

**Exam 1**  
**Science 265**

Name: \_\_\_\_\_ Group: \_\_\_\_\_

*Multiple choice each worth 2.5 points*

- 1) Why does a tuba have lower sounds than a trumpet?
  - a) The large bell the sound comes out of
  - b) The fat tubes the sound waves move through before coming out
  - c) The long distance the sound waves have to travel before they get out**
  - d) The way the musician blows into the tuba
  
- 2) Humans can hear sound with wavelengths that range from half an inch and to 50 feet. Bass notes are low on the musical scale and have
  - a) shorter wavelengths
  - b) longer wavelengths**
  - c) The note does not depend on the length of the wave
  
- 3) The energy of sound waves is always very small and can only be detected by our ears or other sensitive instruments.
  - a) True
  - b) False**
  
- 4) A person blows in a flute and makes a nice C note. This is an example of
  - a) Resonance**
  - b) Sympathetic Vibration
  - c) SONAR
  - d) None of the above
  
- 5) A vibrating guitar string causes the body of a guitar to vibrate. This is an example of
  - a) Natural Frequency
  - b) Resonance
  - c) Sympathetic Vibration**
  - d) none of the above
  
- 6) Of the following, sound travels fastest in
  - a) Steel**
  - b) Water
  - c) Air
  - d) Equal in all three
  
- 7) Sound vibrations travel into the ear canal and cause the ear drum to vibrate. In turn, the ear drum causes the \_\_\_\_\_ to vibrate.
  - a) Cochlea
  - b) Ossicles**
  - c) Hair cells
  - d) Pinna



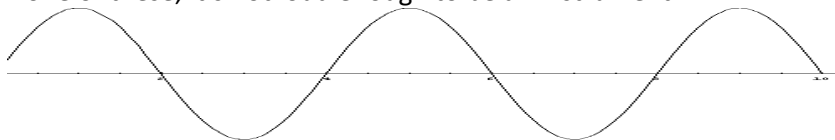
- 8) Consider a banjo. What determines the pitch of the note played?
- How you pluck it
  - The length or tension of a string**
  - The body of the banjo
  - The length of the neck of the banjo
  - None of the above.

- 9) Which mechanism amplifies the sound/ makes the banjo loud?
- Resonance
  - Sympathetic vibration**
  - Neither, it's not loud

- 10) How did you figure out your answer above?
- It only amplifies one note
  - It amplifies any note that you play**
  - It is not loud

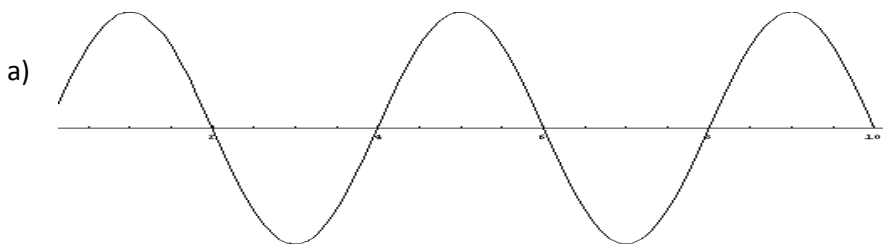


- 11) Where does the amplification happen? What part of the banjo makes it a loud instrument?
- The long neck
  - The strings
  - The round body**
  - None of these, it's not loud enough to be an instrument.



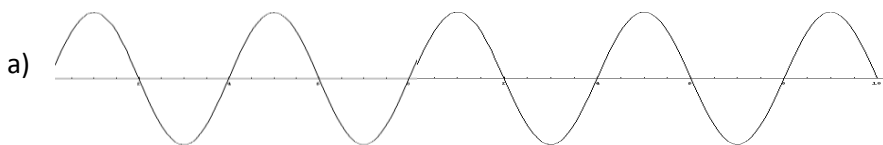
Use **wave A**, above, for the following two questions

- 12) Which of the following waves has a **larger amplitude** than wave A above?

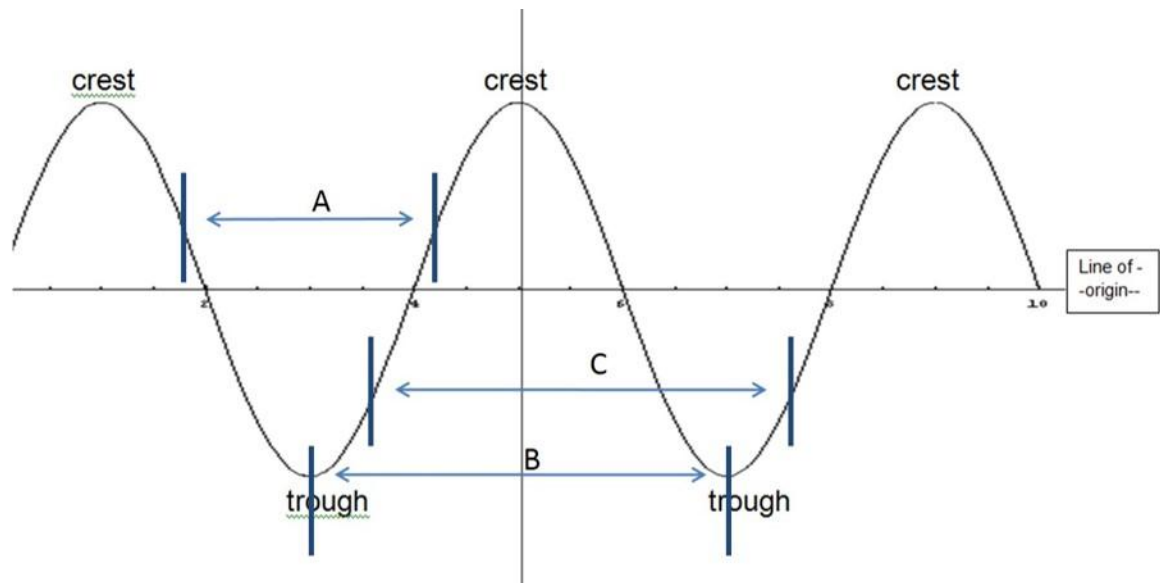


None of the above

- 13) Which of the following waves has a **smaller frequency** than wave A above?



None of the above



14) Which distance(s), labeled above, is equal to **one** wavelength.

- a) B
- b) C
- c) B & C**
- d) A & B
- e) All three

15) When a wave travels through a medium, the medium

- a) moves a short distance back and forth**
- b) travels along with the wave
- c) does not move at all

16) What type of wave is “the wave” in a stadium?

- a) Longitudinal
- b) Transverse**
- c) Neither
- d) Both

17) Electromagnetic Waves require a medium to travel

- a) True
- b) False**

18) Sound waves require a medium to travel

- a) True**
- b) False

19) Echolocation is **most** useful for identifying objects

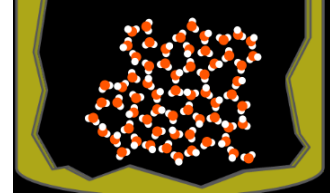
- a) at long distances (200 meters/yards)**
- b) at close range (15 -25 feet)
- c) at very close range (2 feet)

- d) all of the above
- 20) SONAR (SOund Navigation And Ranging) is
- a) Humans' version of echolocation
  - b) When a ship or boat sends out beeps to identify objects under water.
  - c) When a submarine is in stealth mode and listens to sounds around them.
  - d) All of the above**
- 21) When a person taps a cane or makes sounds so that they can hear the sound bounce back, they are using
- a) Electromagnetic waves
  - b) Active echolocation**
  - c) Passive echolocation
  - d) None of the above
- 22) Bats and elephants
- a) are deaf to the sounds each other can hear except for a few specific frequencies**
  - b) hear the same sounds – same range of frequencies
  - c) hear mostly the same range of sounds with a few differences on the extremes (elephants hear lower pitches)
- 23) We see when
- a) Our eyes sense light across the room, it doesn't have to enter the eye.
  - b) Electromagnetic waves enter our eyes**
  - c) Both of the above
  - d) None of the above
- 24) "Visible light" is the light that is visible to
- a) specifically humans, other creatures can also see light outside of the "visible range"**
  - b) all living creatures
  - c) mammals. Insects and snakes can't see what we see
- 25) Chickens can see
- a) the same colors as humans
  - b) more colors than humans**
  - c) fewer colors than humans
- 26) Which of the following are **NOT** a type of electromagnetic wave?
- a) Visible light
  - b) Microwaves
  - c) X-rays
  - d) Sound waves**
  - e) All are examples of electromagnetic waves
- 27) What is in the bubbles of boiling water?
- a) Air
  - b) Hydrogen Gas and Oxygen Gas
  - c) Empty Space
  - d) Water vapor**

- 28) When substances go from liquid to solid,
- a) all substances become more dense (take up less space)
  - b) all substances expand
  - c) all are more dense except water which expands**
  - d) some expand and some are more dense

29) The diagram to the right is showing a substance in

- a) gas state
- b) liquid form
- c) solid form (water)**
- d) Not enough information



30) What are the conditions that allow molecules to stop moving completely?

- a) When the substance is in solid form.
- b) When the substance is at absolute zero, 0K.**
- c) When the substance is at 0°C
- d) When something is completely frozen

31) Consider a giant oak tree. Where does the largest fraction of the dry mass of the tree come from?

- a) Sun
- b) Water
- c) Carbon from the air**
- d) Minerals in the soil
- e) Oxygen from the air

32) When you lose 15 lbs, how did the largest fraction of the weight leave your body?

- a) Water (sweat, urine)
- b) Respiration – water vapor
- c) Respiration – carbon dioxide**
- d) Solid waste
- e) Energy

33) (*Extra Credit*) A nail sits out in the elements and rusts. Rusting is oxidation of iron where iron and oxygen combine to form iron oxide (rust). After rusting, the nail (including the rust)

- a) Weighs less than before
- b) Weighs the same
- c) Weighs more than before**

Write your answer on this sheet for the following three questions. *Show all work and explain each question clearly for credit*

34) (7 pts) What is the difference between red-blind color blindness (II. flag on the far right) and Totally color blind (V. second from right)? Include a description of what is not working in the eye for this to happen.

We have three types of cones in our eyes. One type is sensitive to blues, one is most sensitive to greens and the other to yellow and some red.

When a person is red-blind color blind, the yellow/red cones are not working. So when something is red, that person's eyes do not have enough types of cones to sense the difference between green and red.



The flag that appears in grays indicates a person who is totally color blind. None of their cones work. They only have rods.

35) (7 pts) Susan sucks air out of a bottle during physics lab.

- a) Her bottle has a mass of 80.22 g before she removes some air and then a mass of 80.04 g after. She then allows water to fill the empty space in the bottle. She finds that she has 230 ml of water. Determine the density of air from this data.

First determine the weight of the air that was removed:  $80.22\text{g} - 80.04\text{g} = 0.18\text{g}$

Then we need the volume the air takes up. Susan measured that to be 230 ml.

Density is Mass/Volume so we get  $0.18\text{g}/230\text{ml} = 0.00078 \text{ g/ml}$

- b) Why does the volume of water get used for volume of air in the above calculation?

When you suck air out of the bottle, there is less air per area than in the room. That means there is less pressure in the bottle than in the room. When you put the tube from the bottle under water, the air in the room pushes harder on the water in the bowl than the air in the bottle pushes on the water, so water is pushed up into the bottle. As soon as there is enough water to take up the same amount of room as the air that you sucked out, the pressure on both sides is balanced. Basically you replace the air you sucked out with water from the bowl.

36) (7 pts) How do animals including humans localize sound, tell where it came from? Include how we can tell how far away it is AND which side of us it is on. Be specific and include diagrams.

The question asks for **how far away** and **which direction the sound came from**.

**Far away:** An echolocator sends out sounds that hit objects and bounce back to the echolocator. Sound travels a specific speed in air (and a different speed in water). The sound takes time to reach objects and then bounce back. The longer the sound takes to return, the further away it is.

**Which direction:** You have two ears that are separated by the width of your head. Sound coming from your right takes less time to reach your right ear than your left ear since it's closer to the right. Your brain can sense this very small delay of hearing sounds in each ear. Based on this delay, we know which direction a sound came from.

37) (5 pts *Extra Credit*) Describe the behavior of a substance that has a temperature of  $-10\text{K}$ ? Explain why?

Temperature is a measure of the kinetic energy of molecules. A substance at  $0\text{K}$  is no longer moving at all – no kinetic energy. This is why it's called absolute zero. It's not possible to go any lower. That means  $-20\text{K}$  is impossible.