# REVIEW QUESTIONS – WORK, ENERGY, POWER, AND EFFICIENCY

SPH3U – Unit 3

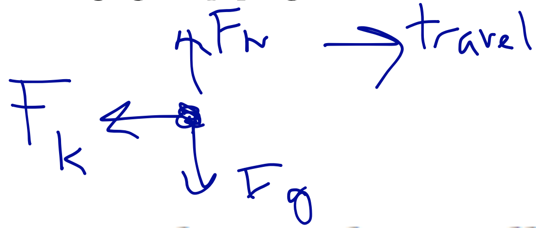
# QUESTIONS

- Pg. 249 # 1-3
- Pg. 254 #1-5
- Pg. 263 #31,34,37,39

# PG. 263 #31

$$\frac{72\,\cancel{km}}{\cancel{h}} \times \frac{1000\,m}{1\,\cancel{km}} \times \frac{1\,\cancel{h}}{60\,\cancel{min}} \times \frac{1\,\cancel{min}}{60\,s}$$

$$= 20\ m/s$$




31. A 2600 kg truck travelling at 72 km/h slams on the brakes and skids to a stop. The frictional force from the road is 8200 N. Use the relationship between kinetic energy and mechanical work to determine the distance it takes for the truck to stop. (5.2) T/I

$$W = F\Delta d$$

$$F = -8200\ N$$

$$W = \Delta E_k$$

$$= E_{k2} - E_{k1}$$

$$W = 0 - \frac{mv^2}{2}$$

$$W = 0 - \frac{(2600\,kg)(20\,m/s)^2}{2}$$

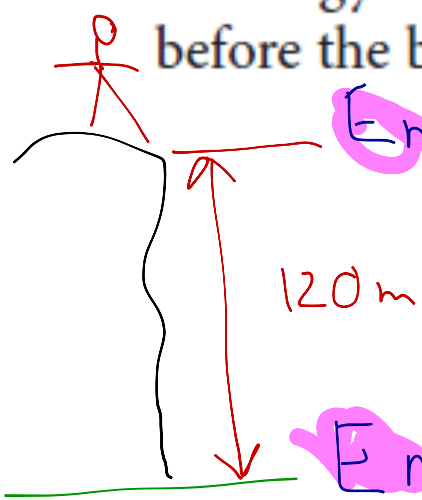
$$W = -520\,000\ J$$

$$\therefore \Delta d = \frac{-520\,000\ \cancel{N}\cdot m}{-8200\ \cancel{N}}$$

$$\Delta d = 63\ m$$

# PG. 263 #34

34. A bungee jumper has a mass of 73 kg and falls a distance of 120 m before the bungee catches and sends the jumper upward. Use the law of conservation of energy to calculate the speed of the jumper just before the bungee catches. (5.3) T/I




$E_m = E_g + \cancel{E_k}$
$0$

$E_m = \cancel{E_g} + E_k$
$0$

$\therefore E_k = 85848\ J$

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

$E_g = mgh$
$= (73\ kg)(9.8\ \frac{m}{s^2})(120\ m)$

$\boxed{E_g = 85848\ J}$

$v^2 = \frac{2E_k}{m}$

$v = \sqrt{\frac{2E_k}{m}}$

$\therefore v = 48\ \frac{m}{s}$

# PG. 263 #37

37. A roller coaster descends 55 m from the top of the first high point to the first low point in the track. The roller coaster converts gravitational potential energy to kinetic energy with an efficiency of 50.0 %. What is the velocity of the roller coaster at the bottom of the first low point? (5.4) T/I

Top: $E_g = m\left(9.8\,\frac{m}{s^2}\right)(55\,m)$

$E_g = 539(m)\,\frac{m^2}{s^2}$

Bottom: $E_k = 0.5\,E_g$

$\frac{\cancel{m}v^2}{2} = 0.5(539)(\cancel{m})\frac{m^2}{s^2}$

$\frac{v^2}{2} = (0.5)539\,\frac{m^2}{s^2}$

$v^2 = 539\,\frac{m^2}{s^2}$

$v = \sqrt{539\,\frac{m^2}{s^2}}$

$\boxed{v = 23\,m/s}$

# PG. 263 #39

39. A car's engine is only 12 % efficient at converting chemical energy in gasoline into mechanical energy. If it takes 18 000 N of force to keep the car moving at a constant speed of 21 m/s, how much chemical energy would be needed to move the car a distance of 450 m at this speed? (5.4) T/I

$W = F\Delta d = \Delta E$

$W = (18\,000\,N)(450\,m)$

$W = 8\,100\,000\,J = E$

$0.12\,E_{need} = 8\,100\,000\,J$

$E_{need} = \dfrac{8\,100\,000\,J}{0.12}$

$E_{need} = 67\,500\,000\,J$

Pg 366

#36, 37, 39-42