**PHYSICS 2021 - 22 April 4, 2022**

**Today’s Agenda (Day 136)**

1. HOUSEKEEPING ITEMS

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1. HOMEWORK CHECK:

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1. CLASS ACTIVITY

🡪BEGIN: Ch 15 PPT Review

1. Section 15.1 – Properties and Detection of Sound
2. Section 15.2 – The Physics of Music

🡪VIDEO: Tenet – cont’d on Tuesday

HOMEWORK:

* READ: Chapter 15 - Sound
* STUDY: Chapter 15Test

<http://glencoe.mheducation.com/sites/0078807220/student_view0/self-check_quizzes.html>

Ch 15 - Sound

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| Sound wave | Pitch | Loudness | Sound level |
| Decibel | Doppler effect  | Closed-pipe resonator | Open-pipe resonator |
| Fundamental | beat | Harmonics | Dissonance | consonance |

Ch 16 – Fundamentals of Light

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| --- | --- | --- | --- | --- |
| Ray model of light | Luminous source | Opaque | Translucent | Transparent |
| Luminous flux | Illuminance | Diffraction | Primary color | Secondary color |
| Complementary color | Primary pigment | Secondary pigment | Polarization | Malus’s Law |

REMINDERS:

* Ch 15 & 16 Vocabularies – April 6
* TEST: Chapter 15 🡪 April 7
* **QUIZ: Ch 15 & 16 Vocabulary – April 12**
* TEST: Chapter 16 🡪 April 14

**PHYSICS 2021 - 22 Review Questions**

**CH 15 PRACTICE PROBLEMS**

SECTION 15.1

1. You are in an automobile, like the one shown in Figure 7, traveling toward a pole-mounted warning siren. If the siren’s frequency is 365 Hz, what frequency do you hear? Use 343 m/s for the speed of sound.



1. You are in an automobile at 55 mph (24.6 m/s). A second automobile is moving toward you at the same speed. Its horn is sounding at 475 Hz. What frequency do you hear?
2. A submarine is moving toward another submarine at 9.20 m/s. It emits a 3.50 MHz ultrasound. What frequency would the second sub, at rest, detect? The speed of sound in water at the depth the submarines are moving is 1482 m/s.
3. A trumpet plays middle C (262 Hz). How fast would it have to be moving to raise the pitch to C sharp (277 Hz)?
4. What physical characteristic of a sound wave should be changed to alter the pitch of sound? To alter the loudness?
5. The eardrum moves back and forth in response to the pressure variations of a sound wave. Sketch a graph of the displacement of the eardrum versus time for two cycles of a 1.0 kHz tone and for two cycles of a 2.0 kHz tone.
6. List two sound characteristics that are affected by the medium through which the sound passes and two characteristics that are not affected.
7. How much greater is the sound pressure level of a typical rock concert (110 dB) than a normal conversation (50 dB)?
8. A bat emits short pulses of high-frequency sound and detects the echoes.
9. In what way would the echoes from large and small insects compare if they were the same distance from the bat?
10. In what way would the echo from an insect flying toward the bat differ from that of an insect flying away from the bat?
11. Can a trooper using a radar detector at the side of the road determine the speed of a car at the instant the car passes the trooper? Explain.

SECTION 15.2

1. A 440-Hz tuning fork is used with a resonating column to determine the velocity of sound in helium gas. If the spacing between resonances is 110 cm, what is the velocity of sound in helium gas?
2. A 440-Hz tuning fork is held above a closed pipe. Find the spacing between the resonances when the air temperature is 20°C.
3. A bugle can be thought of as an open pipe. If a bugle were straightened out, it would be 2.65-m long.

a. If the speed of sound is 343 m/s, find the lowest frequency that is resonant for a bugle (ignoring end corrections).

b. Find the next two resonant frequencies for the bugle

1. What is the vibrating object that produces sounds in each of the following?   a) a human voice b) a clarinet c) a tuba d) a violin.
2. How must the length of an open tube compare to the wavelength of the sound to produce the strongest resonance?
3. A violin sounds a note of F sharp, with a pitch of 370 Hz. What are the frequencies of the next three harmonics produced with this note?
4. One closed organ pipe has a length of 2.40 m.

a) What is the frequency of the note played by this pipe?

b) When a second pipe is played at the same time, a 1.40-Hz beat note is heard. By how much is the second pipe too long?

8. Why do various instruments sound different even when they play the same note?

9. A tuning fork produces three beats per second with a second, 392-Hz tuning fork. What is the frequency of the first tuning fork?

10. trike a tuning fork with a rubber hammer and hold it at arm’s length. Then press its handle against a desk, a door, a filing cabinet, and other objects. What do you hear? Why?

11.  A vertical tube with a tap at the base is filled with water, and a tuning fork vibrates over its mouth. Resonance is heard when the water level has dropped 17 cm and again after 49 cm of distance exists from the water to the top of the tube. What is the frequency of the tuning fork?

12.The auditory canal leading to the eardrum is a closed pipe that is 3.0 cm long. Find the approximate value (ignoring end correction) of the lowest resonance frequency.

13. The lowest note on an organ is 16.4 Hz.

a) What is the shortest open organ pipe that will resonate at this frequency?

b) What is the pitch if the same organ pipe is closed?