

Week August 23rd

SCIENCE NOTES

KINETIC & POTENTIAL ENERGY



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REVIEW: KINETIC & POTENTIAL ENERGY

1. Definition of Kinetic and Potential Energy

<https://www.khanacademy.org/science/in-in-class9th-physics-india/in-in-work-energy/in-in-energy/v/energy-intro-kinetic-potential-work-energy-physics-khan-academy>

2. How to compute for Kinetic Energy (KE)

<https://www.khanacademy.org/science/in-in-class9th-physics-india/in-in-work-energy/in-in-energy/v/kinetic-energy-derivation-work-energy-physics-khan-academy>

3. How to compute for Potential Energy (or Gravitational Potential Energy/GPE)

<https://www.khanacademy.org/science/in-in-class9th-physics-india/in-in-work-energy/in-in-energy/v/gravitational-potential-energy-derivation-work-energy-physics-khan-academy>

4. How to compute for Total Mechanical Energy (TME)

<https://www.youtube.com/watch?v=hce4pncZlI4&list=WL&index=96&t=0s>

FORMULAS TO REMEMBER

1. Deriving the formula for Kinetic Energy (KE)

$$KE = W$$

$$W = Fd$$

$$F = ma$$

$$KE = \frac{mv^2}{2}$$

$$KE = \frac{1}{2} mv^2$$

FORMULAS TO REMEMBER

2. Deriving the formula for Potential Energy or Gravitational Potential Energy (GPE)

$$\text{GPE} = W$$

$$W = \underline{F} \underline{d}$$

or h

Height instead of distance

$$F = \frac{ma}{m} = ga$$

Gravitational acceleration

$$\text{GPE} = mgh$$

3. Deriving the formula for Total Mechanical Energy (TME)

$$\text{TME} = \text{KE} + \text{PE}$$

$$\text{KE}_i + \text{PE}_i = \text{KE}_f + \text{PE}_f$$

↓
"0"

↓
"0"

$$\therefore \text{PE}_i = \text{KE}_f$$

$$mgh = \frac{1}{2}mv^2$$

$$\rightarrow \frac{1}{2}m_i v_i^2 + mgh_1 = \frac{1}{2}m_f v_f^2 + mgh_2$$

PRACTICE: KINETIC ENERGY

Practice 1



A baboon pushes a 3.1 kg stone with 150J kinetic energy.

What is the stone's speed?

Round answer to two significant digits.

Practice 2



A polar bear runs at a speed of 11 m/s with 23,000 J of kinetic energy.

What is the polar bear's mass?

Round answer to two significant digits.

Practice 3



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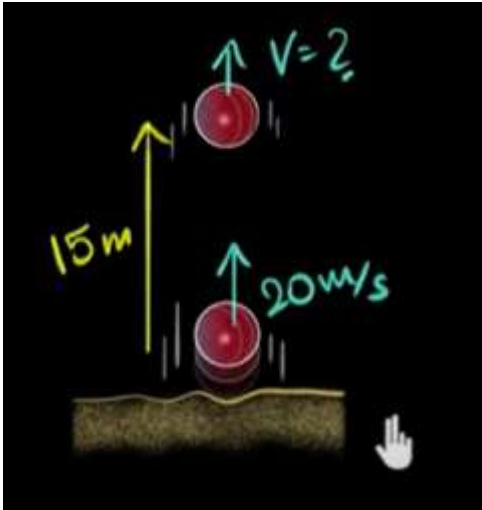
A 30 kg dog runs at a speed of 15 m/s.

What is the dog's kinetic energy?

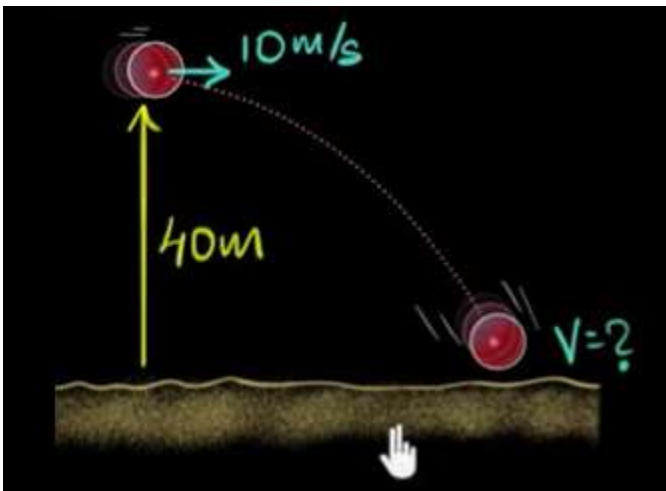
Round answer to two significant digits.

PRACTICE: CONSERVATION OF ENERGY / TME

1. A cricket ball is thrown vertically up with speed of 20 m/s from the ground. Find the speed of the ball when it has reached a height of 15 m . (Round up $g = 10\text{ m/s}^2$)



2. A ball is thrown horizontally at 10 m/s at a height of 40 m from the ground. The ball will go into a curved path. With what speed will the ball go and hit the ground?



3. We have 2 objects, with both masses of 10 kg each, and both are 5 m off the ground. Find the initial Kinetic and Potential energy, and the final Kinetic and Potential energy.

$KE_i + U_i = KE_f + U_f$

$KE_i =$
 $U_i =$

conservative system
no friction

$U = mg\Delta y$ $KE = \frac{1}{2}mv^2$

$KE_f =$
 $U_f =$

4. What are the final velocities of objects 1 and 2?

What are the final velocities of object 1 and object 2?

$m_1 = 10\text{kg}$
 $m_2 = 2,5\text{kg}$
 $h = 3\text{m}$