Physics 112

Tuesday Nov 21st

Potential Energy

Energy that is stored by an object.

$E_g = PE = mgh$

PE → Joules (J)

m → kg

g → 9.81 m/s²

h → height (m)

Example:

You are about to drop a 3.0 kg rock from a height of 0.68 m onto the ground. Calculate the potential energy of the rock at this height.

$$PE = mgh$$

$$= 3.0\,kg \times 9.81\,m/s^2 \times 0.68\,m$$

$$= 2.0 \times 10^1\,J$$

The rock has 2.0×10^1 J of potential energy.

Green Text

P 235 16,17

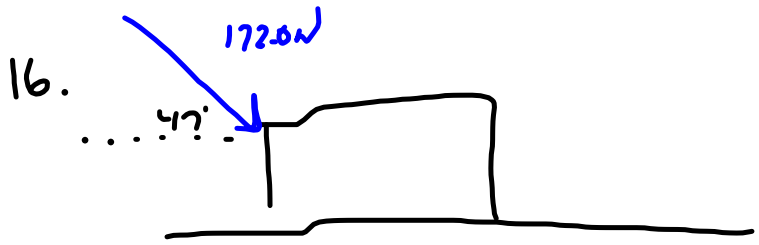
P 238 19.20,21

P 245 22.24

P 250 27,29

P 235

16.



$F_x = 172.0\,N(\cos 47)$

$= 117.3\,N \rightarrow$

$d = 16\,m \rightarrow$

$W = Fd$

$= 117.3\,N \times 16\,m$

$W = 1877\,N \cdot m$

17. $W = 2690\ J$

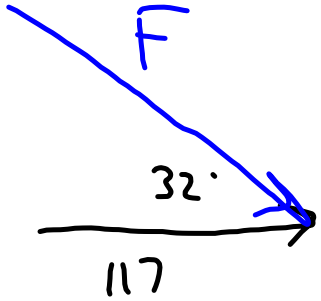
$d = 23.0\ m$

$W = Fd$

$\frac{W}{d} = F$

$\frac{2690\ J}{23.0\ m} = F$

$117\ N = F$



$\cos 32 = \frac{117}{F}$

$F = \frac{117}{\cos 32} = 138\ N$

p238

19. $v = 145 \text{ km/h} \rightarrow 40.3 \text{ m/s}$

$$KE = \frac{1}{2} m v^2$$

$$= \frac{1}{2} (0.100 \text{ kg}) (40.3 \text{ m/s})^2$$

$$\boxed{KE = 81.2 \text{ J}}$$

20.

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

$$m = \frac{2KE}{v^2} = \frac{2(4.5)}{0.95^2}$$

$$= \frac{9}{0.9025}$$

$$m = 1.0 \times 10^{1}\ kg$$

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

$= \frac{1}{2}(69\,kg)(7.25\,m/s)^2$

$KE = 1810\ J$

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22. $m = 6.30\ kg$

$d = 20.0\ m$

$F = 30.0\ N$

Velocity after 13.9m

$W = Fd$

$= 30.0N \times 13.9m$

$= 417\ N \cdot m$

or

$417\ J$

$W = \Delta KE$

$= KE_2 - KE_1$

$W = KE_2 - 0$

$W = KE_2$

$417 = \frac{1}{2}(6.30)v^2$

$132.4 = v^2$

$11.5\ m/s = v$

24. $m = 0.5\ kg$

$v_1 = 0\ m/s$

$v_2 = 1.2\ m/s$

$KE_1 = \frac{1}{2}(0.5)0^2$

$= 0\ J$

$KE_2 = \frac{1}{2}(0.5)(1.2)^2$

$= 0.36\ J$

$W = \Delta KE$

$W = KE_2 - KE_1$

$W = 0.36J - 0J$

$W = 0.36J$

$W = Fd$

$0.36 = F(0.1m)$

$3.6N = F$

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27. $PE = mgh$

$= 4.45\,kg \times 9.81\,m/s^2 \times 2.0\,m$

$PE = 87\,J$

29. $PE = mgh$ $\quad h = \frac{PE}{mg} = \frac{12.0\,J}{0.30\,kg \times 9.81\,m/s}$

$h = \frac{12.0}{2.94}$

$h = 4.08\,m$