Exam 3
Science 265

Name: _____ Group: _____

Multiple choice each worth 2 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

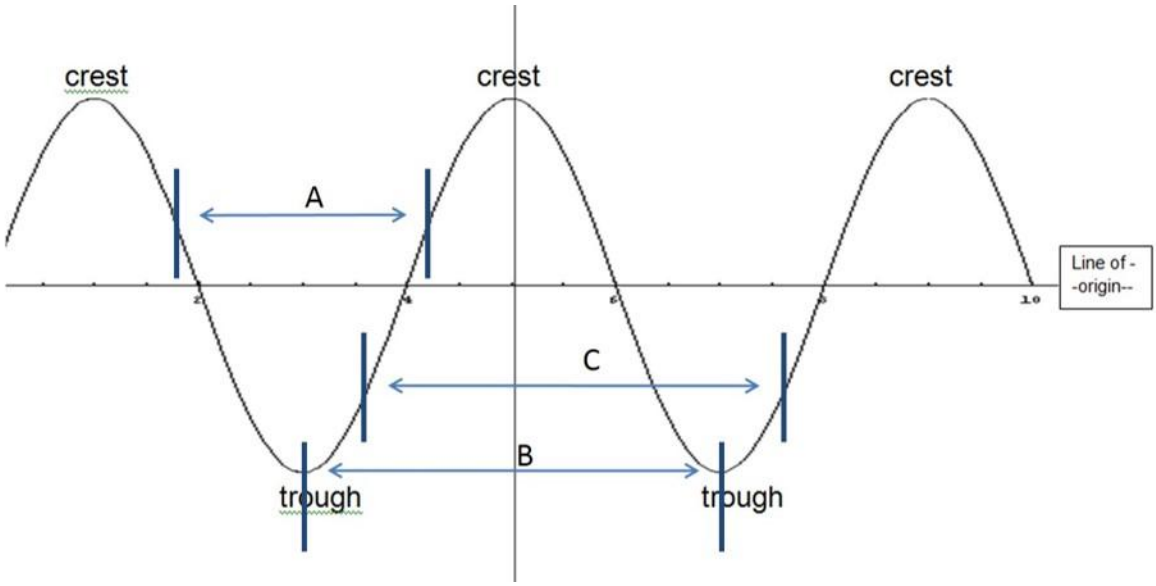
7) Sound vibrations travel into the ear canal and cause the ear drum to vibrate. In turn, the ear drum causes the _____ to vibrate.
   a) Cochlea
   b) Ossicles
   c) Hair cells
   d) Pinna

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

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

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

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



12) Which distance(s), labeled above, is equal to **one** wavelength.
   a) B
   b) C
   c) B & C
   d) A & B
   e) All three

13) 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

14) What type of wave is “the wave” in a stadium?
    a) Longitudinal
    b) Transverse
    c) Neither
    d) Both

15) Electromagnetic Waves require a medium to travel
    a) True
    b) False

16) Sound waves require a medium to travel
    a) True
    b) False

17) 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

18) 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

19) 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

20) 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)
    d) it is very hard to know since they cannot tell us.

21) 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

22) You can see your friend's eye in a small mirror. At the same time, if your friend looks at the mirror, they will see
    a) Your eye
    b) Your nose
    c) The wall behind you
    d) Your hand
    e) Any of the above are possible

23) "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

24) Chickens can see
    a) the same colors as humans
    b) more colors than humans
    c) fewer colors than humans

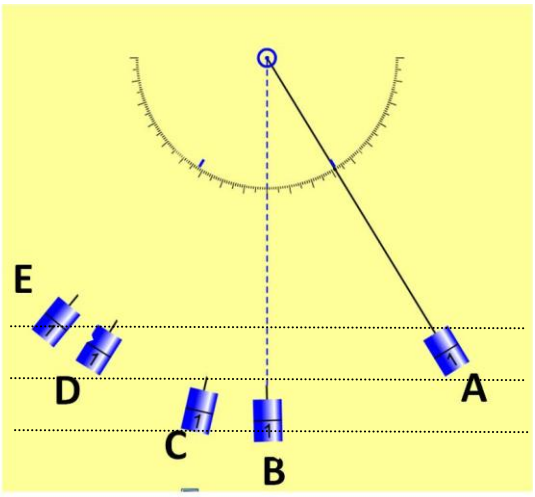
25) Which of the following are **NOT** a type of electromagnetic wave?
    a) Visible light
    b) Microwaves
    c) X-rays
    d) Sound waves
    e) All are examples of electromagnetic waves

26) Which of the following is a form of energy?
    a) Banana
    b) Water
    c) Light
    d) Wood
    e) All of the above

27) When Nicole runs a marathon from the start of the race to the end when she's hugging her opponent, energy begins as _____ and ends up as _____ .
    a) Chemical, Thermal
    b) Chemical, Kinetic
    c) Kinetic, Thermal
    d) Kinetic, Gravitational Potential
    e) Gravitational Potential, Kinetic

28) Energy contains mass
    a) True
    b) False

A pendulum is pulled to the side. After it is released, it swings to the other side and back. There is no friction. The lowest point that the bob can reach is considered the zero potential energy level.



29) The highest point that it will reach on the left side is
   a) It will not swing
   b) Postion B
   c) Position C
   d) Position D
   e) Position E

30) At position B, what type of energy does the pendulum have?
   a) Kinetic
   b) Potential
   c) A combination of both Kinetic and Potential
   d) Thermal

31) At position D, what type of energy does the pendulum have?
   a) Kinetic
   b) Potential
   c) A combination of both Kinetic and Potential
   d) Thermal

32) Why does your hair stand on end when it is charged?
   a) Charges want to discharge into the air.
   b) Ionic bonding
   c) Charged hair wants to get as far apart as possible
   d) Charged hair is attracted to each other

33) What gets used up in a circuit?
   a) Current
   b) Electrons
   c) Electricity in the battery
   d) Chemical energy of the battery
   e) All of the above

34) Power is
   a) energy output per unit time
   b) a form of Energy
   c) a force
   d) All of the above
   e) None of the above

Short Answer each worth 8 points

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

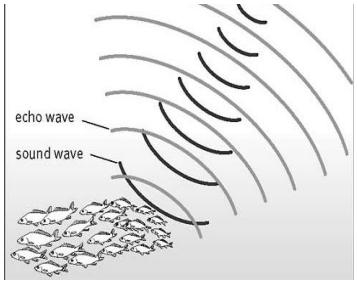
35) What is the difference between violet-blind color blindness (IV. flag second from the left) and totally color blind (V. second from right)? Include a description of what is not working in the eye for this to happen.

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

When a person is violet-blind color blind, the blue/violet cones are not working. So when something is blue, the person doesn't have a cone that is sensitive to that color so it will look basically black.

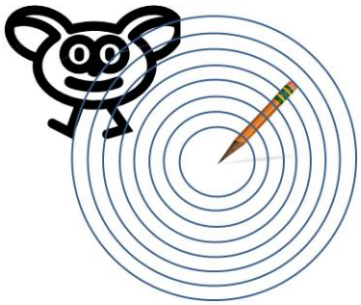
The flag that appears in grays indicates a person who is totally color blind. None of their cones work. They only have rods.

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



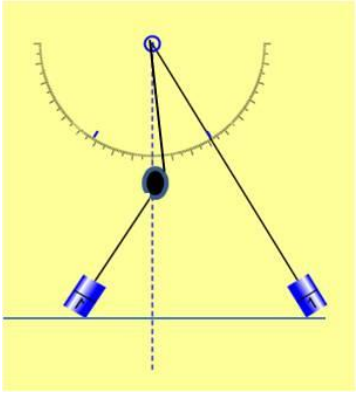
The question asks for **how far away** and **which direction the sound came from**.

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 left takes less time to reach your left ear than your right year since it's closer to the right. See the diagram. Your brain can sense this very small delay between first hearing the sound in each ear. Based on this delay, we know which direction a sound came from.

37) A pendulum made from a string and a mass starts from rest as shown. There is a barrier placed at the black dot. Draw below *on the same diagram* how the pendulum will look when it has swung as far left as it can go. Draw both the string and the bob. Be very clear about the final height (on the left) compared to the original height (on the right).



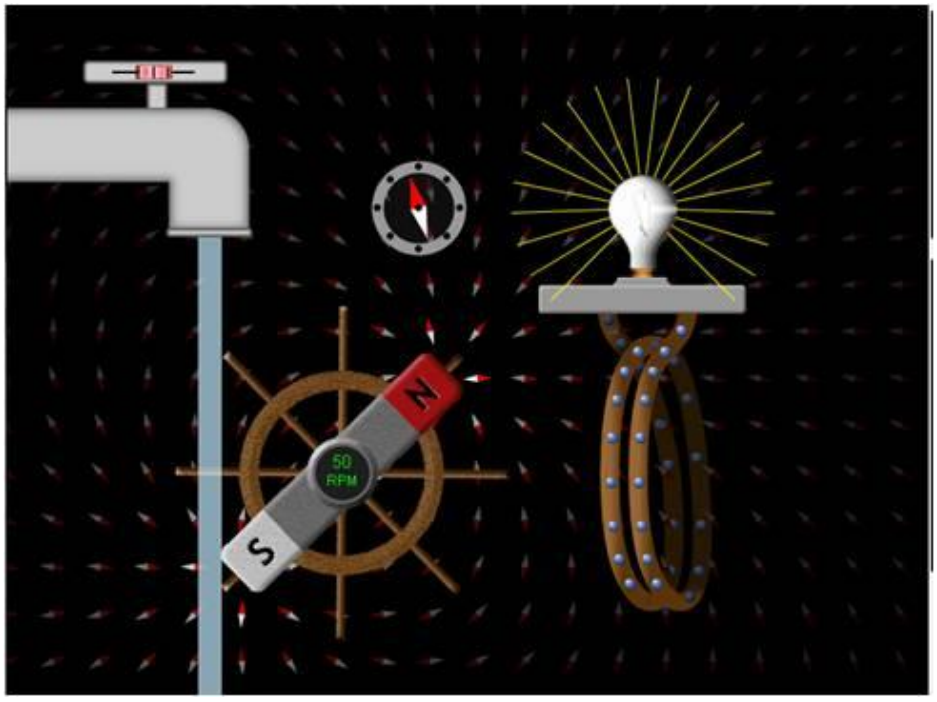
38) Cameron decided she wanted to figure out the amount of horsepower she could produce in a short burst so she timed how long it took her to sprint up a flight of stairs. She measured the height difference from the ground floor to the next level to be 210 cm. She has a mass of 50 kg and is 170 cm tall. She was able to sprint to the top in 1.8 seconds. *Show all your work including conversions.*
Useful equations: Potential energy = mass*gravity*height, Power = Energy/time.
Useful data: g = 9.8 m/s^2, 746 Watts = 1 hp.

Mass = 50 kg
Height = 210 cm (1m / 100 cm) = 2.1 m
Gravity = 9.8 m/s^2
Time = 1.8 s

Change in potential energy = 50 kg * 9.8 m/s2 * 2.1 m = 1029 J
Power = 1029 J/ 1.8 s = 571.7 Watts

Now need horsepower so 571.7 W (1 hp / 746 W) **= 0.76 hp**

Note: it does not make sense to use Cameron's own height to calculate her change in potential energy. What if she were to run up two flights of stairs instead? That is definitely more work. If you were to use her height in the calculation, there is no way to show this additional work.

39) (5 pts *Extra Credit*) Explain how you can use a magnet to create AC current. Include diagrams

When electons experience a *changing* magnetic field, they will move. If you change a magnetic field from one direction to the other back and forth, the electrons will move one way, then the other, then back again etc… When electrons move back and forth that is an AC current. AC stands for Alternating Current. One way to do this was seen on the simulation Faraday's Electromagnetic Lab. In that simulation we see a magnet attaching to a water wheel. There is a coil of wire right next to the water wheel. The water makes the magnet rotate, which means the the end of the magnet facing the coil of wire keeps switching, which means the magnetic field in the coil changes from one direction to the next and back again. This makes the electrons move back and forth. There are other ways to move a magnet and cause an alternating current, this is just one example.