L3 Summary

Mechanical Kinetic + Gravitational Potential ENERGY

E_K = Mechanical Kinetic

depends on < speed (v), mass (m)

Units $E_k = J$ ($kg \cdot m^2/s^2$)
$m = kg$
$v = m/s$

FORMULAS

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

$$m = \frac{2 \cdot E_K}{v^2} \qquad v = \sqrt{\frac{2 \cdot E_K}{m}}$$

E_G = Gravitational Potential

depends on < mass (m), acceleration (g) by gravity, change in height (Δh)

Units $E_G = J$
$m = kg$
$g = m/s^2 = 9.8\ m/s^2$ on Earth
$\Delta v = m$

FORMULAS

$$E_g = m \cdot g \cdot \Delta h$$

$$m = \frac{E_g}{g \Delta h} \qquad g = \frac{E_g}{m \Delta h} \qquad \Delta h = \frac{E_g}{m \cdot g}$$

Steps to Always Follow:

1) Write known + unknown values
2) Check Units + Convert if needed
3) Choose formula
4) Solve
5) Round to Sig Fig

(1) (1) (1)

I will give formulas but you need to know units!

½ off no units!

ex ① $E_g = ?$
$m = 5\ kg$
$\Delta h = 1.5\ m$
$g = 9.8\ m/s^2$
② Units check ✓

③ $E_g = m \cdot g \cdot \Delta h$

④ $= 5\ kg \cdot 9.8\ m/s^2 \cdot 1.5\ m$

$= 73.5\ kg \cdot m^2/s^2$

$= 70\ J$ or $74\ J$ would both be fine!

Lets Try a Few More: On a Separate Sheet + Show Steps!

1) A 54 kg skier, including equipment stands at the top of a black diamond run. The vertical distance to the bottom of the run is 0.42 km. What is the E_g of the skier? (watch units!)

2) A satellite has a mass of 689 kg and travels at a speed of 27000 km/h (watch units). How much mechanical kinetic energy does the satellite have?

3) A bowling ball is rolling down the lane at 2.8 m/s If it has a mechanical kinetic energy of 25.5 J what is it's mass? in pounds ☺ (1 lb = 0.4536 kg)

#4) A person who has a mass of 65 kg goes on a Sky Tower ride. If the person reaches a final velocity of 90 km/hr just befor the bottom, from what height did the rider drop? Ignore Friction

Hint: Law of Conservation of Energy