**Notes**:

* Go over the homework problems as well!
* Go over the examples we did in class!!
* Solutions are at the end of the test.
* More than one correct answer is possible for some questions.

## Part 1. Multiple choice

14. Heating of the earth from the sun is an example of

a. Conduction

b. Convection.

c. Radiation.

1. Sublimation.

15. The warming of the handle of a pot on the stove is an example of

a. Conduction

b. Convection.

c. Radiation.

1. Sublimation.

16. The cooling of the beach by a sea breeze is an example of

a. Conduction

b. Convection.

1. Radiation.
2. Sublimation.

17. Rank the following objects according to their temperature (coldest to hottest).

A charcoal glowing dully red; a candle glowing with an orange light; a light bulb filament glowing white.

1. Not enough information
2. Candle – charcoal – filament.
3. Charcoal – candle – filament.
4. Filament – candle – charcoal
5. None of the above. The right order is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

18. A metal block, a plastic block and a wooden block are at the same temperature. If you touch the three together,

1. heat will flow from the metal block to the two other blocks
2. no heat will flow
3. heat will flow from the plastic block to the metal block and the wooden block.
4. Heat will only flow into the metal block, because it is a good conductor
5. None of the above. My answer is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

19. The top heating element (broil) in your oven has a temperature of 400 K and it is heating the food by radiative heat transfer. When you increase the temperature of the heating element to 800 K, the power output will increase by a factor of

1. 2
2. 4
3. 8
4. 16
5. 32

3. Pitch is most directly associated with

a. amplitude.

b. frequency.

1. intensity.
2. density.
3. None of the above.

5. The number of cycles of a wave passing a point per unit time is the wave’s

a. speed.

b. frequency.

c. wavelength.

d. amplitude.

1. loudness.
   1. The maximum displacement of a point on a wave from the equilibrium position is the wave’s

a. speed.

b. frequency.

c. wavelength.

1. amplitude.
2. loudness.

7. The rate of flow of electric charge is

a. voltage.

b. current.

c. resistance.

1. electric field.
2. critical temperature.

8. The energy of the electrons flowing through a circuit is most closely related to

1. The current
2. The potential (voltage)
3. The resistance
4. The wire thickness
5. None of the above. My answer is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. The quantity that is measured in ohms is

a. voltage

b. current.

c. resistance.

1. electric field.
2. critical temperature.

14. When a guitar is played and tuned there are ways to get different pitches from the instrument:

1. Change the tension of the string
2. Change the mass of the string
3. Shorten the string
4. Change gravity

15. A mass attached to a string (pendulum) is performing harmonic oscillations. How could the period of the oscillation be changed

1. Doubling the mass
2. Doubling the length of the string
3. Transferring the pendulum to the moon
4. Doubling the amplitude
5. All of the above

**16. Same for a mass attached to a spring.**

19. The skin of your instructor has a resistance of 10,000  He is touching the positive pole of a 9 V battery with his left hand and the negative pole of the battery with his right hand. What can you say about the current that is running through him?

1. There is no current running through him
2. There is a current of about 0.0009 = 0.9 mA running through him.
3. The current running through him is a DC current
4. Only AC currents can run through a body
5. His head will start glowing.
6. His jacket will catch on fire.

**Part 2. Concepts and such**

1. Consider a bulb that is designed to consume 75 watts when connected to 120 volts.

a. What is the current through the bulb?

b. What is its resistance?

1. How much energy does it consume in a day?
   1. Consider the string of a violin that is stretched between two points that are 0.5 m apart.
2. You plug the string and it oscillates up and down as a standing wave. Draw a sketch of the first, second and third harmonic. What is the wavelength of each harmonic?
3. If the first harmonic has a frequency of 220 Hz, what frequencies do the second and third harmonics have?
4. A string just by itself does not emit a loud sound. What is needed to create a loud sound (Explain).
5. I did a demo where I vibrated a circular metal plate. Whenever it emitted a loud sound we also observed that sand was accumulating in circles on the plate. How does that experiment relate to part c?
6. We did some waves in class (people standing up and sitting down), from one side of the room to the other. About how big was the amplitude of that wave. Was that a longitudinal or transverse wave?
   1. Identify three mechanisms of heat transport and give an example for each.

**Solutions:**

**Part 1:**

14c, 15a, 16b, 17c, 18b, 19d, 3b, 5b, 6d, 7b, 8b, 10c, 14abc, 15bc, 19bc

**Part 2:**

**1a**. 0.625A

**1b**. 192 

**1c**. 6,480,000 J

**2b** 440 Hz, 660 Hz

**2c Since** strings are small and skinny objects they can’t push around many air molecules (don’t strong sound waves. ) The body of the violin picks up the oscillation via resonance energy transfer (It resonates, vibrates at its resonance). Because the body is a surface, it can push around many air molecules and thus create strong sound waves.

**2d** Whenever an object is excited with one of its resonance frequencies, it will vibrate particularly violently. The plates vibrated at one of their resonances. The sand accumulated in the nodes of the standing wave that formed in the plate. The violin bodies also have many resonance frequencies and the body picks up the harmonies from the sting and amplifies them.

**2e** The change in height of the people. It was a transverse wave.