Name: Key

POTENTIAL AND KINETIC ENERGY CALCULATIONS WORKSHEET

In Lesson 15.1, you learned that Potential Energy = mass x gravity x height. The formula can also be written to find mass or height. Use the below formulas to solve the following problems.

1) Known + Unknown
2) Check + Convert Units
3) Formula + work
4) answer rounded!

Potential Energy = mass x gravity x height	Units: J
Mass = Potential Energy / (gravity x height)	Units: kg
Height = Potential Energy / (mass x gravity)	Units: m
Gravitational Constant = 9.8 m/s^2	

In Lesson 15.1, you learned that Kinetic Energy = ½ x mass x velocity^2.

Kinetic Energy = ½ x mass x velocity^2	Units: J

1. Calculate the potential energy of a rock with a mass of 5 kg while sitting on a cliff that is 30 m high.

E = ?
m = 5kg
h = 30m
g = 9.8 m/s^2 ✓

$E = m \cdot g \cdot h$
$= 5 \times 9.8 \times 30$
$= 1470$ J
$= \boxed{1500 \text{ J}}$ 1-2 digits

2. Calculate the potential energy of an object with a mass of 15 kg while sitting on a shelf that is 20 m high.

E = ?
m = 15 kg
h = 20m
g = 9.8m/s^2 ✓

$E = m \cdot g \cdot h$
$= 15 \times 9.8 \times 20$
$= 2,940$ J
$= \boxed{2900 \text{ J}}$ 1-2 digits

3. Calculate the potential energy of a statue with a mass of 20 kg while sitting on a table that is 2 m high.

E = ?
m = 20kg
h = 2m
g = 9.8m/s^2 ✓

$E = m \cdot g \cdot h$
$= 20 \times 9.8 \times 2$
$= 392$ J
$= \boxed{390 \text{ J}}$

4. What distance is a book from the floor if the book contains 195 Joules of potential energy and has a mass of 5 kg?

$h = ?$
$E = 195\,J$
$m = 5\,kg$
$g = 9.8\,m/s^2$

$h = \frac{E}{g \cdot m}$

$= \frac{195}{9.8 \times 5} = \frac{195}{49} = 4\,m$

WATCH OUT
$195 \div 9.8 \times 5 = 99.5$
*Order of operations!
$195 \div (9.8 \times 5)$

5. What distance is an object from the floor if the object contains 600 Joules of potential energy and has a mass of 15 kg?

$h = ?$
$E = 600\,J$
$m = 15\,kg$
$g = 9.8\,m/s^2$

$h = \frac{E}{g \cdot m}$

$= \frac{600}{15 \cdot 9.8} = \frac{600}{147} = 4.081632\,m = 4.1\,m$

6. What distance is a rock from the floor if the rock contains 175 Joules of potential energy and has a mass of 25 kg?

$h = ?$
$E = 175\,J$
$m = 25\,kg$
$g = 9.8\,m/s^2$

$h = \frac{E}{g \cdot m}$

$= \frac{175}{9.8 \times 25} = \frac{175}{245} = 0.714286\,m = 0.71\,m$

7. An car is sitting on a hill which is 20 m higher than ground level. Find the mass of the car if it contains 362,600 J of potential energy.

$h = 20\,m$
$m = ?$
$E = 362{,}600\,J$
$g = 9.8\,m/s^2$

$h = \frac{E}{g \cdot m}$

$= \frac{362600}{9.8 \times 20} = 1850\,kg = 1850\,kg$ / $1900\,kg$

8. An car is sitting on a hill which is 30 m higher than ground level. Find the mass of the car if it contains 636,000 J of potential energy.

$h = 30\,m$
$m = ?$
$E = 636000\,J$
$g = 9.8\,m/s^2$

$h = \frac{E}{g \cdot m}$

$= \frac{636000}{9.8 \times 30} = \frac{636000}{294} = 2{,}160\,kg$

9. An car is sitting on a hill which is 50 m higher than ground level. Find the mass of the car if it contains 800,500 J of potential energy.

$h = 50\,m$
$m = ?$
$E = 800{,}500\,J$
$g = 9.8\,m/s^2$

$h = \frac{E}{g \cdot m}$

$= \frac{800{,}500}{9.8 \times 50}$

$= \frac{800{,}500}{490} = 1633.67\,kg = 1600\,kg$

10. Calculate the kinetic energy of a rock that has a mass of 55 kg rolling down a hill with a velocity of 8 m/s.

$E = \frac{m \cdot v^2}{2}$

E?
$m = 55\text{kg}$
$V = 8\text{m/s}$

$= \frac{55 \times 8^2}{2} = 1760 = \boxed{1800\text{ J}}$

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

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

$E = ?$
$m = 2900\text{kg}$
$V = 55\text{m/s}$

$= \frac{2900\text{kg} \cdot 55^2}{2} = 4{,}386{,}250\text{ J} \quad \boxed{4400{,}000\text{ J}}$

12. Calculate the kinetic energy of a 71 kg man walking at 1 m/s.

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

E?
$m = 71\text{kg}$
$V = 1\text{m/s}$

$= \frac{71 \times 1^2}{2} = 35.5\text{J} = \boxed{36\text{ J}}$

13. Calculate the kinetic energy of a 71 kg man running at 5 m/s.

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

E?
$m = 71\text{kg}$
$V = 5\text{m/s}$

$= \frac{71 \times 5^2}{2} = 887.5\text{J} = \boxed{890\text{ J}}$ 1-2 dig

14. Calculate the kinetic energy of a 1816 kg car traveling at 26.8 m/s.

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

$E = ?$
$m = 1816\text{kg}$
$V = 26.8\text{m/s}$

$= \frac{1816 \cdot 26.8^2}{2} = 652{,}161.92\text{J} \quad \boxed{=652{,}100\text{ J}}$ 3-4 dig

15. Calculate the kinetic energy of a 10 kg ball rolling at 10 m/s.

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

$E = ?$
$m = 10\text{kg}$
$V = 10\text{m/s}$

$= \frac{10 \times 10^2}{2} = 500\text{ J} = \boxed{500\text{J}}$