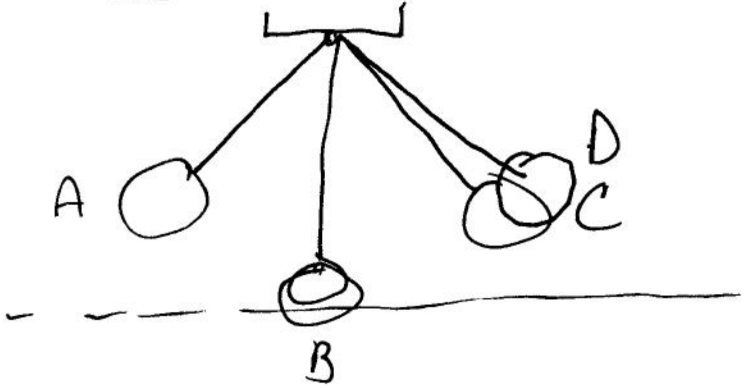
Ch. 8 Homework

Phy 101

Questions

④



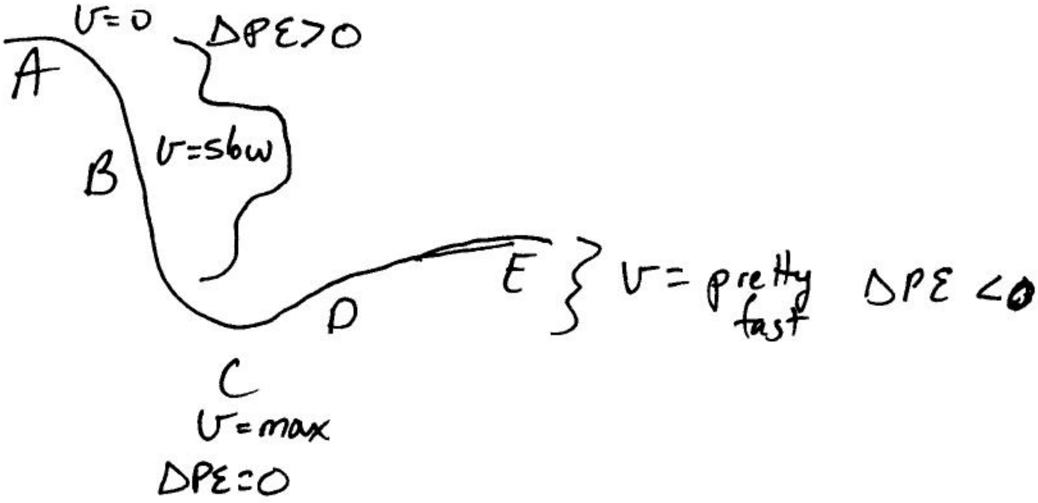
Tot E at pt. A = PE the gravitational force does positive work. $W = \Delta PE = mg(h_2 - h_1) > 0$

Tot E at pt. B = KE, no Δh, ∴ no gravitational work

Tot E at pt. C = PE + KE The gravitational force does negative work $\Delta h < 0$

Pendulum speed pt. A $v = 0$
B $v = \text{max.}$
C $v =$ almost 0
D $v = 0$

⑤



Ch. 8 HW

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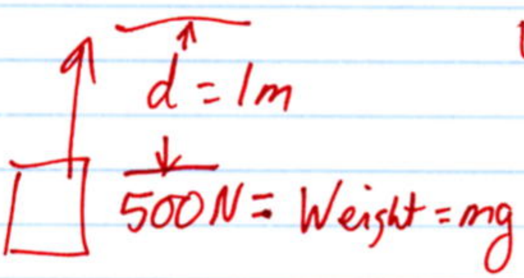
②

Qs

⑪ Pt. A has TotE = PE
Pt. C has TotE = KE (if C is lowest spot)

⑬ As a car accelerates, the engine turns the drive shaft which turns the wheels of the car. The friction between the tire & the road & the push of the road back on the tires propels the car forward.

⑮



$W = F \cdot d = 500N(1m)$
$= 500J$

It doesn't matter if you lift the crate straight upward or if you slide it up the ramp, the height of the crate will be the same ∴ ΔPE = same. However, the force you need to lift the crate is less when you slide it up a ramp.

Problems

⑥ $m = 50kg$
$d = 6m$
$F = 20N$

a) $W = F \cdot d = 20N(6m) = \boxed{120 J = W}$

b) $F = ma$

$$\frac{20N}{50kg} = a = \boxed{0.4 m/s^2 = a}$$

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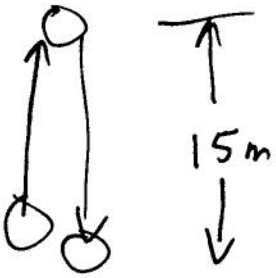
Ps

(13.) m=250g



a) $PE = mgh = 0.25\,kg(9.8\,m/s^2)(15\,m) = \boxed{36.75\,J}$

b) $KE_{bott} = PE_{top} = \boxed{36.75\,J}$

c) $KE_{bott} = \boxed{36.75\,J}$

d) $KE = \frac{1}{2}mv^2$ $\qquad v = \sqrt{\frac{2(KE)}{m}} = \sqrt{\frac{2(36.75)\,J}{0.25\,kg}}$

$$\boxed{v = 17.1\,m/s}$$

(15.) P = 75W
t = 6 hrs/day $\qquad$ Bill = ? for 30 days

cost = 10¢/kW·hr

$\#kW\cdot hr = 75W\left(\frac{6\,hrs}{day}\right)(30\,days) = 13{,}500\,W\cdot hr$

$= 13.5\,kW\cdot hr$

$Cost = 13.5\,kWh\left(\frac{10¢}{kWh}\right) = \boxed{\$1.35}$

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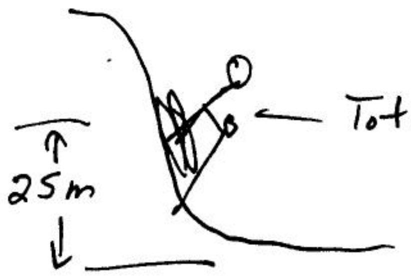
P5

⑯

$m = 65\,kg$



a) $KE_{bott} = PE_{top} = 65kg\,(9.8\,m/s^2)(25\,m) = \boxed{15,925\,J}$

b) $KE = \frac{1}{2} m v^2$ $\quad v = \sqrt{\frac{2(KE)}{m}} = \sqrt{\frac{2(15,925\,J)}{65\,kg}}$

$\boxed{v = 22.1\,m/s}$

c) Awfully fast, good thing for friction!

Extra Problems

⑤ $m = 3kg$ $\quad m = 2kg$
$v = 6m/s$ $\quad v = -4\,m/s$ $\quad v_f = 2m/s$

$$KE_{before} = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$$

$$= \frac{1}{2}(3kg)(6m/s)^2 + \frac{1}{2}(2kg)(-4m/s)^2 = 70\,J$$

$$KE_{after} = \frac{1}{2}(m_1 + m_2) V_f^2 = 10J$$

$$\boxed{KE_{lost} = 60\,J}$$

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ExPs

⑦ $m = 0.5 kg$, $F = 0.8N$, $d = 2m$

$W = F \cdot D = \Delta KE$

$W = 0.8N(2m) = 1.6 J = \frac{1}{2} m (v_f^2 - \cancelto{0}{v_i^2})$

$\boxed{KE = 1.6 J}$

(10.) $KE = 12 J$, $F_{frict} = 0.6N$, $d = 5m$

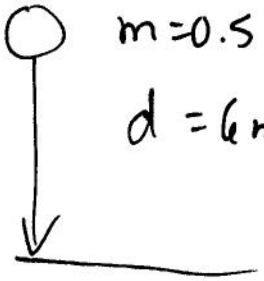
$KE_{after} = KE_{initial} - W_{frict} = 12J - F \cdot d$

$= 12J - 0.6N(5m)$

$\boxed{KE_{after} = 9J}$

(17.) $m = 0.5 kg$ $TotE = PE_{top}$

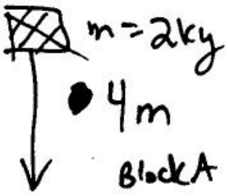
$d = 6m$

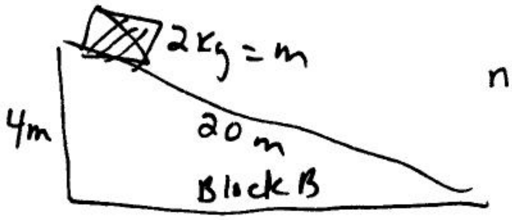


$TotE = KE_{bott}$

$KE_{bot} = PE_{top} = mgh = 0.5kg(9.8m/s^2)(6m) = \boxed{29.4J}$

(18.)





neglecting friction

$PE_A = PE_B$, $KE_{A bott} = KE_{B bott}$, speeds same

momentum same

Ch. 8 HW

ExPs

(18. cont)

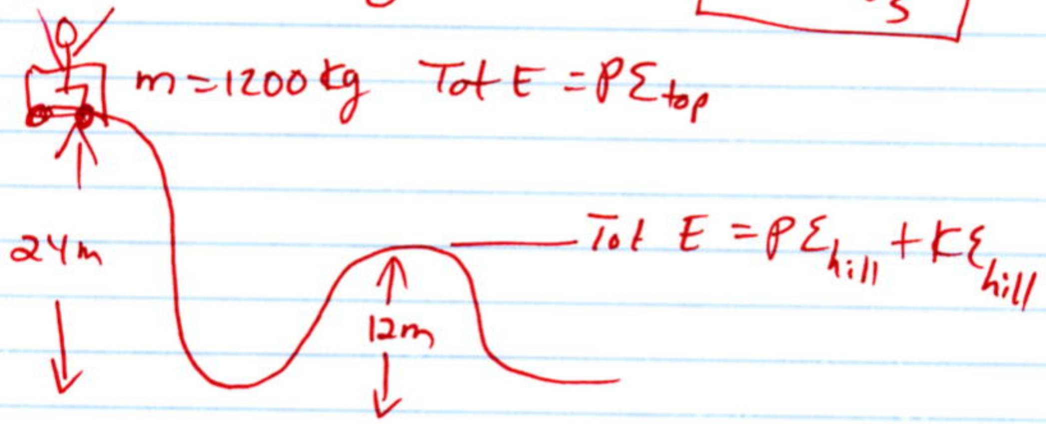
a) $PE = mgh = 2kg(9.8 m/s^2)(4m) = \boxed{78.4J}$

b) $KE_{bott} = PE_{top} = \boxed{78.4J}$

c) $v = \sqrt{\frac{2(KE)}{m}} = \sqrt{\frac{2(78.4J)}{2kg}} = \boxed{8.85 m/s}$

d) $p = m \cdot v = 2kg(8.85 m/s) = \boxed{17.7 \frac{kgm}{s}}$

(19.)



$m = 1200 kg$ $Tot E = PE_{top}$

$Tot E = PE_{hill} + KE_{hill}$

$KE_{hill} = PE_{top} - PE_{hill} = mg(h_{top} - h_{hill})$

$= 1200kg(9.8 m/s^2)(24 - 12m)$

$\boxed{KE_{hill} = 141,120 J}$