

2.3 Problem Set 2

Fecha:

①

P.2 #1 $PE_s = \frac{1}{2} k \Delta x^2 = \frac{1}{2} (100 \frac{N}{m}) (10 m)^2 = \boxed{0.50 J}$

#3 Target practice - Bow & Arrow

$\Delta x = 0.30 m$ $F = 40.0 N$

~~W = F \Delta x = PE_{stored} = 40 N \times 0.30 m = \boxed{12 J}~~

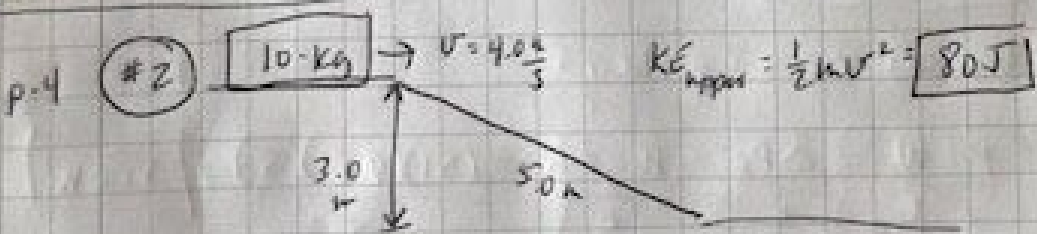
P.3 #9 Parachutist $m = 50.0 kg$ altitude = 1000 m
lands w/ $v = 5.00 \frac{m}{s}$ $g = 9.81 \frac{m}{s^2}$

Cons. of E $PE_{grav} + KE_0 \Rightarrow PE_{end} + KE_{end}$

$mgh_{start} + 0 \Rightarrow \frac{1}{2} m v^2$

$(50 kg) (9.81 \frac{m}{s^2}) (1000 m) \Rightarrow \frac{1}{2} (50 kg) (5 \frac{m}{s})^2$

$490,500 J \Rightarrow 625 J$ so air resistance removed
 $\boxed{489,875 J}$



#3 $PE_g = mgh_{upper} = (10)(9.81)(3) = \boxed{294 J}$

#4 $PE_g + KE_{upper} = PE_g + KE_{(lower)}$
(upper) (lower)
 $294 J + 80 J = \frac{1}{2} (10) v_{lower}^2$ $v = \boxed{8.7 \frac{m}{s}}$

$$\#5 \quad KE_{\text{lower}} = \frac{1}{2}mv^2 = \frac{1}{2}(10)(8.7)^2 = \boxed{378J}$$

p.5

#11 Playground Slide - speed at bottom must be $\leq 6.0 \frac{m}{s}$

$$\cancel{KE}_{\text{top}} + PE_{\text{top}} = KE_{\text{bottom}} + \cancel{PE}_{\text{bottom}} \quad (\text{mass of child cancels})$$

$$mgh = \frac{1}{2}mv^2 \quad h = \frac{v^2}{2g} = \boxed{1.8m}$$

p.7

$$\#25 \quad P = \frac{W}{t} \quad \text{to stop car } W = \Delta KE = -8 \times 10^6 J$$

$$P = \frac{-8 \times 10^6 J}{10 s} = \boxed{8.0 \times 10^5 W}$$

#26 Escalator moves 20 people (60 kg = 1 person)
 $h = 5m$ in 1 minute

$$P = \frac{W}{t} = \frac{\Delta PE}{\text{time}} = \frac{mgh}{t} = \frac{(20 \times 60)(9.81)(5)}{60}$$

$$\boxed{P \approx 980W}$$

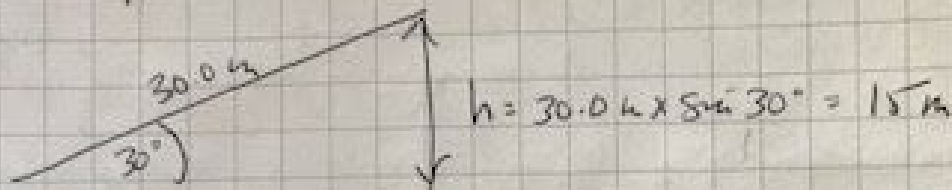
#27 Woman runs up stairs

$$P = \frac{W}{t} = \frac{\Delta PE}{t} = \frac{mgh}{t} = \frac{(51)(9.81)(5)}{5} = \boxed{500W}$$

#28 lift 49 kg person 5.0m in 20.0s

$$P = \frac{W}{t} = \frac{\Delta PE}{t} = \frac{mgh}{t} = \frac{(49)(9.81)(5)}{20} = \boxed{120W}$$

#29 Escalator = 30.0 m long w/ $\theta = 30^\circ$ angle
 $v = 1.00 \text{ m/s}$. What is rate of work to lift 50 kg man
 to top?



$$P = \frac{W}{t} = \frac{\Delta PE}{t} = \frac{mgh}{t} = \frac{(50)(9.81)(15)}{30} = \boxed{245 \text{ W}}$$

p.8 #35 ~~Engine X Power > Engine Y Power~~

