

CH 7 Review questions

1, 2, 3, 4, 5

13, my examples

SOLUTIONS:

①

$$(36-10)h \times \frac{60min}{1h} \times \frac{1song}{3.5min} = \boxed{445.7 songs}$$

$$\textcircled{2} (82L - 77L) \times \frac{0.264 gal}{1L} = \boxed{1.32 gal}$$

$$\textcircled{3} \left( 26.4 mi \times \frac{5280 ft}{mi} \right) - \left( 41940 yd \times \frac{3 ft}{1 yd} \right)$$
$$139392 ft - 125820 ft = \boxed{13572 ft}$$

$$\textcircled{4} 400m \times \frac{1km}{1000m} \times \frac{0.62mi}{1km} = \boxed{\begin{matrix} 0.248 mi \\ (0.25 mi) \end{matrix}}$$

$$\textcircled{5} 300 \frac{mi}{hr} \times \frac{1hr}{3600s} \times \frac{1km}{0.62mi} \times \frac{1000m}{1km}$$
$$= \boxed{134.4 \frac{m}{s}}$$

$$\textcircled{13} 528 \frac{gal}{day} \times \frac{1L}{0.264 gal} \times \frac{365 day}{yr} =$$
$$\boxed{730 kL}$$

EX: Determine if each is a valid equation

if  $U: \text{m/s}$ ,  $g: \text{m/s}^2$ ,  $H: \text{m}$

$P: \text{Pa}$ ,  $\rho: \frac{\text{kg}}{\text{m}^3}$

(a)  $U = \frac{P}{\rho} + \sqrt{2gH}$

$$\frac{\text{m}}{\text{s}} = \frac{\frac{\text{Pa}}{\frac{\text{kg}}{\text{m}^3}}}{\frac{\text{m}^2}{\text{s}^2}} + \sqrt{2 \frac{\text{m}}{\text{s}^2} \text{m}}$$

*(Note: The above equation is a direct transcription of the handwritten work, which contains dimensional errors. The next block shows the corrected derivation.)*

$$\frac{\text{m}}{\text{s}} = \frac{\frac{\text{kg}}{\text{m s}^2}}{\frac{\text{kg}}{\text{m}^3}} + \frac{\text{m}}{\text{s}}$$

$$\frac{\text{m}}{\text{s}} = \frac{\text{m}^2}{\text{s}^2} + \frac{\text{m}}{\text{s}} \quad \underline{\text{no!}}$$

(b)  $U = \sqrt{\frac{2P}{\rho} + 2H}$

$$\frac{\text{m}}{\text{s}} = \sqrt{2 \frac{\text{m}^2}{\text{s}^2} + 2 \text{m}} \quad \text{no!}$$

(c)  $U = \sqrt{\frac{2P}{\rho} + 2gH}$

$$= \sqrt{2 \frac{\text{m}^2}{\text{s}^2} + 2 \frac{\text{m}^2}{\text{s}^2}} \quad \text{yes!}$$

EX: Find if each equation is valid if  
 $P \propto W$        $A: m^2$      $v: \frac{m}{s}$      $\eta: \text{unitless}$

$$P: \frac{kg}{m^3}$$

(a)  $P = \eta \rho A v^2$

↙  
 $W = \frac{kg}{m^3} m^2 \frac{m^2}{s^2}$

↘  
 $\frac{J}{s} = \frac{Nm}{s} =$

$$\frac{kg m^2}{s^3} \neq$$

$$kg \frac{m}{s^2}$$

no!

(b)  $P = \eta \rho A v^3$

$$\frac{kg m^2}{s^3}$$

$$\frac{kg}{m^3} m^2 \frac{m^3}{s^3}$$

$$= \frac{kg m^2}{s^3} \text{ yes!!}$$