$PE = mgh$ $PE = \frac{1}{2}kx^2$
$KE = \frac{1}{2}mv^2$
$W = Fd$
$P = \frac{W}{t}$

Work Energy Power Practice Problems

Energy

1. How many joules of potential energy does a 0.65 kg book gain when it is elevated 3 m? When it is elevated 6 m?

$PE = (.65\,kg)(9.8\,m/s^2)(3m)$ $\quad$ 19.11 J

$PE = (.65\,kg)(9.8\,m/s^2)(6m)$ $\quad$ 38.22 J

2. What is the kinetic energy of a 2.5 kg snow ball thrown through the air at 4 m/s?

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

$\frac{1}{2}(2.5)(4)^2 = 20\,J$

3. A 3.2kg book is sitting on top of a counter. The book has 50 J of potential energy. How tall is the counter?

$PE = mgh$

$50\,J = (3.2\,kg)(9.8\,m/s^2)(h)$ $\quad h = 1.6\,m$

4. The 3.2kg book slides off the counter and has 50 J of kinetic energy just before it lands on the ground. How fast is the book falling just before it hits the ground?

$KE = \frac{1}{2}mv^2$ $\quad 50\,J = \frac{1}{2}(3.2\,kg)(v)^2$

$\frac{50}{1.6} = \frac{1.6v^2}{1.6}$ $\quad \sqrt{31.25} = \sqrt{v^2} = 5.6\,m/s$

5. A spring is stretched 10 cm and has a spring constant of 680 N/m. Calculate the potential energy of the spring.

$10\,cm = .1\,m$

$PE = \frac{1}{2}kx^2$

$PE = \frac{1}{2}(680\,N/m)(.1m)^2 = 3.4\,J$

Work

6. A book weighing 1.7 N is lifted 1.5 m. How much work was done?

$W = Fd$ $\quad (1.7N)(1.5m) = 2.55\,Nm$ or J

7. A force of 150 N was necessary to lift a rock. A total of 200 J of work was done. How far was the rock lifted?

$W = Fd$

$\frac{200\,J}{150} = \frac{150N(d)}{150}$ $\quad 1.33\,m$

Power

8. How much power is used if a force of 43 N is used to push a box a distance of 8m in 3s?

$P = \frac{W}{t}$ $\quad P = \frac{Fd}{t}$ $\quad P = \frac{(43N)(8m)}{3s} = 114.7\,W$

9. What is the power of a kitchen blender if it can perform 3,000 J of work in 12s?

$P = \frac{W}{t}$ $\quad \frac{3000\,J}{12\,s}$ $\quad 250\,W$

Work Energy Theorem

10. A 2.0kg bird is flying through the air at a speed of 15m/s. The bird approaches a building with mirrored windows and, sadly, runs straight into the building.

a. What is the bird's kinetic energy when flying?

$KE = \frac{1}{2}mv^2$ $KE = \frac{1}{2}(2.0\,kg)(15\,m/s)^2 = 225\,J$

b. What is the bird's kinetic energy after running into the window?

$KE = \frac{1}{2}(2.0\,kg)(0\,m/s)^2 = 0\,J$

c. How much work does the window do on the bird?

$W = \Delta KE$

$W = KE_f - KE_i$

$0\,J - 225\,J = -225\,J$

Conservation of Energy

11. Fill in the missing blanks: