Tishk International University
Faculty of Applied Science
Medical Technical Radiology

General Physics

3- ENERGY-WORK

First Grade- 2024-2025

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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

What does WORK mean to you?

Are you doing work when….

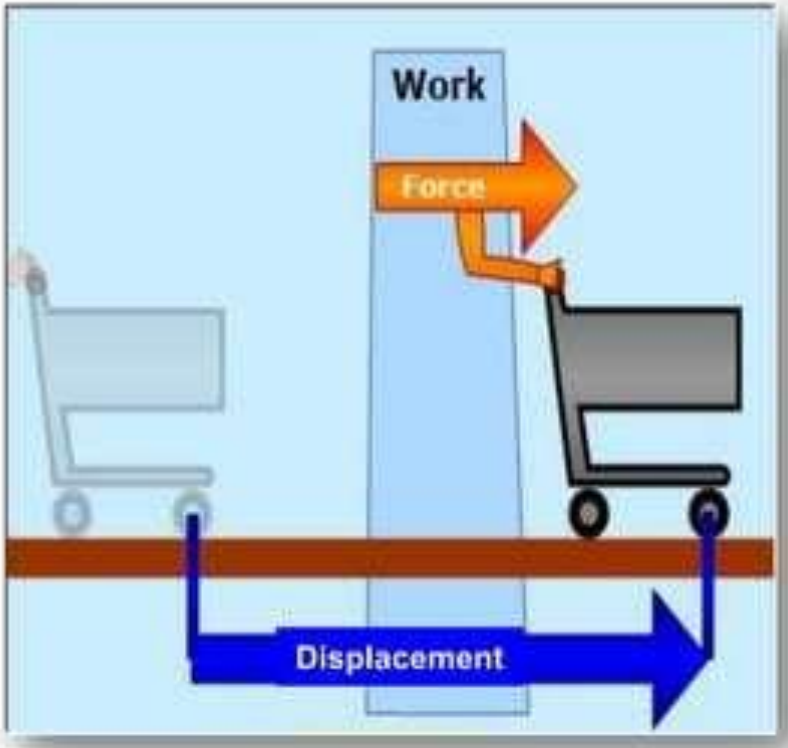
- Lifting a weights?
- Walking with a bag grocery in your hand?
- Completing your homework assignment?
- Writing essay?

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:**

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

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

Joule

second

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

$$Power = Force \times velocity$$

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

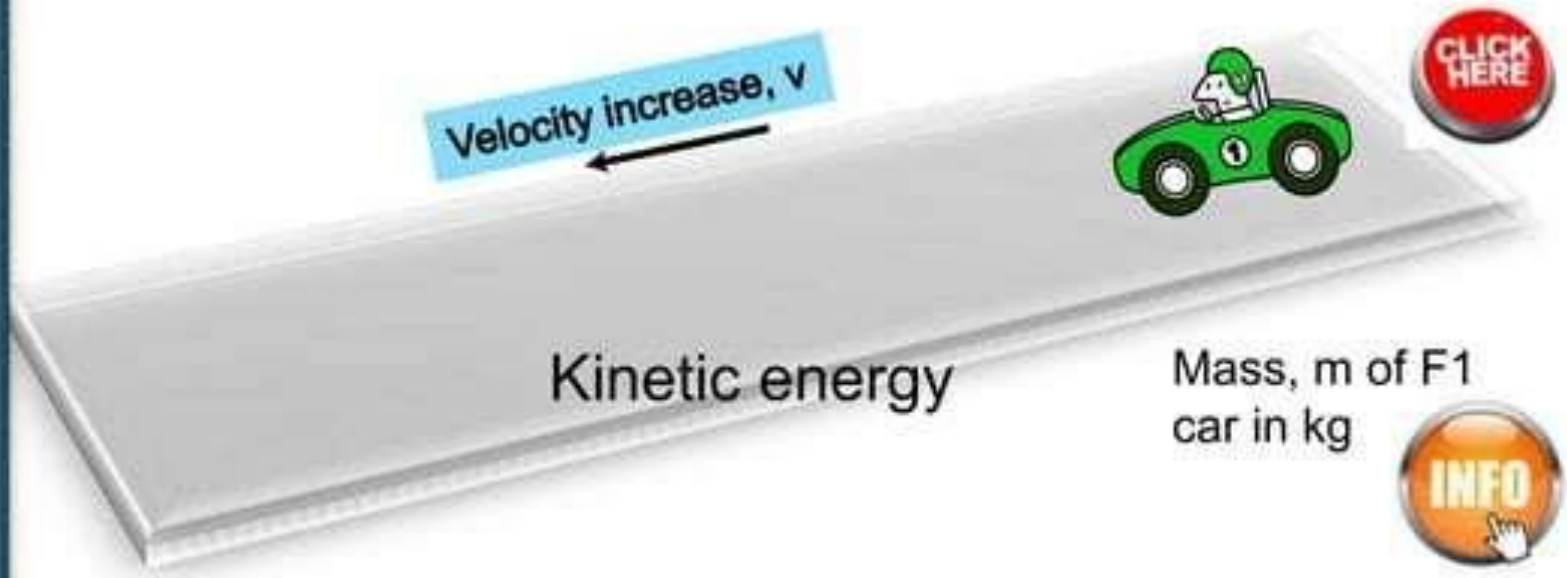
Definition : Kinetic energy is energy due to the motion.

Formula:

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

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

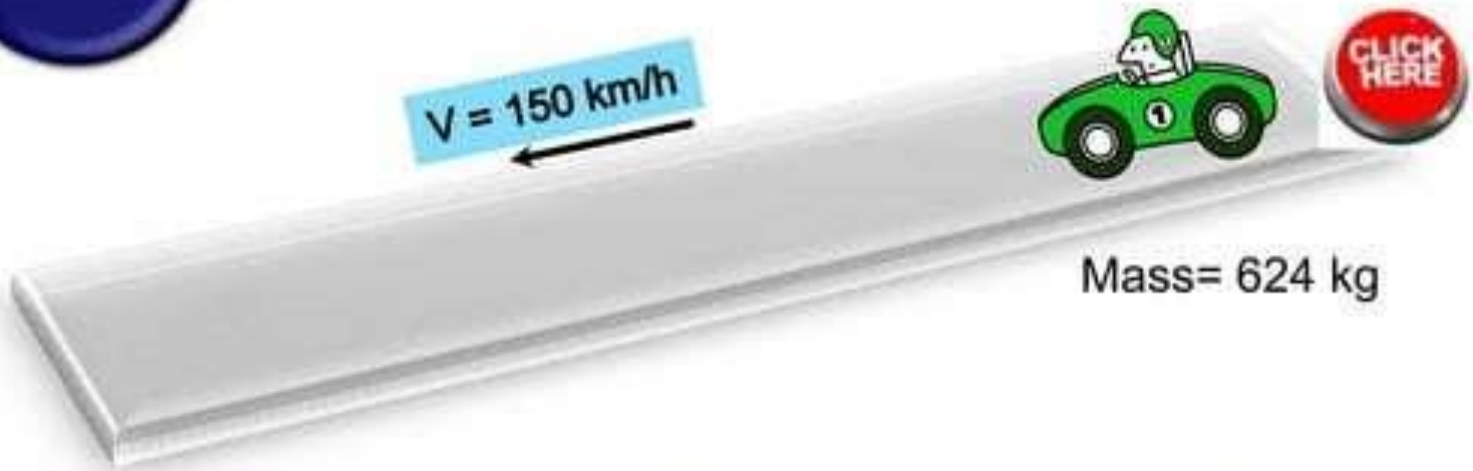
SI Unit : Joule (J)



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

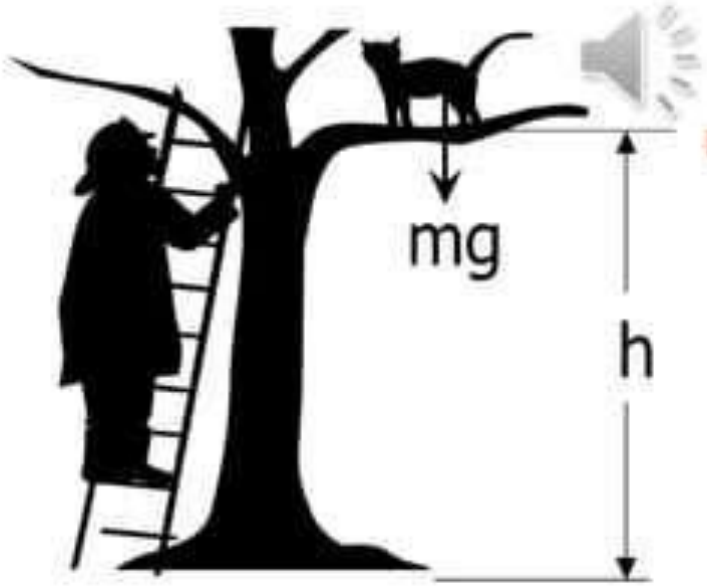
Definition : Potential energy is energy possessed by an object due to its position or state.

Formula:

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

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

SI Unit : Joule (J)

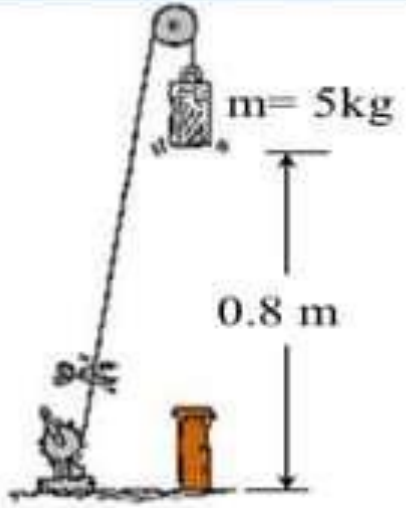


The cat has a **POTENTIAL ENERGY** at high position.

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

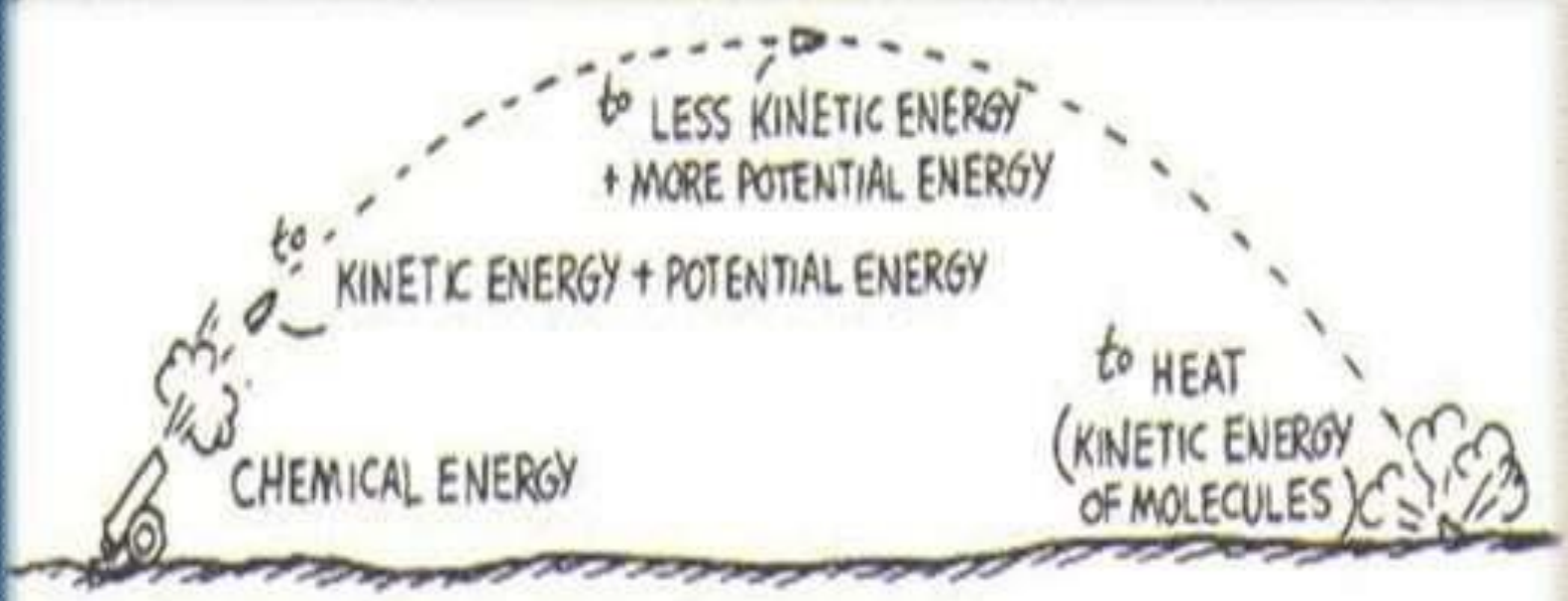
The principle of conservative of energy states that:

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)

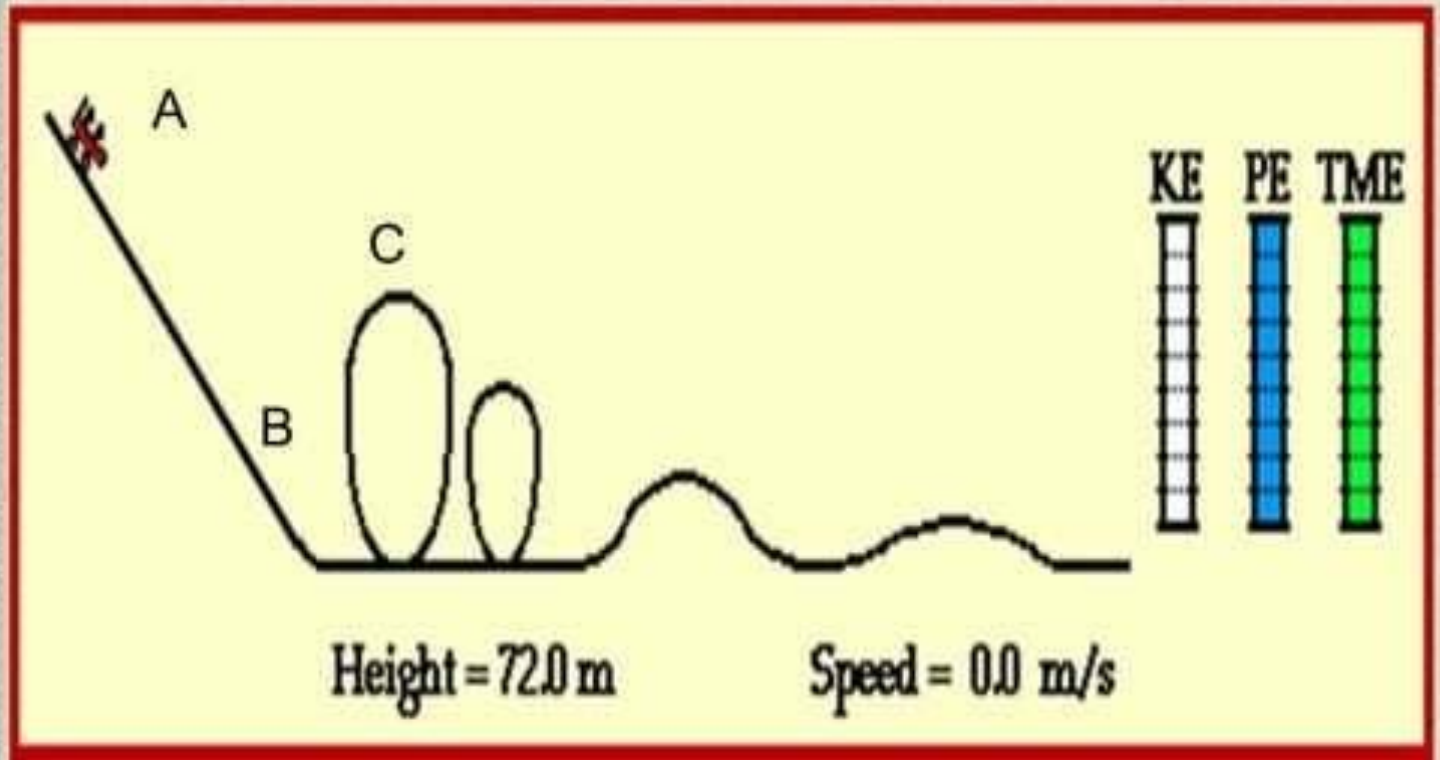
Outcomes:

Describe conversion from one form to another form

How energy transform from one form to another form?

The roller coaster:

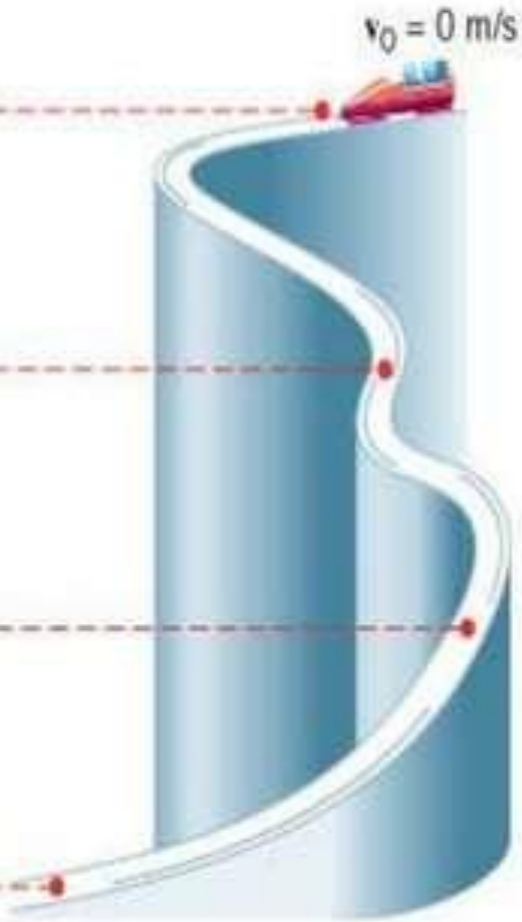
A: Potential energy
B: kinetic energy
C: Potential + Kinetic changes alternately…



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

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

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