Tishk International University
Faculty of Applied Science
Medical Technical Radiology

General Physics

3- ENERGY-WORK

First Grade- 2025-2026

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OBJECTIVES

Understand the concept of work, energy and power.

1	Define work, energy and power.
2	Calculate the form of energy by using formula Kinetic Energy and Potential Energy.
3	State the principal of conservation energy.
4	Describe conversion from one form to another form
5	Apply the concept and formula of work, energy and power in solving the related problems.
6	Calculate the efficiency of mechanical system efficiency

DO YOU KNOW?

Q1: How many steps of batu cave stair?

Q2: What is the height of the stair? answer:

Q3: How to measure our work or energy when climb a stair?

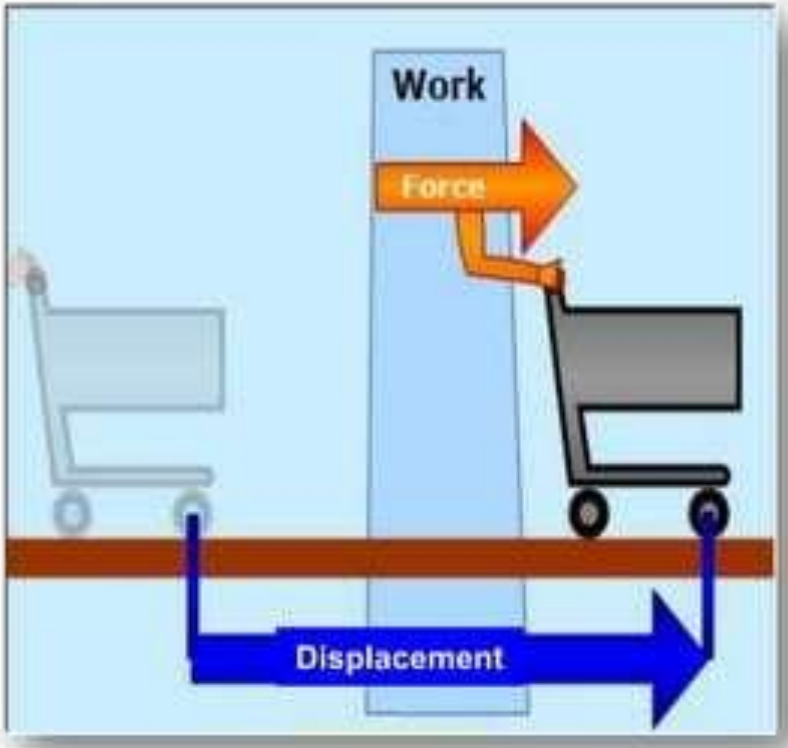
Q4: Who has a big power to delivered up the stair?

Outcomes:

Define work, energy and power

WORK

- WORK is **defined** as product of the force and displacement of an object in the direction of force.



- Formula of work is

$$W = F \times s$$

F= Force in Newton
s = Displacement in meters.

- Unit of work is Joule.

Outcomes:

Define work, energy and power

ENERGY

- Energy is defined as CAPACITY TO DO WORK.
- SI Unit : Joule (J)
- Many form.
- Common one:
  - Kinetic
  - Potential
  - Electric
  - Chemical
  - Solar
  - Nuclear

Outcomes:

Define work, energy and power

POWER

- **Power is defined as ability to do work.**
- **SI Unit : Watt (W)**
- **Formula:**

$$Power = \frac{Work}{time}$$

Joule

second

$$P = \frac{W}{t}$$

$$Power = \frac{Force \times displacement}{time}$$

$$Power = Force \times velocity$$

The Power of body…..
Strong and Fast…… (Big Force and small times..)

Let's twist……

Outcomes:

Calculate the form of energy by using formula Kinetic Energy and Potential Energy.

KINETIC ENERGY

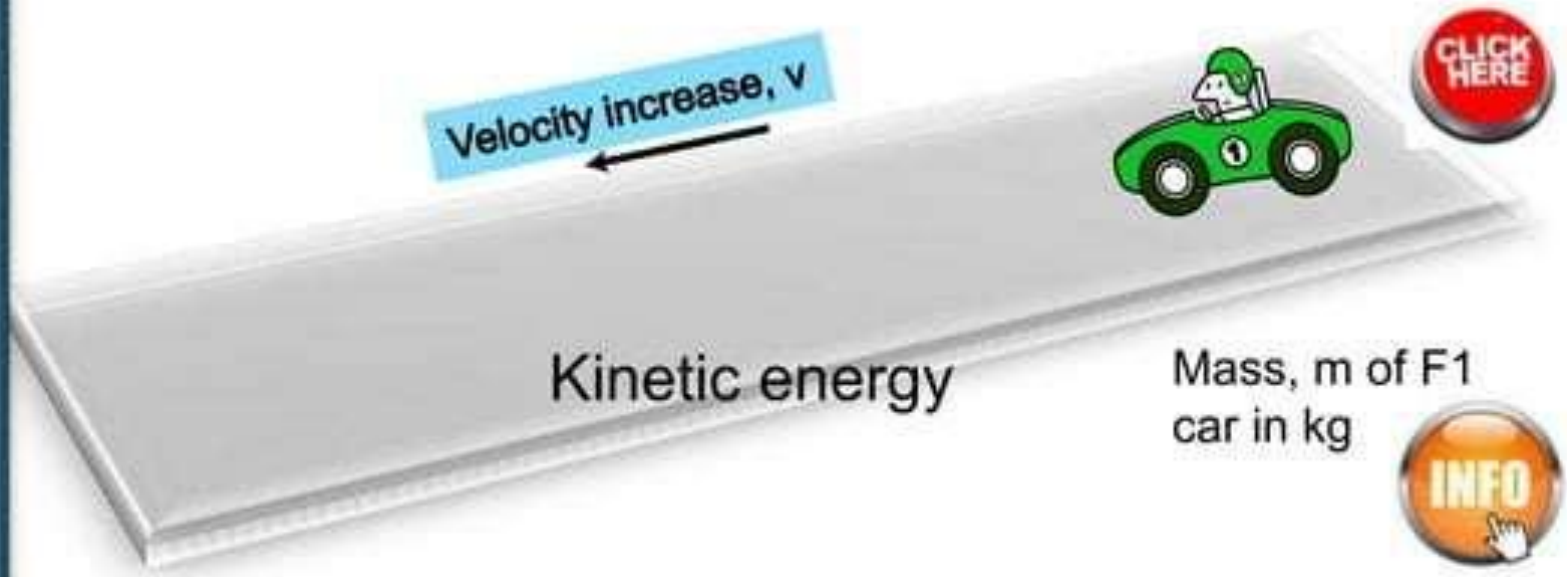
Definition : Kinetic energy is energy due to the motion.

Formula:

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

Where:
m = mass (kg)
v = velocity (ms^{-1})

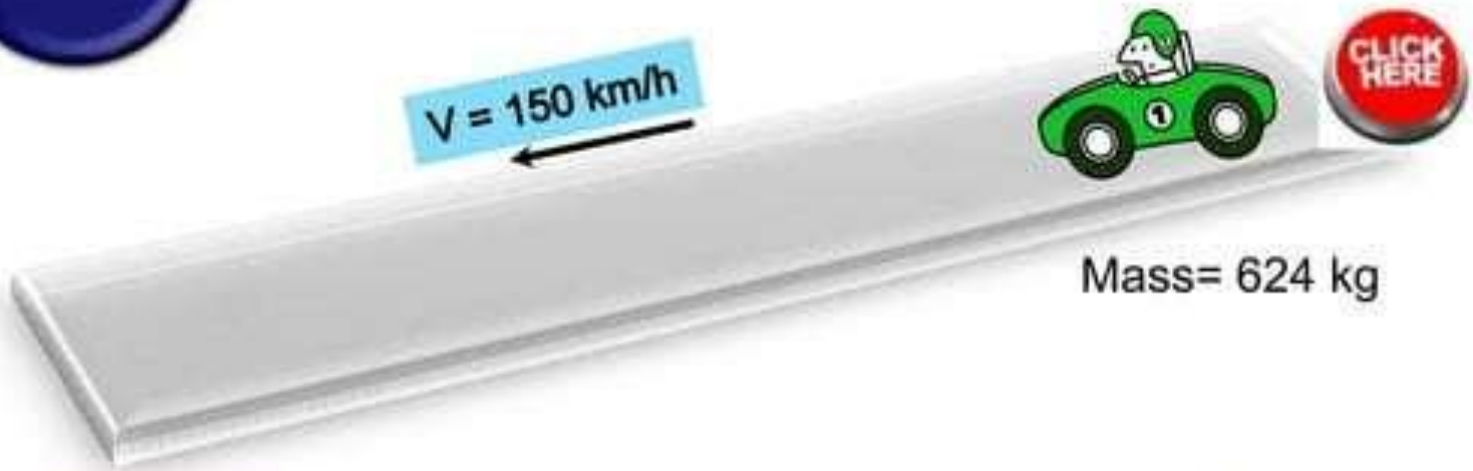
SI Unit : Joule (J)



Outcomes:

Calculate the form of energy by using formula Kinetic Energy and Potential Energy.

Q & A



A 624 kg of F1 car is moving at a speed of 150 km/h. Determine the kinetic energy of the car.

Given:

- Mass = 624 kg
- Speed = $150\frac{km}{h} \times \frac{1000m}{1km} \times \frac{1h}{3600s} = 41.67m/s$

Kinetic energy = ½ m v ^{2}

= ½ x 624 x 41.67^2

= 541753.34 Joule

Outcomes:

Calculate the form of energy by using formula Kinetic Energy and Potential Energy.

POTENTIAL ENERGY

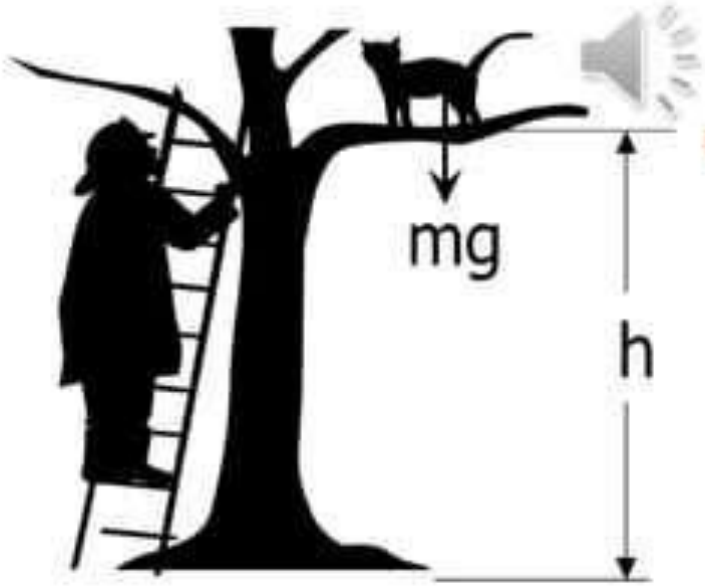
Definition : Potential energy is energy possessed by an object due to its position or state.

Formula:

$$PE = m\,g\,h$$

Where:
m= mass (kg)
g = gravitational acceleration (ms^{-1})
h = height (m)

SI Unit : Joule (J)

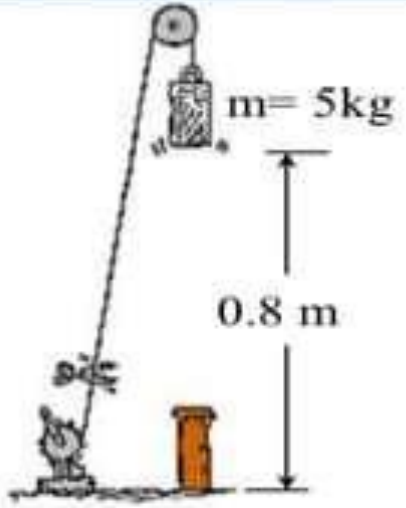


The cat has a **POTENTIAL ENERGY** at high position.

Q&A

A load with as mass 5 kg was lifted up by a pulley to the height of 0.8 m for pile work. (Use, $g = 9.81\ ms^{-2}$).

What is Potential Energy the load.



Solution

$Ep = m\,g\,h$

$= 5\ kg \times 9.81 \times 0.8m$

$= \mathbf{39.24\ J}$

Outcomes:

State the principal of conservation energy

PRINSIP KEABADIAN TENAGA
Principle of Conservation of Energy

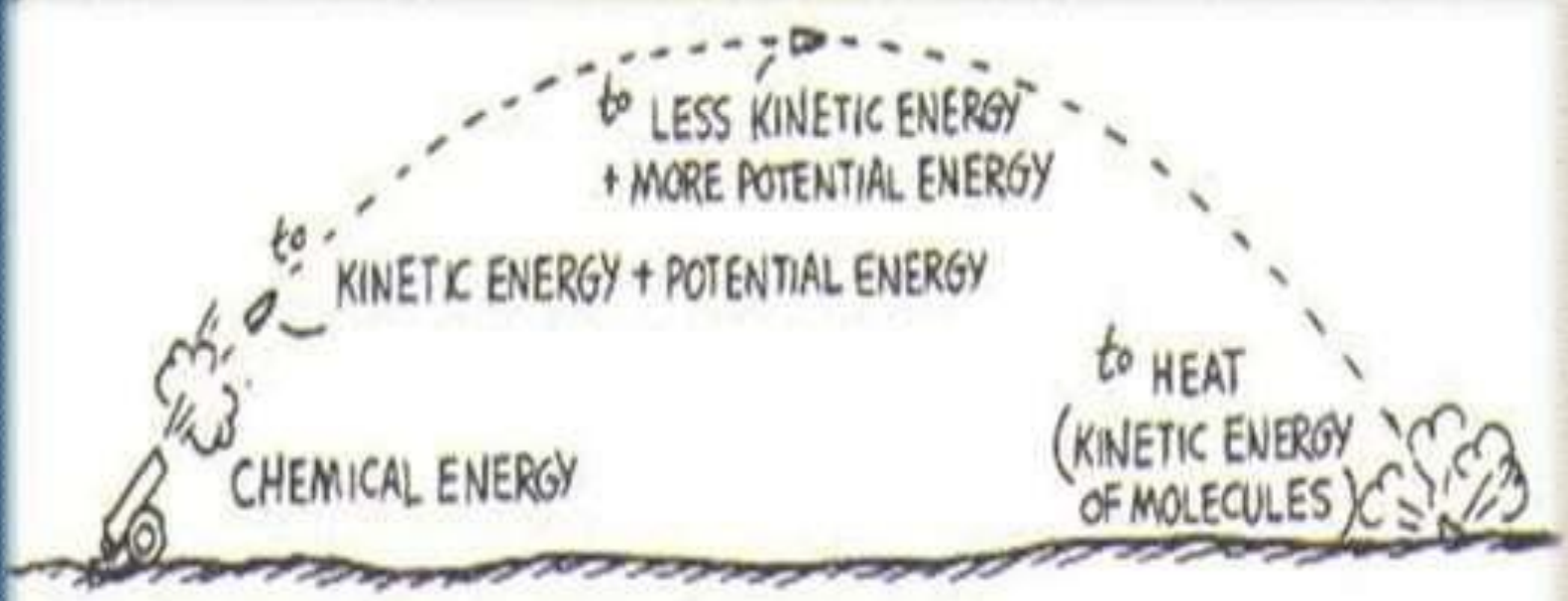
The principle of conservative of energy states that:

1) Energy cannot be created and destroyed
2) Energy can change from one form to another form.
3) Total of energy is constant.

Outcomes:

Describe conversion from one form to another form

How energy transform from one form to another form?



Energy Cannot Be Created or Destroyed

(It just changes forms)

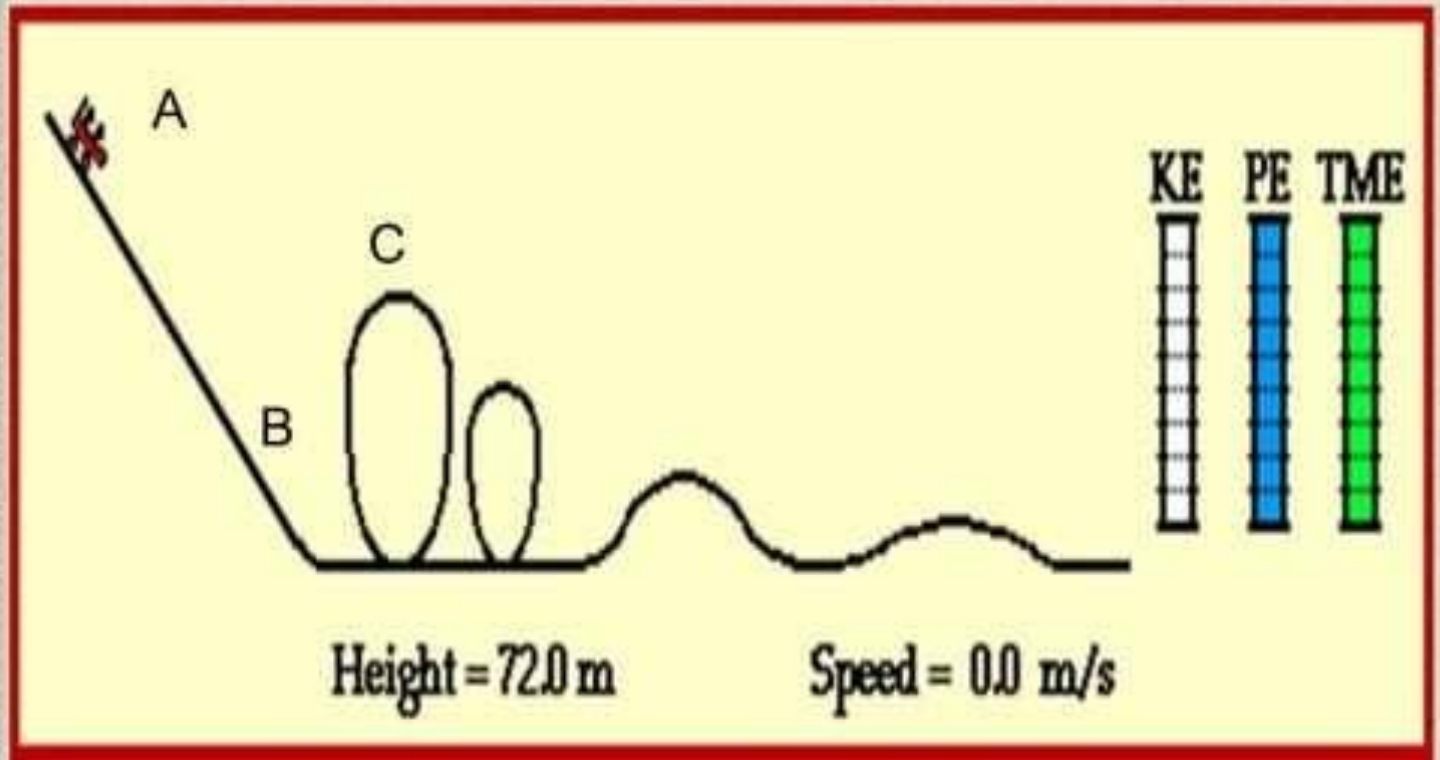
Outcomes:

Describe conversion from one form to another form

How energy transform from one form to another form?

The roller coaster:

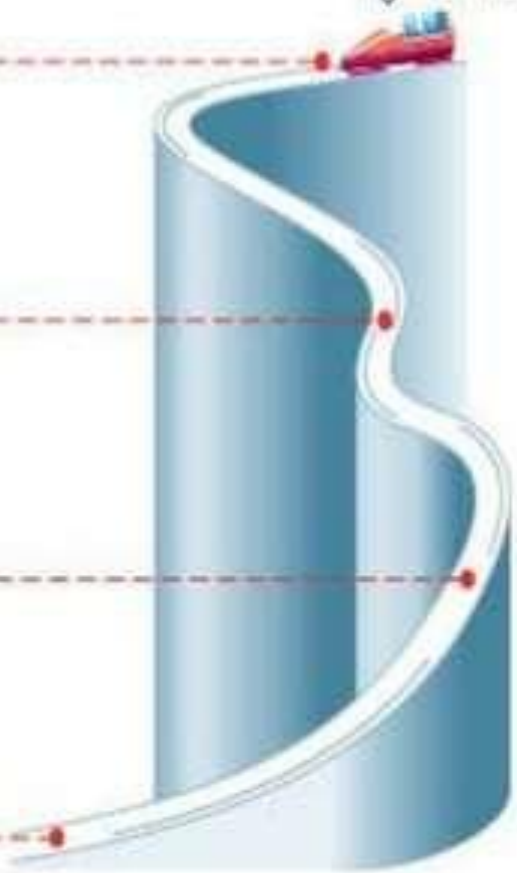
A: Potential energy
B: kinetic energy
C: Potential + Kinetic changes alternately…



Total energy is constant..

Conservation of Mechanical Energy

KE	PE	E = KE + PE
0 J	600 000 J	600 000 J
200 000 J	400 000 J	600 000 J
400 000 J	200 000 J	600 000 J
600 000 J	0 J	600 000 J



The Gravitational Potential Energy at the top. . .

is transformed into

. . .the Kinetic Energy at the bottom

Concept of WORK, ENERGY & POWER

Outcomes:

Apply the concept and formula of work, energy and power in solving the related problems.

- **If little Nellie Newton lifts her 40kg body a distance of 0.25m in 2 seconds, then what is the power delivered by little Nellie's biceps?**

Solution

- The work done is,

$$W = F \times s$$
$$= mg \times s$$
$$= 40\text{kg}\ (9.81) \times 0.25\ \text{m}$$
$$= 100\ \text{J}$$

- Hence, the power is

$$P = \frac{W}{t}$$
$$= \frac{100\ \text{J}}{2\ \text{s}}$$
$$= 50\ \text{Watt}$$

Outcomes:

Calculate the efficiency of mechanical system efficiency.

Mechanical system efficiency

- Efficiency is the ratio between the useful power delivered by the motor and the power that you supply to the engine.
- Efficiency has no unit and is usually expressed in%.

Efficiency of work

$$\frac{Work\ output}{\text{Work input}} \times 100\%$$

Efficiency of power

$$\frac{Power\ output}{\text{Power input}} \times 100\%$$

SUMMARY

- ENERGY IS THE ABILITY TO MOVE
- POTENTIAL IS STORED ENERGY (STATICS)
  - DEPENDENT ON HEIGHT
- KINETIC IS MOVING ENERGY (DYNAMICS)
  - DEPENDENT ON VELOCITY
- POWER IS HOW FAST THE WORK IS DONE

Outcomes..

- What is work?
- What is energy?
- What is power?

Outcomes..

- What is formula of kinetic energy?
- What is formula of potential energy?
- What is conservation energy?

THE END