

Kinetic energy 2. LR

Kinetic energy. Objective, to learn about kinetic energy. We know that the capacity or ability of a body to do work is called energy.

Energy can be found in different forms. Let's learn about one of its forms called kinetic energy. Here's a nail being fixed to this wooden block.

As the moving hammer falls on the nail it does work in driving the nail into the wood. We understand that an object in motion can do work and hence possesses energy. The energy of a body by virtue of its motion is called kinetic energy.

Now let's learn about the factors on which the kinetic energy of a body depends. Observe the ball thrown by the bowler towards the stumps. The ball possesses kinetic energy so when it hits the stumps it pushes the stump away.

Now observe the tennis ball thrown with the same speed as the cricket ball. The ball hits the but there is only a slight change in the position of the stumps. This is because the kinetic energy possessed by the cricket ball is more than that of the tennis ball as the mass of the cricket ball is more than that of the tennis ball.

So we have learned that the kinetic energy of a body depends on its mass. We know that a fast moving cricket ball can push away the stumps on striking them but if the same ball is thrown with less speed there is only a slight change in the position of the stump. This happens because a faster ball has more kinetic energy than a slower ball.

We understand that the kinetic energy of a body increases as its speed increases. Calculating kinetic energy. The kinetic energy of a body is equal to one half the product of its mass and the square of its speed.

Here we see a moving ball and the three scales representing its mass speed and kinetic energy respectively. Observe the scales when the mass of the ball doubles at a constant speed then its kinetic energy becomes double. However when the speed of the ball doubles even if its mass remains constant then its kinetic energy increases four times.

We find that a change in speed has more effect than a change in mass on the kinetic energy of a body. This is because speed is squared in the formula of kinetic energy. To summarize the energy possessed by an object by virtue of its motion is called kinetic energy.

The kinetic energy of a body depends upon its mass and speed. The kinetic energy of a body is equal to one half the product of its mass and the square of its speed.

Summary of Kinetic Energy

Understanding Kinetic Energy

Energy is the **capacity to do work**, and it exists in different forms. **Kinetic energy** is the energy an object has **due to its motion**.

Example:

- A **hammer** striking a nail drives it into wood, proving that **a moving object can do work**.
 - The **energy of a moving object** is called **kinetic energy**.
-

Factors Affecting Kinetic Energy

✓ Kinetic Energy Depends on Mass:

- A **cricket ball** and a **tennis ball** are thrown at the same speed.
- The **cricket ball displaces the stumps more** because it has **more mass**, meaning **greater kinetic energy**.

✓ Kinetic Energy Depends on Speed:

- A **fast-moving cricket ball** pushes the stumps further than a **slow-moving ball**.
 - This shows that **higher speed results in more kinetic energy**.
-

Formula for Kinetic Energy

The kinetic energy (**KE**) of a body is given by the formula:

$$KE = \frac{1}{2} m v^2$$

where:

- **m** = mass of the object
- **v** = speed of the object

✓ Effect of Changing Mass:

- If the **mass doubles**, kinetic energy **doubles** (assuming speed remains the same).

✓ Effect of Changing Speed:

- If the **speed doubles**, kinetic energy increases **four times** because speed is **squared** in the formula.
 - **Speed has a greater impact** on kinetic energy than mass.
-

Key Takeaways

- ✓ Kinetic energy is the energy of motion.
 - ✓ It depends on both mass and speed of an object.
 - ✓ Kinetic energy is given by the formula $KE = \frac{1}{2}mv^2$
 - ✓ Doubling speed has a greater effect than doubling mass because speed is squared.
-

Quiz on Kinetic Energy

1. What is kinetic energy?

- ☒ The energy possessed by an object due to its motion.
- ☐ The energy stored in a stationary object.
- ☐ The energy stored in food.
- ☐ The energy due to height above the ground.

2. What happens to kinetic energy if the mass of an object doubles (keeping speed constant)?

- ☒ It also doubles.
- ☐ It becomes four times greater.
- ☐ It remains the same.
- ☐ It decreases.

3. What happens to kinetic energy if speed doubles (keeping mass constant)?

- ☒ It becomes four times greater.
- ☐ It doubles.
- ☐ It remains the same.
- ☐ It decreases.

4. Which factor has a greater effect on kinetic energy?

- ☒ Speed, because it is squared in the formula.
- ☐ Mass, because it is heavier.
- ☐ Distance, because it affects force.
- ☐ Temperature, because it affects movement.