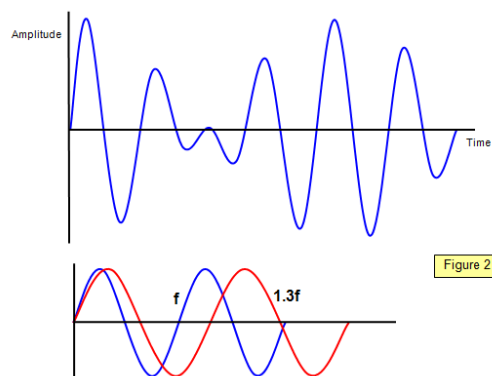
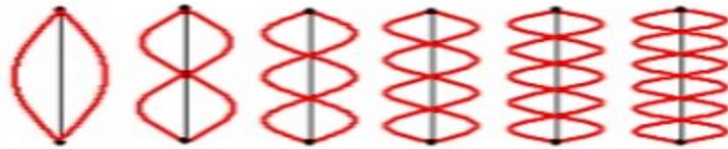


Honors Physics Semester 2 Review

General and mechanical waves

- 13 troughs of a transverse wave pass a buoy in 8 seconds. What is the magnitude of the frequency in Hz?**
- The period of a mechanical wave is 1.7s, what is the frequency in Hz?**
- A wave has a period of 1.3s and a length of 6.4m. What is its speed and frequency?**
- A wave pulse reflects from a solid wall. What is the orientation of the reflected wave?**
- A wave pulse travels from a less dense material to a more dense material.**
 - What is the orientation of the reflected portion of the wave?**
 - What is the orientation of the transmitted part of the wave?**
- A wave pulse reflects from a loosely attached ring. What is the orientation of the reflected wave?**
- The wave at the top is produced by the interaction of the two waves below it. Label the zones of greatest constructive interference and greatest destructive interference.**





Distance from top node to bottom node **0.5m** **10.0m** **5.0 m** **2.6m** **1.0 m** **4.2 m**
A **B** **C** **D** **E** **F**

8. A set of 6 standing waves with the lengths of the springs used to generate them is listed above.

What is the frequency of each wave?

9. If these represented standing waves on a stringed instrument, which would have the highest pitch?

10. A standing wave is generated in a string, it has 6 nodes and 5 antinodes

a. Sketch the wave.

b. If the length of the string is 2.5m, what is the wavelength?

c. If the frequency is 167Hz, what is the speed of the wave in this string?

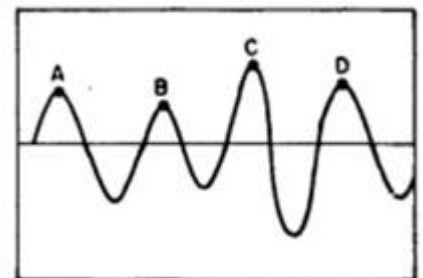
d. The frequency is adjusted until there are only 5 nodes. But the team forgets to write it down. Can they calculate the frequency? How? If they can calculate the frequency, what is it?

Sound Waves

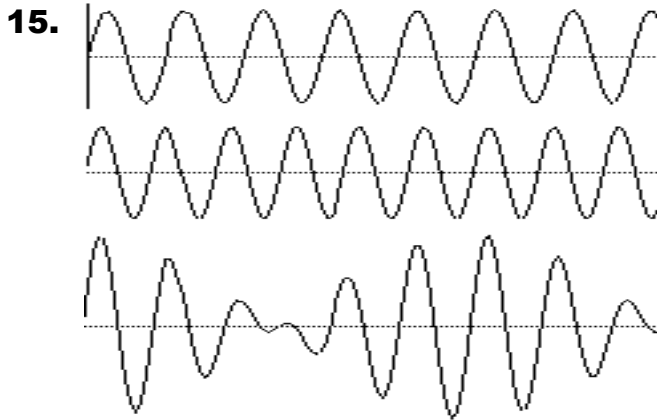
11. The frequency of an “A” note is 440Hz. Calculate the wavelength associated with this frequency for sound that travels at 340 m/s.

12. The frequency of a “fishfinder” sonar being used by a sportsfisher is 50 kHz and its wavelength is 2.9m. What is the speed of sound in the lake in m/s?

13. Students are drawing a simplified version of sound waves (because longitudinal waves are hard to draw). Which point would represent the quietest portion of the sound?



14. "White noise" is used to mask other sounds. Describe how it works.



What property of sound waves is being shown in this example?

Light waves

The wave equation $f=v/\lambda$, is written slightly differently $v=c/\lambda$. These two equations are identical, with v used for the frequency of light and c used for the speed of light (3.0×10^8 m/s)

Material	Index of Refraction
Water	1.33
Glass (crown)	1.52
Glass (flint)	1.62
Sapphire	1.77
Zircon	1.94
Diamond	2.42

16. What is the speed of light in Zircon?

17. How does this speed of light relate to index of refraction?

18. Light travels from water into air. The angle of refraction in air is 60° . What is the angle of incidence in water?

19.a. Sketch an incident→refracted ray of light from a material with a low index of refraction into one with a high incidence of refraction.

b. Sketch an incident→refracted ray of light from a material with a high index of refraction into one with a low incidence of refraction.

c. Sketch a set of incident→refracted ray diagrams where the light goes light from a material with a low index of refraction into one with a high incidence of refraction, and then back into the low index of refraction material. (for example from air into lucite and back into the air)

20. Define critical angle and show how you would determine it.

21. Determine the critical angle for an air water interface for light going from the air into the water and for light going from water into the air. Is it easier to see from water into air or air into water (hint- which way is the light moving in each case?) Why would understanding this be important for a lifeguard?

Universal Gravitation:

22. What factors affect the force of gravity?

22b. In what direction is the force of gravity?

22c. Consider 2 objects, R and S. R has a mass of $7 \times 10^9 \text{ kg}$ and S has a mass of $1.3 \times 10^5 \text{ kg}$. If S exerts a 47N gravitational force on R, what gravitational force does R exert on S?

22d. How will doubling the mass of one of two masses affect the gravitational force between them?

22e. How will doubling the distance between two masses affect the gravitational force between them?

22f. Consider the pairs of masses described below. Which pair will have the greatest force of attraction?

- a. A (mass 1 kg) and B (mass 3 kg)**
- b. A (mass 1 kg) and C (mass 2 kg)**
- c. B (mass 3 kg) and C (mass 2 kg)**

23. Gravity force is directly proportionate to _____ and inversely proportionate to _____.

24. Sketch a graph with Force of gravity on the Y axis and distance between the centers of each object on the x axis.

25. Planet X has an orbital radius of 4.50×10^7 m from its star. If the planet has a mass of 4.78×10^{21} kg, and the star has a mass of 3.10×10^{36} kg, what is the magnitude of the force of gravity?

**26. An object has a mass of 35 kg and is being pulled with a force of 48 N by the earth. How far is the object from the center of the earth?
(mass of earth 6×10^{24} kg)**

27. If an asteroid orbits the sun in 2.3 earth years, how far is the asteroid from the sun (in AU)?

28. Two satellites orbit the earth, one orbits in 12 hrs, at a distance of 13.2×10^4 m from the earth's center. The second satellite orbits in 14.5 hrs. What is its distance from the center of the earth?

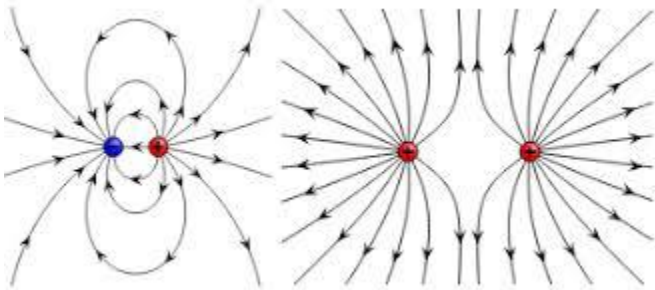
Electric and Magnetic Fields

29. Rank from most repulsive to most attractive.

A	+3q	-3q,	x meters apart
B	+4q	-3q	x meters apart
C	-4q	-3q	x/2 meters apart
D	-4q	-4q	x meters apart

30. Show the electric field lines around this negative charge -A

31. Where is the electric field the weakest in the following diagrams?



32. A proton, $1.6 \times 10^{-19} \text{C}$, is acted on by a force of $6.7 \times 10^{-15} \text{N}$. What is the magnitude of the electric field acting on the charge?

33. Draw a bar magnet and show the magnetic field lines around it, include direction in your sketch.

34. Show a compass needle attracted to bar magnet, note the poles of the compass needle and the bar magnet.

35. Two neutral conducting pop cans are touching each other. A positively charged balloon is brought near one of the cans as shown below. The cans are separated while the balloon is nearby, as shown. After the balloon is removed the cans are brought back together. When touching again, can X is ____.



36. In the middle frame above, what is the charge of can X and can Y?

37. A positive charge of $3.60 \times 10^{-5} \text{ C}$ and a negative charge of $-2.40 \times 10^{-5} \text{ C}$ are separated by 0.034 m. What is the magnitude of the force between the two objects?

38. The force between two objects is 64 N. One has a positive charge of $1.4 \times 10^{-6} \text{ C}$. The other has a negative charge of $1.8 \times 10^{-6} \text{ C}$. How far apart are the two objects?

39. Two objects exert a force on each other of 4.2 N. The distance between the objects is 0.36 m. The charge on one object is $2.8 \times 10^{-9} \text{ C}$. What is the charge on the second object?

List the formulas you will use for each of these topics. Identify each variable.

Universal gravitation

Coulomb's Law

Magnetic Fields

Electric Fields

Refraction and Reflection of light

Mechanical Waves