PHYS 1400 Sample Exams: Temperature

1. Temperature is
   D) the measure of the average kinetic energy per molecule of a substance.

2. What is the difference between the Celsius and Kelvin temperature scales?
   C) Celsius is a relative scale is based on the freezing and boiling of water; Kelvin is an absolute scale.

3. What is the difference between the Celsius and Fahrenheit temperature scales?
   A) Degrees Celsius are larger than degrees Fahrenheit.

4. The Kelvin scale of temperature
   E) is absolute. The degrees are the same size as degrees Celsius, but there are no negative temperatures. 0K is literally as cold as anything can possibly get.

5. A mercury thermometer
   C) uses the principle of thermal expansion. The liquid in the glass tube expands when heated. The amount of expansion is proportional to the increase in the temperature, regardless of the scale you use.

6. You have two 100 ml beakers of water. One is 20°C and the other is 10°C.
   C) The 20° beaker has more heat, but not twice as much, as the the 10° beaker.

7. Heat is
   A) the energy transferred from one substance to another because of a temperature difference.

8. There is more heat in a 5 gallon pail of warm water than in a teacupful of boiling water.
   A) True; there is less energy per molecule in the pail, but there are many more molecules.

9. One beaker holds 1 liter of boiling water; a second beaker holds 2 liters of boiling water.
   C) The one liter beaker has half as much heat as the two liter beaker.

10. Fifty calories of energy is added to 50g of water (beaker 1). At the same time, 50 calories of energy is added to 100g of water (beaker 2). Both are initially at room temperature.
   B) Beaker 1 has the higher final temperature because it contained fewer molecules of water.

11. Fifty calories of energy is added to 50g of water. At the same time, 50 calories of energy is added to a 50 g cube of iron. Both are initially at room temperature.
    B) The iron has the final higher temperature because it takes less energy per gram to heat it.

12. An iron thumbtack and an iron horseshoe are each removed from a 300° oven and dropped into separate pails of water at room temperature.
    C) The horseshoe raises the temperature of its water more.

13. Specific heat is
    E) the energy required to raise the temperature of one gram of a substance by one degree Celsius.

14. The mashed potatoes on your plate stay warm long after the peas have cooled because
    B) the specific heat of the potatoes is much greater than that of the peas.

15. Water has a higher specific heat than sand.
    A) True; you know this because the water heats up and cools down more slowly than the sand.

16. A metal ring is plunged into a dewar (a fancy thermos) of liquid nitrogen, at ~196°C. As it cools,
    A) the hole in the middle will get smaller.

17. An iron ring is held in the flame of a gas burner. As it gets hotter,
    C) the hole in the middle will get larger.

18. The lid on the pickle jar is stuck again, and you can't find that rubber grippy thing to open it. You should run it under
    A) hot water. The lid will expand, the opening will get larger, and the lid will loosen.

19. A metal ingot has dimensions L=length, W=width, and H=height. It is placed in a furnace and heated.
    D) All three dimensions of the bar will increase as the temperature increases.
20. Two rods of unknown metal are each 1 m long. Each is raised from room temperature to 100° C.  
   C) If the coefficient of thermal expansion is the same for each, they will expand by the same amount.

21. A brass rod 1m long is raised from room temperature to 100°C. It expands by 1.54 mm. If a second brass rod, 2m long, is raised from room temperature to 100°C, the expansion will be  
   A) 0 mm  B) 0.77 mm  C) 1.54 mm  D) 3.08 mm

22. For most substances, the density decreases as the temperature increases.  
   D) True; at higher temperatures, increased molecular motion creates greater distances between molecules. The mass stays the same, but the volume increases, making the density less.

23. At what temperature is the density of water the greatest?  
   B) At 4°, because molecular motion is small, and crystallization hasn't started yet.

24. Ice is less dense than liquid water.  
   C) True; this is because as you decrease the temperature, the water molecules “lock” into a crystal structure that holds them farther apart, making the ice less dense.