contribute to the mechanical energy of a system.

2. B) Potential energy

- Explanation: Lifting the watering can increases its height, thus increasing its gravitational potential energy due to the work done by the gardener's force.

3. A) 490,000 J

- Explanation: The change in potential energy is calculated using the formula $\Delta U = mgh$, where $m = 500 \text{ kg}$, $g = 9.8 \text{ m/s}^2$, and $h = 100 \text{ meters}$. This results in $\Delta U = 500 \text{ kg} * 9.8 \text{ m/s}^2 * 100 \text{ m} = 490,000 \text{ J}$.

4. C) It transforms into kinetic energy of the marble.

- Explanation: Compressing the spring stores potential energy, which is then converted into kinetic energy as the marble is launched, illustrating the transformation of energy from one form to another by non-conservative forces.

5. A) It is equal to the change in kinetic energy plus the thermal energy generated.

- Explanation: The work done by the person not only changes the kinetic energy of the box due to its acceleration but also generates thermal energy because of friction with the surface.

6. B) Kinetic energy

- Explanation: As the apple falls, the work done by gravity converts its potential energy into kinetic energy, increasing the apple's speed until it reaches the ground.

7. A) Its potential energy decreases while its kinetic energy increases, then decreases.



Explanation: As the ball rolls down the first inclined plane, its potential energy decreases due to the decrease in height, and this energy is converted into kinetic energy, causing the ball to speed up. As it moves up the second inclined plane to a lower height than the first, its kinetic energy is converted back into potential energy, but to a lesser extent due to the lower height of the second plane, illustrating the conservation of mechanical energy in the absence of friction. Therefore, the ball has residual kinetic energy

8. B) It is equal to the negative change in potential energy.

- Explanation: The work done by conservative forces, like gravity on a projectile, is related to changes in potential energy, with the work being negative as potential energy increases to a maximum at the peak of its trajectory.

9. B) It increases both kinetic and thermal energy.

- Explanation: The car's engine provides the energy to increase the car's speed (kinetic energy) and also generates thermal energy due to friction between the car's components and the road.

10. B) Kinetic energy due to motion.

Explanation: When the person pushes against the wall, the force exerted results in the skateboard moving in the opposite direction, due to Newton's third law of motion. This action transfers energy to the skateboard, increasing its kinetic energy as it moves.

