Waves Problem Set

1. a) the minute hand makes 1 cycle every hour.

$$f = \frac{\text{cycles}}{s} = \frac{1}{60 \cdot 60} = \boxed{\frac{1}{3600}\ \text{Hz}} = \boxed{2.78 \times 10^{-4}\ \text{Hz}}$$

b) the hour hand makes 1 cycle every 12 hours.

$$f = \frac{\text{cycles}}{s} = \frac{1}{12 \cdot 3600} = \boxed{\frac{1}{43200}\ \text{Hz}} = \boxed{2.31 \times 10^{-5}\ \text{Hz}}$$

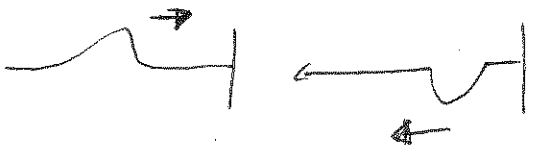
2. a) under damped
   b) critically damped
   c) over damped

3. longitudinal. Particles are moving in the same direction as the wave.

4. transverse. Particles are moving perpendicular to the direction of the wave.

5. No. Wave speed is how fast the wave is moving. Particles will move at different speeds.

6. When two waves pass each other their Amplitudes add.

7. 

same speed & λ, but the Amplitude changes sign.

8.  same λ, speed and amplitude

9. 

10. $V = \lambda f$ so greater λ means smaller f

$f_{AM} = 7 \times 10^5$ Hz $\quad f_{FM} = 90.3 \times 10^6$ Hz

$f_{AM} < f_{FM} \therefore \lambda_{AM} > \lambda_{FM}$ **the AM Station**

11. it speeds up

12. $d = 7.5 \times 10^2$ m $\quad$ cycles $= 1.1 \times 10^3$ $\quad \lambda = ?$

$$\lambda = \frac{d}{c} = \frac{7.5 \times 10^2}{1.1 \times 10^3} = \boxed{.68 \text{ m}}$$

13. $f = 575$ Hz $\Rightarrow$ $T = \frac{1}{f} = \frac{1}{575} = \boxed{0.00174 \text{ s}}$

14. $f = \frac{\text{cycles}}{s} = \frac{12}{26} = \boxed{.46 \text{ Hz}}$

15. $\lambda = 21.1 \text{ cm} = 21.1 \times 10^{-3} \text{ m} = 0.0211 \text{ m}$

$V = 3.00 \times 10^8$ m/s

$V = \lambda f \qquad 3.00 \times 10^8 = 0.0211 f$

$\boxed{f = 1.42 \times 10^{10} \text{ Hz}}$

16. $v = 351\ m/s$ $\lambda = 2.400\ m$ $T = ?$ $T = \frac{1}{f}$

$v = \lambda f$ $351 = 2.4f$ $f = 146.25$

$T = \frac{1}{146.25} = 0.00684$

$= 0.00684 s$

17. $f = 0.80\ Hz$ $v = 1.5\ m/s$ cycles $= 6$

$v = \lambda f$

$1.5 = \lambda(.8)$

$\lambda = 1.875\ m$

$d = \text{cycles}(\lambda) = 6(1.875)$

$d = 11.25 m = \boxed{11 m}$

18. $f_1 = 5.72 \times 10^5\ Hz$ $\lambda_1 = 0.533 m$

$v_1 = \lambda f = (5.72 \times 10^5)(0.533) = 304876\ m/s$

$v_1 = v_2 = 304876$ $f_2 = 6.13 \times 10^5\ Hz$

$v_2 = \lambda_2 f_2$ $304876 = \lambda(6.13 \times 10^5)$

$\boxed{\lambda_2 = 0.497\ m}$