3055 BA SANGAM COLLEGE

PH: 6674003/9264117 E-mail: basangam@connect.com.fj

Worksheet 7

School: **Ba Sangam College** Year/Level: **11**

Subject: **Physics** Name of student:_____

Strand	2-Energy
Sub-strand	Work, Power and Energy
Content Learning Outcome	Objective: ➢ Understand mechanical energy (Kinetic and Potential Energy ➢ Calculate potential and kinetic energies

ENERGY

Difference between Energy and Work

Energy	Work
Is the ability to produce/create work	Is the ability to provide force and a change in distance to an object
There are many types of energy	Only one type of work

Note:

1. Both work and energy has scalar units.
2. Both work and energy are measured in Joules (J).

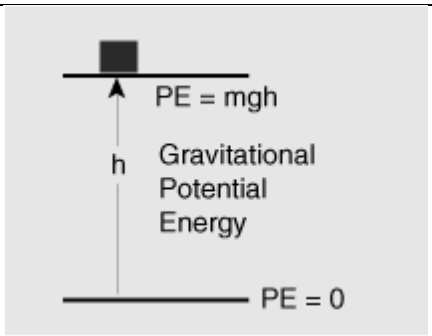
FORMS OF ENERGY

1. Mechanical energy:

Total mechanical energy is the sum of gravitational potential energy and kinetic energy present in the components of a mechanical system.

$$\mathcal{E}_{\_} \quad \mathcal{E}_{\_} \quad \mathcal{E}_{\_}$$

- **Gravitational Potential Energy**: This is the energy stored in an object due to its height**.**



The higher the object is elevated, the greater the gravitational potential energy. Gravitation Potential Energy of an object is given as:

$$\mathcal{E}_p = mgh$$

Where:

$\mathcal{E}_p$ =Gravitational Potential Energy (J)

m =mass of the object (kg)

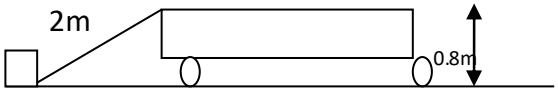
g= gravitational acceleration on Earth (g = 10 m/s^2)

h= height of the object (m)

Examples

1. What is the potential energy of a 6 kg mass 4 m above the ground?
   $E_p = mgh = 6 \times 10 \times 4 = 240$ J
2. A 45 kg girl jumps from a 0.4 m high stool onto the ground. How much potential energy does she lose?
   $E_{p\ loss} = mgh = 45 \times 10 \times 0.4 = 180$ J
3. Shivneel slides a 25 kg box up a ramp onto the back of a lorry. If the ramp is 2 m long and the back of the lorry is

0.8 m above the ground how much potential energy does the box gain?



All that matters is the VERTICAL height moved and not the length of the ramp. So:

$E_{p\ gain}$ = mgh = 25 x 10 x 0.8 = 200 J

- **Kinetic Energy**: This is the energy an object has due to its motion (speed). The kinetic energy of a mass *m* is given by

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

Where: Ek = kinetic energy (J)
m = mass of object (kg)
v = speed of object (m/s)

Example 1

What is the kinetic energy of a 500 kg horse running at 15 m/s?

$Ek=\frac{1}{2}mv^2$= ½ x 500 x 15^2 = 56 250 J

Example 2

What is the kinetic energy of a one milligram raindrop falling at 0.5 mm/s .

$Ek=\frac{1}{2}mv^2$ = ½ x 0.000001 x 0.0005^2 = 0.000 000 000 000 125 J = 1.25 x 10^{-13} J

(Notice here that the mass must be in kg and the velocity in m/s)

ACTIVITY

1. Find the potential energy of:

a) 500g mass placed at a height of 1.2m

(2 marks)

b) 1.5kg mass placed at a height of 2000mm.

(2 marks)

2. Ridhi kicks a 50g ball vertically up to a maximum height of 5.2m. What was the balls':

a) kinetic energy of at the maximum height. Explain.
(Recall Projectile motion)

(2 marks)

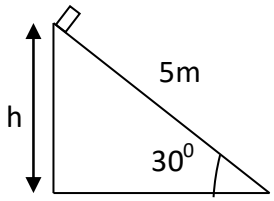
b) potential energy of at the maximum height.

(3 marks)

3. A 0.10kg bird is flying at a constant speed of 8m/s. What is the birds' kinetic energy?

(3 marks)

4. A 200g wooden block slides from rest from a 5m long incline as shown below:



Calculate the potential energy stored in the wooden block before it was released.
Note: Use SOH/CAH/TOA to calculate h.

(4 marks)

5. Alanieta drives a police vehicle at a constant speed of 120km/hr.

120km/hr

a) Convert 120km/hr to m/s

(2 marks)

b) Calculate the kinetic energy at which Alanieta is driving the car.

(2 marks)

THE END