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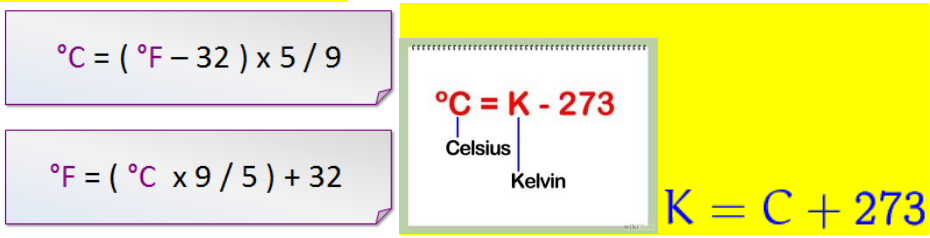
FPS – Chapter 16 - Unit 5 Review

Name_____ Period_____

1. What are the scales of temperature? What are the formulas to convert among them?
   Fahrenheit, Celsius, Kelvin



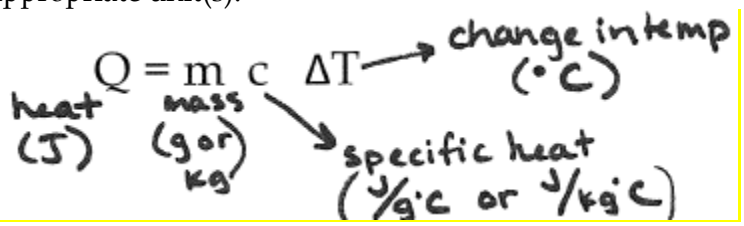
2. Define Heat and temperature.
   Heat – transfer of thermal energy from hotter object to colder object
   Temperature – measure of average kinetic energy of particles in an object

3. What does temperature measure?
   average kinetic energy of the particles in an object and is therefore measuring speed of particles indirectly

4. How does the speed of particles affect the temperature?
   the faster the speed of the particles in an object, the higher the kinetic energy, and therefore the higher the temperature

5. How does a thermometer measure the kinetic energy?
   Using the mechanism of thermal expansion – as particles move faster they also expand – liquids used within thermometers expand as their particles move quicker in higher temps

6. What is the formula for calculating *heat*? Write the formula, define each variable, and give its appropriate unit(s).



7. What are the 3 types of thermal energy transfer? Define them.
   Conduction – heat transfer by direct contact eg.: your hand on a hot stove burner
   Convection – heat transfer by movement of particles in a fluid (liquid or gas) eg.: hot soup cooling down as hot air rises away or Bill Nye in the glider
   Radiation – heat transfer by electromagnetic waves across empty space – does not require matter to transfer. can transfer through a vacuum eg.: sun heating earth, thermal energy escaping your thermos of hot coffee
8. What is an example of each type of heat transfer?
   See above

9. Define the 3 laws of thermodynamics.
   1st – Energy is conserved – it cannot be created or destroyed.
   2nd – In order for heat transfer to occur from colder to hotter temperatures, work must be done on the system.
   3rd – Absolute zero cannot be reached.

10. What is the difference between *forced* and *natural* convection?
    Forced – using a pump/fan to force thermal energy by fluid molecules
    Natural – the mechanism of warm air naturally rising and cooler air sinking
11. How do we typically heat our homes?
    Convection – both by forced convection using machines and natural convection mechanism

12. Explain what coats, jackets, curtains and other **insulators** do.
    Insulators like coats and jackets are NOT good conductors- they are typically porous materials that contain lots of air. Air is a poor conductor – so thermal energy does not escape by conduction as freely

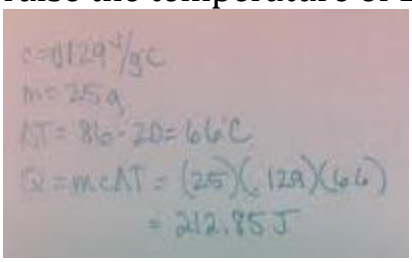
13. What are the types of systems we use to harness heat for our convenience and how do they work?
    Hot Water System (boiler heat water which moves in convection current through piping; pipes heat up by conduction and radiation; hot pipes heat the room's air by radiation, conduction, and convection)
    Force Air Heating (furnace heats air and uses fans to push warm air through vent; vents are placed in opposite sides of the room to capitalize on convection currents as the hot air rises and cool air sinks)
    Refrigerator (heat pump that uses refrigerant to do work by forcing heat absorbed from food compartment into the room via the coils)
    Air conditioner (uses refrigerant to do work by forcing heat absorbed from hot room's air outside and blowing cooled air in)

$$°C = \frac{5}{9}(°F - 32) \qquad °F = \left(\frac{9}{5}\,°C\right) + 32 \qquad K = °C + 273 \qquad °C = K - 273$$

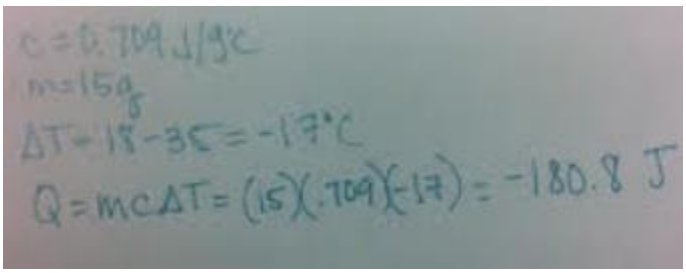
$$Q = mC\Delta T$$

Fahrenheit	**Celsius**	**Kelvin**
220 °F	14. 104.4	15. 377.4
16. 77	**25°C**	17. 298
18. 19.4	19. -7	**266 K**
20. 102.2	**39°C**	21. 312
70°F	22. 21.1	23. 294.1

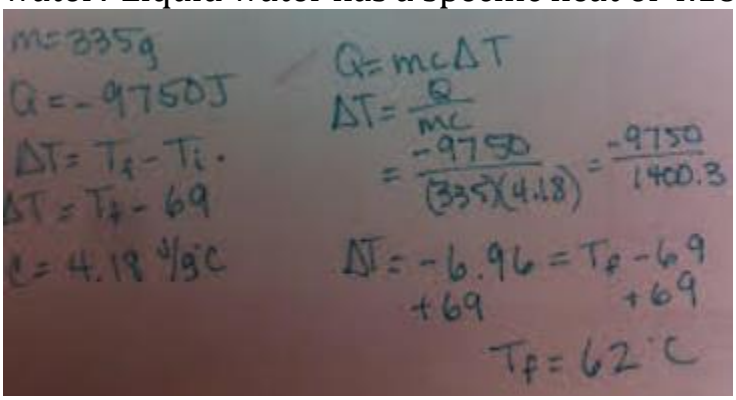
23. Gold has a specific heat of 0.129 J/g°C. How many joules of heat are required to raise the temperature of 25 grams of gold from 20°C to 86°C?



24. Graphite has a specific heat of 0.709 J/(g×°C). If a 15 gram piece of graphite is cooled from 35 °C to 18 °C, how much energy was lost by the graphite?

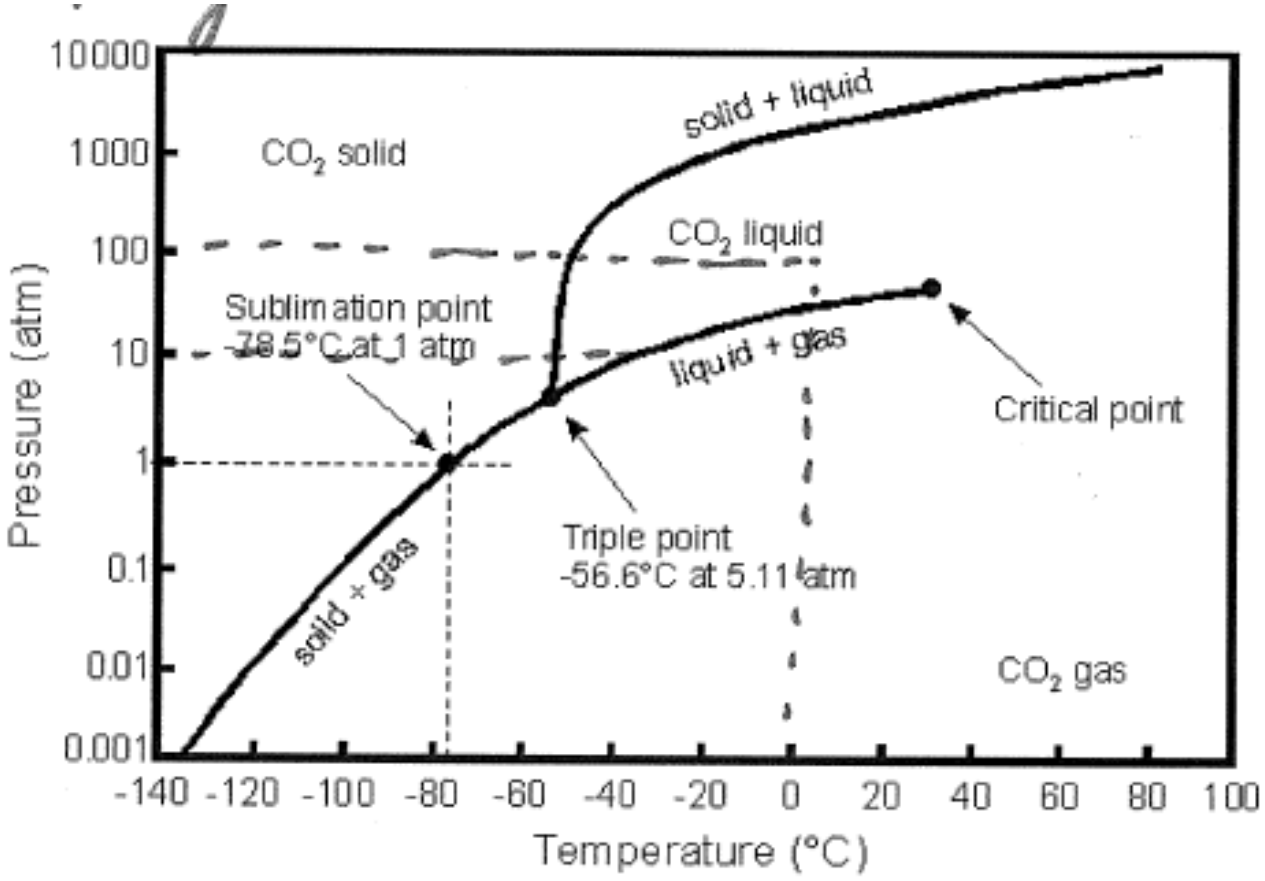


25. If 335 g of water at 69 °C loses 9750 J of heat, what is the final temperature of the water? Liquid water has a specific heat of 4.18 J/(g×°C).



CHECK YOUR NOTES FOR THE OTHERS.

26. See the diagram below. Label the varying points and lines on the diagram.

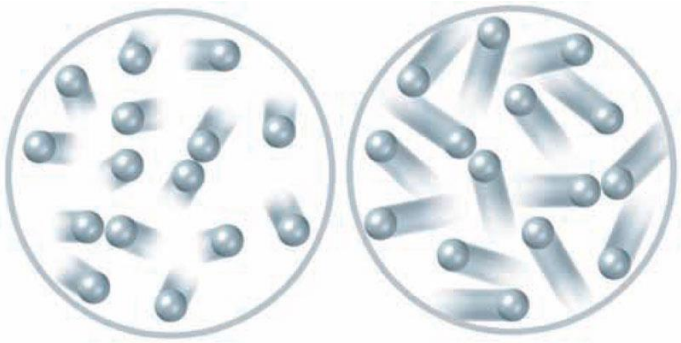


a. What is normal pressure? 1 atm

b. What would happen at normal pressure if you raised the temperature from -120 degrees Celsius to -40?

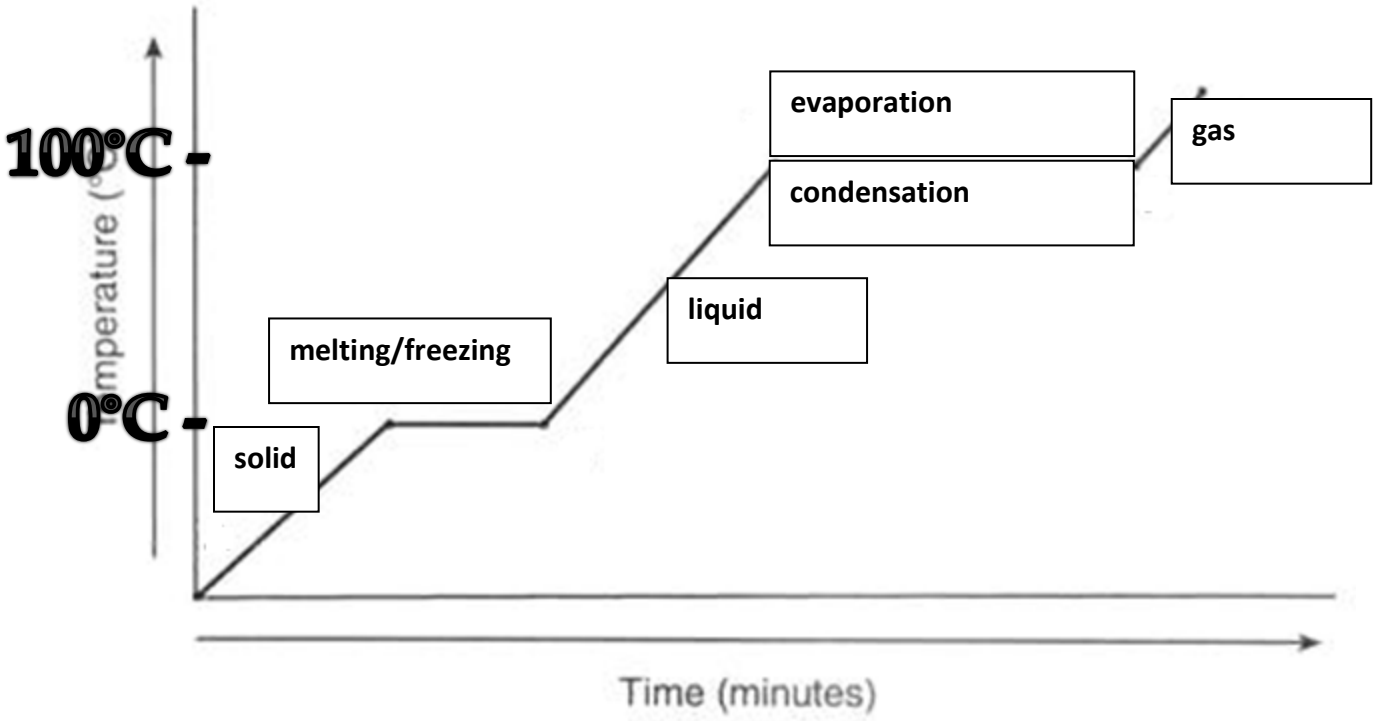
sublimation

27. See the image below. Which sample of particles has a higher temperature AND why?



Second – fast particles = higher average kinetic energy = higher temperature

28. See the heating curve for water below. Fill in the missing terms.



a. You have water in a cup at -10°C . What state of matter is the water? SOLID
b. You take that water at -10°C and travel to Ecuador where the temperature is 30°C. What phase change occurs? MELTING
c. You put that water in a pot on the stove and heat it to 108°C, which causes it to boil. Then, you quickly cool it to 48°C by putting it in a refrigerator. What phase change occurs? MOST LIKELY CONDENSATION THEN FREEZING – MAYBE DEPOSITION!