8th Grade Honors Science
Wave Equations

Name Answer Key
Class Period _____

Calculating Wave Speed, Frequency, and λ

1. Frequency = 5 Hz
   Wavelength = 100m
   Speed =

   $5\ Hz \times 100\ m = 500\ m/s$

2. Frequency = 20 Hz
   Wavelength = 200m
   Speed =

   $20\ Hz \times 200\ m = 4000\ m/s$

3. Frequency = 27 Hz
   Wavelength = 150m
   Speed =

   $27\ Hz \times 150\ m = 4050\ m/s$

4. Frequency = 27 Hz
   Wavelength =
   Speed = 46 m/s

   $\frac{46\ m/s}{27\ Hz} = \frac{\lambda \times 27\ Hz}{27\ Hz} = 1.70\ m$

5. Frequency = 502000 m
   Wavelength = ~~502 km~~
   Speed = 100 m/s

   $\frac{100\ m/s}{502000} = \frac{502000\ m \times f}{502000}$

   $f = .00019\ Hz$

6. Frequency =
   Wavelength = 326m
   Speed = 14 m/s

   $\frac{14\ m/s}{326} = \frac{326\ m \times f}{326}$

   $f = .043\ Hz$

7. Frequency = 97 Hz
   Wavelength = ~~1378 km~~ 1378000 m
   Speed =

   $V = 97\ Hz \times 1378000\ m$

   $V = 133,666,000\ m/s$

8. Frequency = 78 Hz
   Wavelength = ~~1378 km~~ 1378000m
   Speed =

   $V = 78\ Hz \times 1378000\ m$

   $107,484,000\ m/s$

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9. What is the v if λ = 8m and f = 20 Hz? $8m \times 20Hz = 160 m/s$

10. What is the λ if v = 50 m/s and f = 25 Hz? $\frac{50 m/s}{25Hz} = 2m$

11. What is the f if v = 50 m/s and λ = 10m? $\frac{50 m/s}{10m} = 5Hz$

12. What is the v if λ = 1 m and f = 345 Hz? $345Hz \times 1m = 345 m/s$

13. What is the λ if v = 100 m/s and f = 3 Hz? $\frac{100 m/s}{3Hz} = 33.33 m$

14. What is the f if v = 120 m/s and λ = 3 m? $\frac{120 m/s}{3m} = 40 Hz$

15. What is the v if λ = 3 m and f = 10 Hz? $3m \times 10Hz = 30 m/s$

16. What is the λ if v = 345 m/s and f = 790 Hz? $\frac{345 m/s}{790Hz} = .44m$

17. What is the f if v = 345 m/s and λ = .25 m? $\frac{345 m/s}{.25} = 1380 Hz$

Challenge Questions:

18. Joe the whistle maker knows that the maximum volume for a whistle will occur if the length of the whistle is exactly ¼ of the wavelength. If Joe must make a whistle that plays at a pitch of 340 Hz, how long will the whistle be? $343 m/s = \lambda \times 340 Hz$
$\lambda = 1.008m \times .25 =$ **.252 m**

19. How long is the wavelength of KAJA radio whose broadcast frequency is 97.1 MHz? (97.1 MHZ = 97,100,000 Hz and v = 300,000,000 m/s)
$\frac{300,000,000}{97,100,000} = \frac{97,100,000 \times \lambda}{97,100,000} \rightarrow \lambda = 3.09 m$

20. Using the velocity of sound at 343 m/s and given the frequencies of a piano scale, compute the wavelengths of that scale.

Note	Frequency	Wavelength
C4	261.6	1.311 m
D4	293.6	1.168 m
E4	329.6	1.04 m
F4	349.2	.982 m
G4	392	.875 m
A4	440	.78 m
B4	493.9	.694 m
C5	523.2	.655 m