Name: ANSWER KEY Pd: ___ Ast: _____

Wave Questions

1. What is the equation for the velocity of a wave? $v = f\lambda$
2. A wave with a frequency of 250 Hz has a wavelength of 4 m. How fast is the wave travelling?

$v = f\lambda = 250\,Hz \cdot 4\,m = 1000\,m/s$

3. A radio wave with a wavelength of 120 m has a frequency of 5000 Hz. What is its speed?

$v = f\lambda = 5000\,Hz \cdot 120\,m = 600{,}000\,m/s$

4. A wave with a wavelength of 100 m is travelling past a radio tower. If 240,000 crests pass that location in one minute, how fast is the wave moving?

$v = f\lambda = \left(\frac{240000}{60\,s}\right) \cdot 100\,m = 400{,}000\,m/s$

5. A wave is moving at a speed of 30 m/s. If its wavelength is 2 meters, what is its frequency?

$f = \frac{v}{\lambda} = \frac{30\,m/s}{2\,m} = 15\,Hz$

6. 15 wave crests pass by a single point in a span of 10 seconds. If the wave is moving at a speed of 3 m/s, what is its wavelength?

$\lambda = \frac{v}{f} = \frac{3\,m/s}{\left(\frac{15}{10\,s}\right)} = 2\,m$

7. What is the frequency of a wave if it is travelling at 300,000,000 m/s and its wavelength is 0.00000065 m (650 nm)?

$f = \frac{v}{\lambda} = \frac{300{,}000{,}000\,m/s}{0.00000065\,m} = 4.61 \times 10^{14}\,Hz$

8. A wave has a frequency of 85 Hz. If it is travelling at a speed of 85 m/s, what is its wavelength?

$\lambda = \frac{v}{f} = \frac{85\,m/s}{85\,Hz} = 1\,m$

9. You are standing outside during super howlout. Mr. Howard is flying his drone low over your head. As it approaches you, it is giving off a high-pitched buzz. However, as it passes you and continues on, the buzz changes to a lower pitch. Did the drone's buzz actually change, or just your perception? What causes this?

THE APPARENT CHANGE IN THE SOUND OF THE DRONE IS A RESULT OF THE DOPPLER EFFECT. WHEN THE DRONE IS MOVING TOWARD YOU, THE SOUND WAVES ARE COMPRESSED, RESULTING IN A HIGHER PITCH. WHEN IT IS MOVING AWAY FROM YOU, THE SOUND WAVES ARE STRETCHED, RESULTING IN A LOWER PITCH.

10. Mr. Lynch starts his car, but a wiring malfunction causes the horn to sound, giving off a constant "BEEEEEEEEEEEEEEEEEEEEEP". Describe how the horn would sound as Mr. Lynch drives down the road toward the mechanic's shop from the perspective of:
    a. Mr. Lynch driving the car: THE SOUND WOULD BE CONSTANT,
    b. A person standing on the sidewalk as Mr. Lynch drives past: THE SOUND WOULD BE A HIGHER PITCH AS MR. LYNCH APPROACHES, CHANGING TO A LOWER PITCH AS HE PULLS AWAY.
    c. The mechanic waiting for him at the shop as he pulls into the parking lot: THE SOUND WOULD BE A HIGH PITCH, WHICH WOULD LOWER TO BE THE SAME SOUND MR. LYNCH HEARS WHEN THE CAR STOPS.