Team Name: _____ Team Number: _____

Competitor Names: _____

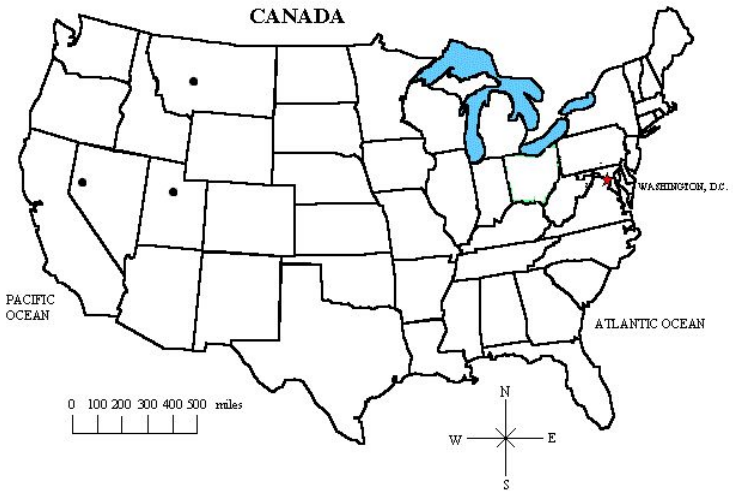
Crave the Wave Test

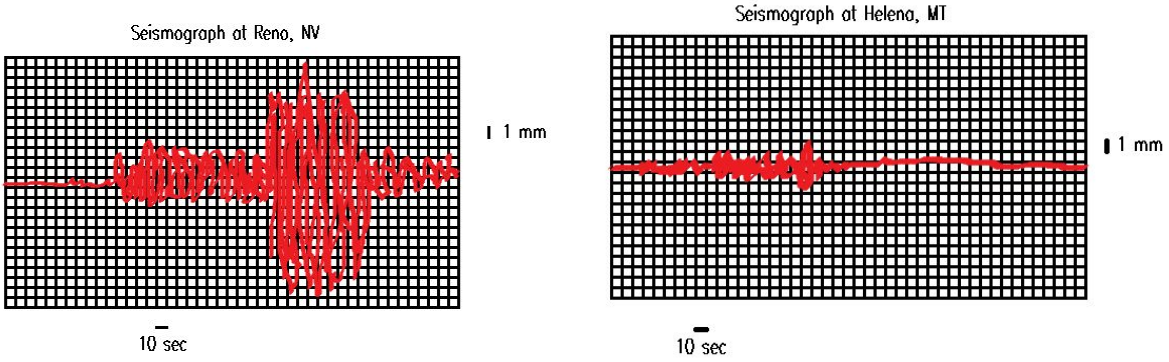
Instructions:

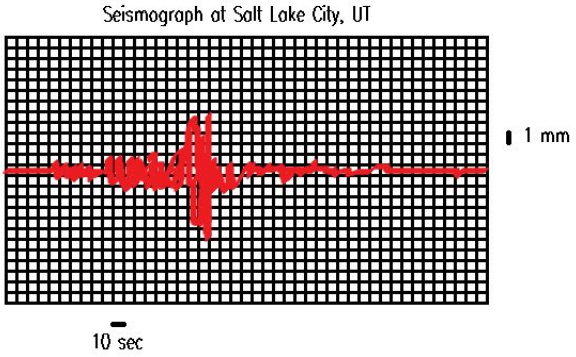
- This test is designed for four 3-minute stations and a non-station portion.
- If the competitors finish the station before the given time is finished, they may work on the non-station portion.
- Answers should be calculated using proper significant figures unless specified otherwise.
- Units of measurement should be included when appropriate.
- This test is to be used for practice and **NOT to be used in ANY competition.**

Station 1

1. 3 seismographs at Reno, NV, Salt Lake City, UT and Helena, MT detected an earthquake. Draw a dot on the epicenter of the earthquake and show all work:







2. Find the magnitude of the earthquake.

Station 2

1. You shine a magenta flashlight in a filter, and the light hits a yoga ball. The yoga ball appears cyan. Next, you repeat the same test with the filter removed. The yoga ball appears magenta. Finally, you try the test with the filter in and out with a yellow flashlight. With the filter in, the ball appears black. Without the filter, it appears red. Find the colors of the filter and the yoga ball.

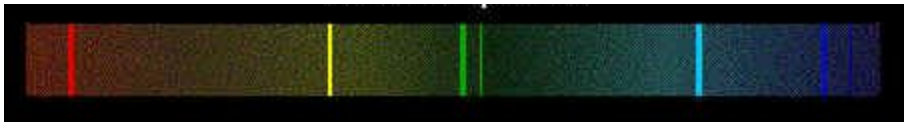
2. What are the primary and secondary colors of light?

3. What are the primary and secondary colors of pigments?

4. Pigments are _____ while light is _____.

5. What are optical filters?

6. Identify if the following are emission or absorption spectra:



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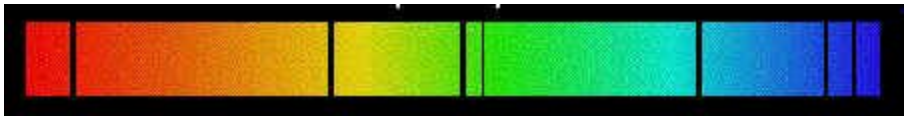

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Station 3

1. There is a recording of a truck with the sound of its horn getting higher. Is the truck approaching or leaving?

2. What is this effect called?

3. A truck is moving away at 30 mph from a car moving towards the truck at 60 mph. If the truck emits a horn of frequency 500 Hz, what frequency does the driver of the car hear to 3 significant digits?

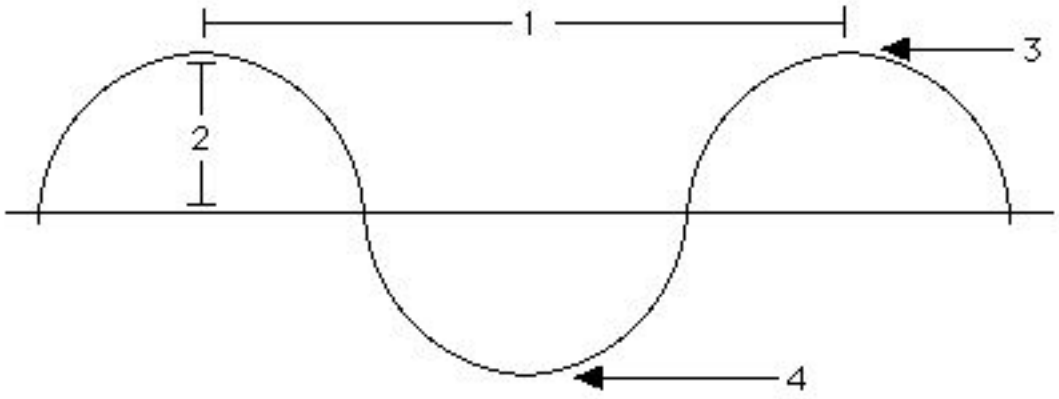
4. What are the two types of reflection, and on what types of surfaces do they occur?

5. What qualities do your image in the mirror possess?
    1. It is
    2. It is
    3. It is
    4. It is
    5. It is
6. What is the law of reflection?

7. Who is credited with discovering Snell's Law?

Station 4

Use the following diagram for questions 1-5:



1.
2.
3.
4.
5. What type of wave is this? _____
6. Define constructive interference:

7. Define destructive interference:

8. Draw a diagram of the formation of a standing wave:

9. Where do surface waves occur?

10. What is a ground wave?

Test

1. List the following waves in order from lowest to highest frequency: AM waves, Infrared waves, Visible light, Gamma rays, X-rays, UV rays, Microwaves, FM waves.

2. Define amplitude:

3. A light beam 30 degrees from the normal refracts from air through crown glass at an angle of __ deg.

4. __ deg is the angle of incidence from air through water at which the reflected beam and the refracted beam form 90 degrees. What is this angle called?

5. Identical sounds of “Darius Milhaud - La création du monde” coming from a boombox, going through water and air, arrive at different times to the same place. Why is this? If the sounds arrive 0.25 seconds apart, assuming the sound never fully attenuates and has a constant speed, how far away is the source in meters and in scientific notation? Which sound comes first?

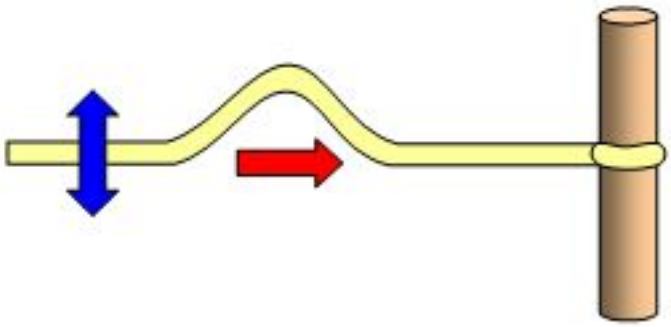
6. What is the difference between the media of which transverse and longitudinal waves travel through?

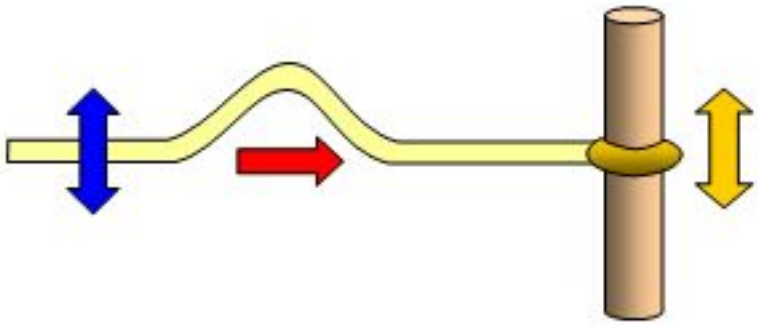
7. How can the boundary effect amplify sound?

8. How fast, in km/sec, do P and S-waves travel through an unknown material with a bulk modulus of 96 GPa, a shear modulus of 36 GPa and a density of 4 g/cm^3?

9. __ deg is the angle of refraction for when a light beam refracts from air into a prism of crown glass at an angle of 45 degrees.

For questions 10 and 11, draw the reflection on the picture after the wave hits the pole.

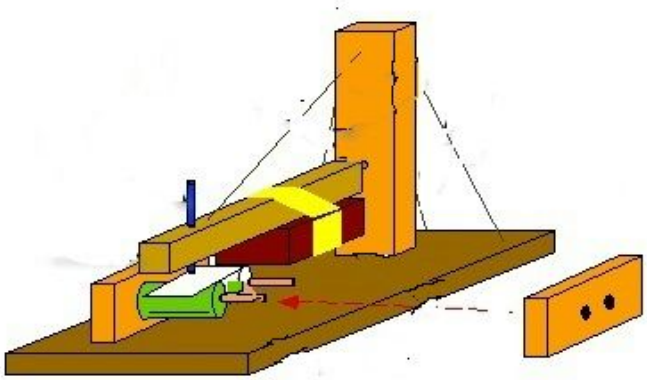
10. 

11. 

12. What causes the sky to be blue? Describe this phenomenon.

13. You shine a laser at the moon with a frequency of 1.2 * 10^13 Hz. You then double the frequency. What is the final wavelength in meters and by what factor does the wavelength change when you double the frequency?

14. Name the range of photon energy, in eV to the nearest thousandth, for infrared waves and the relationship between frequency and wavelength.



15. What type of machine is shown in the diagram above?

16. What is the study of sound called?

17. What are mechanical waves?

18. What do AM and FM stand for?

19. Ripples are primarily

a. swells
b. capillary waves
c. wind waves
d. love waves

20. Who is the hertz named after? (First and last name)

21. What is the study of ocean waves (among other things) called?

22. Around what wavelength in micrometers of infrared light do humans radiate?

23. What do the Fresnel equations define?

24. What are the two main types of earthquake waves? Describe the difference between them.

25. How are UV rays used, what are the harms of UV rays and how does the Earth protect us from UV radiation?

26. How does the Earth protect us from UV radiation?

27. A tsunami travels from California to Hawaii (around 2,500 miles) in 2.0 days and 2.0 hours. It takes about one minute for each wave to occur. What is the wavelength of the tsunami wave in kilometers? (Hint: 1.0 mi is approximately 1.6 km.)

28. You call out to your friend in another room without going to the door. If your friend hears what you say, what is this an example of?

29, a, b, c, d. Identify the type(s) of waves shown.

a. 

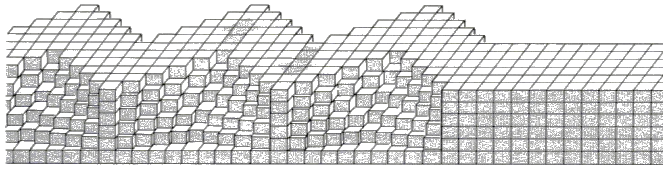
_____

b. 

_____

c. 

_____

d. 
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