Name: Key

SET 1 OF 2

Potential and Kinetic Energy Worksheet

Kinetic Energy (KE) = ½ mass times velocity squared

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

GRAVITATIONAL

Potential Energy (~~PE~~) = mass times the acceleration due to gravity times height

E_g E_g $(F_g)(h)$

$PE = mgh = N*h$ $(g = 9.8\ m/s^2)$

$F_g = mg$ ← weight

1 Newton (N) = 1kg*1m/s² or 1kgm/s²

1. You serve a volley ball with a mass of 2.1kg. The ball leaves your hand at 30m/s. The ball has kinetic energy. Calculate it.

G: $m = 2.1\ kg$, $V = 30\ m/s$

U: $E_K = ?$

E: $E_K = \frac{1}{2} m v^2$

S/S: $(E_K) = \frac{1}{2}(2.1)(30)^2$

$E_K = 945\ J$

2. There is a bell at the top of a tower that is 45m high. The bell weighs 190N. The bell has gravitational potential energy. Calculate it.

G: $h = 45m$, $F_g = 190N$

U: $E_g = ?$

E: $E_g = mgh$, $E_g = (F_g)h$

S/S: $(E_g) = (190)(45)$

$E_g = 8550\ J$

3. The potential energy of an apple is 6.0 joules. The apple is 3m high. What is the mass of the apple?

G: $E_g = 6.0\ J$, $h = 3m$, $g = 9.8\ m/s^2$

U: $m = ?$

E: $E_g = m g h$

S/S: $(6.0) = (m)(9.8)(3)$

$m = 0.204\ kg$

4. What is the velocity of a 500kg elevator that has 4000J of energy?

G: $m = 500\ kg$, $E_K = 4000\ J$

U: $V = ?$

E: $E_K = \frac{1}{2} m v^2$

S/S: $(4000) = \frac{1}{2}(500)(v)^2$

$4000 = 250\, v^2$

$16 = v^2$

$\sqrt{16} = \sqrt{v^2}$

$V = 4\ m/s$

5. What is the mass of an object that creates 33,750J of energy by traveling at 30m/s?

G: $v = 30\ m/s$
$E_K = 33{,}750\ J$
U: $m = ?$

E: $E_K = \frac{1}{2} m v^2$
S/S: $(33750) = \frac{1}{2}(m)(30)^2$
$\frac{33750}{450} = \frac{450m}{450}$
$m = 75\ kg$

6. Missy Diwater, the former platform diver for the Ringling Brothers' Circus had a kinetic energy of 15,000J just prior to hitting the bucket of water. If Missy's mass is 50kg, the what was her velocity?

G:
$E_K = 15000\ J$
$m = 50\ kg$
U: $v = ?$

E: $E_K = \frac{1}{2} m v^2$
S/S: $(15000) = \frac{1}{2}(50)(v)^2$
$15000 = 25 v^2$
$600 = v^2$
$v^2 = 600$
$\sqrt{v^2} = \sqrt{600}$
$v = 24.4949\ m/s$
$v = 20\ m/s$

7. A 75kg refrigerator is located on the 70th floor of a skyscraper (300m above ground). What is the potential energy of the refrigerator?

G:
$m = 75\ kg$
h = 300 m
$g = 9.8\ m/s^2$
U: E_g

E: $E_g = m g h$
S/S $(E_g) = (75)(9.8)$ **(300)**
$E_g =$ **220,500 J**

8. At what height is an object that has a mass of 50kg, if its gravitational potential energy is 9800J?

G: $E_g = 9800\ J$
$m = 50\ kg$
$g = 9.8\ m/s^2$
U: $h = ?$

E: $E_g = m g h$
$(9800) = (50)(9.8)(h)$
$9800 = 490h$
$h = 20$ meters

9. A 10kg mass is lifted to a height of 2m. What is its potential energy at this position?

G: $m = 10\ kg$
$h = 2\ m$
$g = 9.8\ m/s^2$
U: $E_g = ?$

E: $E_g = m g h$
S/S: $(E_g) = (10)(9.8)(2)$
$E_g = 196\ J$

10. Calculate the kinetic energy of a truck that has a mass of 2900kg and is moving at 55m/s.

G: $v = 55\ m/s$
$m = 2900\ kg$
U: E_K

E: $E_K = \frac{1}{2} m v^2$
S/S: $(E_K) = \frac{1}{2}(2900)(55)^2$
$E_K = 4386250\ J$

11. A bullet has a mass of 0.0042kg. The muzzle velocity of the bullet coming out of the barrel of the rifle is 993m/s. What is the KE of the bullet as it exits the gun barrel?

G: $m = 0.0042\ kg$
$V = 993\ m/s$
U: $E_K = ?$

E: $E_K = \frac{1}{2} m v^2$
S/S: $(E_K) = \frac{1}{2}(.0042)(993)^2$
Ek = 2070 J

12. What is the potential energy of a 3kg ball that is on the ground?

$E_g = m g h$ so $E_g = 0$
$h = 0$
$h = 0$

The gravitational potential energy of anything on the ground is 0 since h is 0.

13. A roller coaster is at the top of a 72m hill and weighs 966N. At the top of the hill the coaster car has gravitational potential energy. Calculate it.

G:
$h = 72\ m$
$F_g = 966\ N$
U: $E_g = ?$

$F_g = mg$

E: $E_g = m g h$
$E_g = (966N)(72m)$
$= 69{,}552\ J$

14. What is the kinetic energy of a 3kg ball that is rolling 2m/s?

G: $m = 3kg$
$V = 2m/s$
U: E_K

E: $E_K = \frac{1}{2} m v^2$
S/S: $E_K = \frac{1}{2}(3)(2)^2$
$E_K = 6\ J$

15. A baby carriage is rolling down a hill at 18m/s. If the carriage has 90J of kinetic energy, what is the mass of the carriage?

G: $V = 18\ m/s$
$E_K = 90\ J$
U: $m = ?$

E: $E_K = \frac{1}{2} m v^2$
S/S: $(90) = \frac{1}{2}(m)(18)^2$
$90 = 162m$
$m = .556kg$