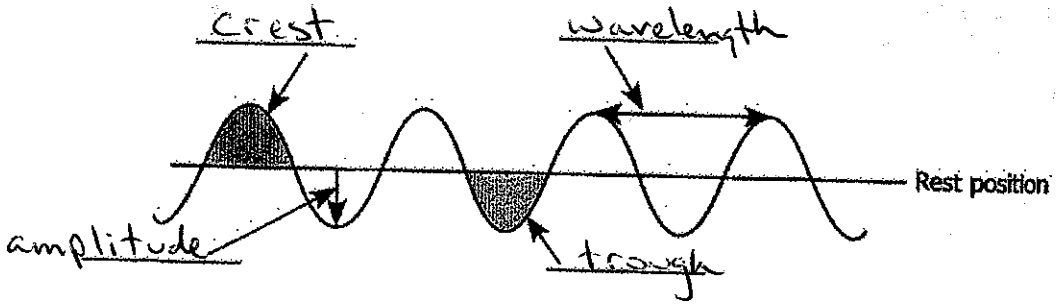
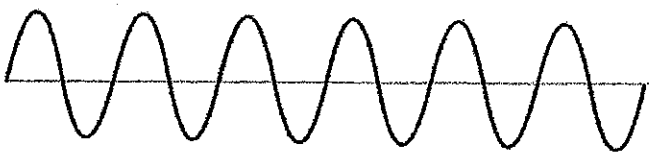
Waves Worksheet #1

1. Label each part of a transverse wave as indicated.



2. The periodic transverse wave below travels past a point P in 2.75 s.



a) What is the wavelength of this wave? Use a ruler to measure it.
b) What is the amplitude of this wave? Use a ruler to measure it.
c) What is the frequency of this wave?
d) What is the period of this wave?

3. Describe the motion of a point on the medium that occurs in a transverse wave.

4. Describe the motion of a point on the medium that occurs in a longitudinal wave.

5. Define the following terms: crest, trough, compression, rarefaction.

6. What is the frequency of a wave?

7. What is the metric unit of frequency?

8. How is the period of a wave related to its frequency?

9. What is the wavelength of a wave?

10. "Domino toppling" involves lining up a large number of dominoes and then letting them topple, one after the other. It is one entry in the Guinness Book of World Records. If we think about the disturbance that propagates along the line of dominoes, is it transverse, longitudinal, or both?

② a) 1.4 cm

b) 0.8 to 0.9 cm

c) $f = \frac{\#\text{ of waves}}{\text{time}} = \frac{6}{2.75} = \boxed{2.18 \text{ Hz}}$

d) $T = \frac{1}{f} = \frac{1}{2.18} = \boxed{0.46 \text{ s}}$

③ point moves perpendicular to direction of wave motion

④ point moves parallel to direction of wave motion

⑤ crest - high point on a wave

trough - low point on a wave

compression - part of a longitudinal wave where the particles of the medium are closest together

rarefaction - part of a longitudinal wave where the particles of the medium are farthest apart

⑥ number of waves that pass a given point per second

⑦ Hertz

⑧ $T = \frac{1}{f}$

⑨ distance from one crest to the next crest of the wave

(10) longitudinal – the dominoes move in the same direction as the wave travels

(11) $f = \frac{10}{100} = \boxed{0.1 \text{ Hz}}$

(12) $v = f\lambda$

$3 \times 10^8 = (97.5 \times 10^6)\lambda$

$\lambda = \boxed{3.08 \text{ m}}$

(13) $v = f\lambda$

$1470 = f(0.025)$

$f = 58\,800 \text{ Hz}$

$T = \frac{1}{f} = \frac{1}{58\,800}$

$T = \boxed{1.7 \times 10^{-5} \text{ s}}$

(14) $f = \frac{54}{55} = \boxed{0.98 \text{ Hz}}$

$T = \frac{1}{f} = \frac{1}{0.98} = \boxed{1.02 \text{ s}}$

(15) $\frac{450 \text{ b}}{1 \text{ min}} = \frac{450 \text{ b}}{60 \text{ s}} = \frac{7.5 \text{ b}}{1 \text{ s}} = 7.5 \text{ Hz}$

$\frac{650 \text{ b}}{1 \text{ min}} = \frac{650 \text{ b}}{60 \text{ s}} = \frac{10.8 \text{ b}}{1 \text{ s}} = 10.8 \text{ Hz}$

$\boxed{7.5 - 10.8 \text{ Hz}}$

(16) $T = \frac{1}{f} = \frac{1}{3.58} = 0.279 \text{ s}$ per vibration

$100 \times 0.279 = \boxed{27.9 \text{ s}}$ for 100 vibrations

(17) $f = \frac{12}{30} = \boxed{0.4 \text{ Hz}}$

$T = \frac{1}{f} = \frac{1}{0.4} = \boxed{2.5 \text{ s}}$

(18) $v = f\lambda$

$= (10)(0.75)$

$v = \boxed{7.5 \text{ m/s}}$

$v = \frac{d}{t}$

$7.5 = \frac{6}{t}$

$t = \frac{6}{7.5} = \boxed{0.8 \text{ s}}$

(19) $v = f\lambda$

$3 \times 10^8 = f(0.21)$

$f = \boxed{1\ 428\ 571\ 429 \text{ Hz}}$

(20) $v = \frac{d}{t}$

$= \frac{3250 \text{ km}}{4.6 \text{ h}}$

$v = 706.5 \text{ km/h}$

$v = 196.3 \text{ m/s}$

$v = f\lambda$

$196.3 = f(640\,000 \text{ m})$

$f = \boxed{3.1 \times 10^{-4} \text{ Hz}}$

(21) a) $v = f\lambda$

$4600 = f(523)$

$f = \boxed{8.8 \text{ Hz}}$

b) $v = f\lambda$

$7500 = 8.8\lambda$

$\lambda = \boxed{853 \text{ m}}$

c) that frequency is the same as in (a).

(22) a) $v = f\lambda$

$343 = 256\lambda$

$\lambda = \boxed{1.34 \text{ m}}$

b) $v = f\lambda$

$343 = 512\lambda$

$\lambda = \boxed{0.67 \text{ m}}$