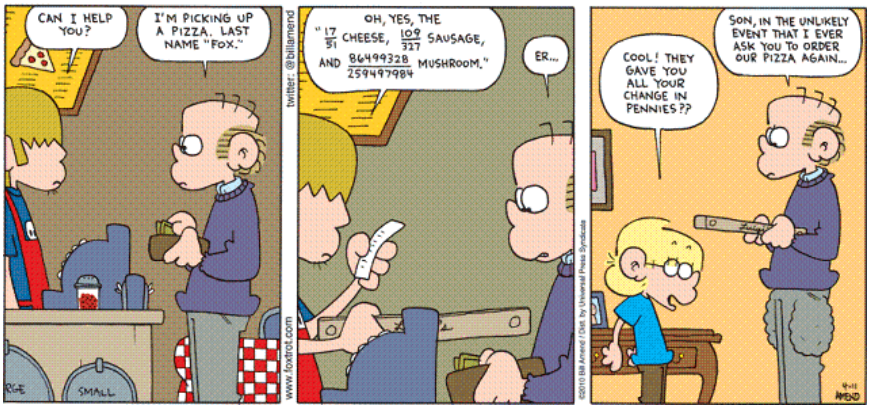

Weekly Sheet for PHYSICS 2

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Physics 2

Week #T2-5 Thermo Review

January School Wide Memory Verse:

Galatians 5:22-23 New International Version (NIV)

22 But the fruit of the Spirit is love, joy, peace, forbearance, kindness, goodness, faithfulness, 23 gentleness and self-control. Against such things there is no law.

Topics/Content/Skills: Electro statics, Circuits, LEDs, Diodes, Capacitors, Resistors, AC, vs DC, Transformers, etc.

Skills:

Introduce- **Thermo Dynamics**:

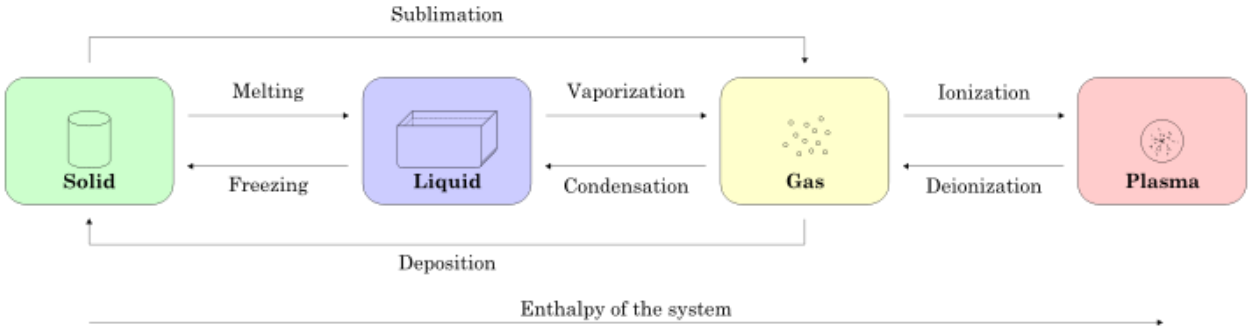
- Temperature,
- Green house effect
- How Microwaves work
- Buoyancy
- Heat,
- KFC scales,
- Laws
- Linear Expansion

Projects-Science Olympiad Topic Challenge.

Vocabulary/Key Terms/Formulas:

Mr. Know it Wall:

1. Heat (Q)- the form of energy associated with the vibration or movement of particles in a substance. The more movement, the more heat.
2. Heat transfer- Heat can be transferred by:
    a. Conduction- a hot object touching another- like a metal spoon in hot soup,
    b. Convection- the movement of a heated gas or fluid, like the heating up of a boiling pot of water,
    c. Radiation- through light energy moving through a vacuum and able to heat things up, like asphalt being heated up in the summer time due to sun light.
3. Temperature (T)- the average kinetic energy of an object measured on various scales, such as Kelvin, Fahrenheit, Celsius. (KFC).
4. The 5 States of Matter (From Coldest to hottest)
    a. _____
    b. _____
    c. _____
    d. _____
    e. _____



From Wikipedia (the 4 states of matter)

5. Phase Changes (States of Matter)

   a. What does Heat of fusion mean?_____

   b. Explain the graph to the right:

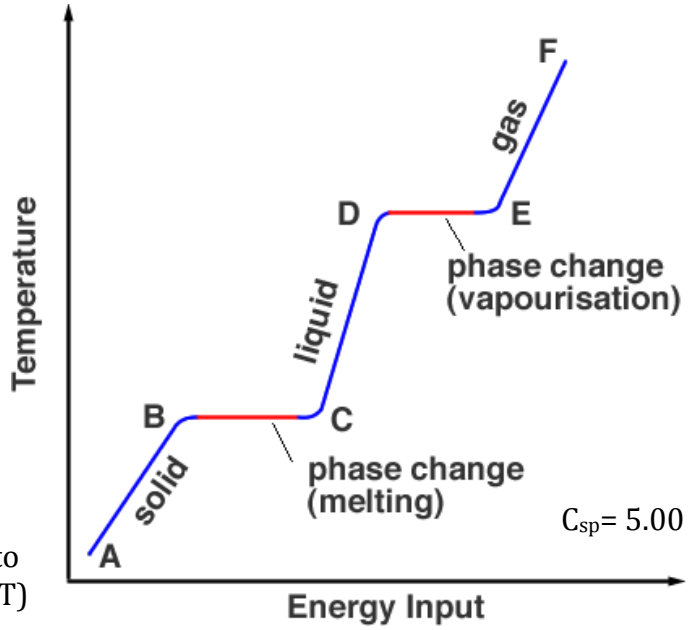
   _____

   _____

   _____

   _____

   _____



6. Thermo with Q=MCΔT

   a. Ex. If the specific heat of a liquid is J/g°C What is the heat (Q) needed to raise 30gms (M) of the liquid, 40°C (T) ?

   Answer: Q=MCΔT so

   Q= 30 **g** (5) **J/g~~°C~~** (40) **~~°C~~** = 6000 Joules

   Try These:

1. If you have 41860J of heat added to 1kg of water (C_{sp} = 4.186 J/ g°C), how much does the temperature rise?

2. If you have 30gm of ethanol (C_{sp}= 2.1 J/gC) at 10°C, and add 1kJ (1000J), what is the final temperature of the ethanol?

3. What is the specific heat of a substance if 20gm of it, raise 50°C when 4000J are added?

Thermodynamics: The Laws & Definitions

1. Ideal Gas Law:_____
2. Boyles Law (P & V proportional):_____
3. Charles Law (V &T Inversely Proportional):_____
4. 1st Law of Thermodynamics: **W(work done) + Q (Heat)= U(increase in energy)**
5. What the first law means: (conservation of energy but where does the missing energy go?- to heat!)

6. The second Law of Thermodynamics:_____
7. What the second law means:_____
8. What is the equation that relates heat and energy:_____
9. What is a Calorie:_____(hint about 4.2 Joules)
10. The equation of the efficiency of a heat Engine? $e = 1 - \frac{T_c}{T_H}$ **T_c= Cold temp; T_H = Hot Temp; Way to remember, the eff is always less than 1,and T_H is always bigger than T_C, so T_c is always over T_H**
11. What does Isobaric mean?_____
12. What does Isothermal mean?_____
13. What are the limits of the efficiency of a heat engine?_____
14. What is the equation for the conversion from Celsius to Fahrenheit?_____

Kentucky Fried Chart (KFC)

Temp	**Kelvin**	**Fahrenheit**	**Celsius**
Who uses it	***Scientists***	***In USA***	***Everywhere else***
Abs. Zero	**0**	**-460°**	**-273**
Water Freezes	**273**	**32**	**0**
Room Temp	**293**	**68**	**20**
Body Temp	**310**	**98.6**	**37**
Water Boils	**373**	**212**	**100**

Linear Expansion (From Sparknotes)

Any given substance will have a **coefficient of linear expansion**, α, and a **coefficient of volume expansion**, β. We can use these coefficients to determine the change in a substance's length, *L*, or volume, *V*, given a certain change in temperature.

$$\Delta L = \alpha L_i \Delta T$$
$$\Delta V = \beta V_i \Delta T$$

Example

A bimetallic strip of steel and brass of length 50 cm, initially at 15ºC, is heated to 45ºC. What is the difference in length between the two substances after they have been heated? The coefficient of linear expansion for steel is 1.2×10^{-5} m/Cº, and the coefficient of linear expansion for brass is 1.9×10^{-5}m/Cº.

First, let's see how much the steel expands:

ΔL_{steel} =

Next, let's see how much the brass expands:

ΔL_{brass} =

The difference in length is _____m. Because the brass expands more than the steel, the bimetallic strip will bend a little to compensate for the extra length of the brass.

Homework/Classwork: (All homework is due the next class day unless indicated.)

	In Class	Homework Due in this Class
This Monday	**NO CLASS**	
Tuesday	**KFC Memory lickin' Good,**	**#16 HAND IN #17 In Class- Homework sheet**
Wednesday Not HS1		**MS1 #18**
Thursday HS1 Double		**MS1 #19, HS1 #18-19**
Friday	**No Class on Fridays**	**NA**
Next Week		**#20**

Tests/Due Dates: Quiz Thursday

Special Events/News:

Science Olympiad/ Special Advanced Projects During January… We will be having 4 MIT students working with us in January on Special Projects!

Extraordinaries/Mastery Review Topics:

Summations, 15%, DVAJ, Trigonometry, Base 2, Chain rule, Product rule, Inverse functions, composite and embedded functions, Imaginary numbers and powers.

NAME: _____GRADE:_____

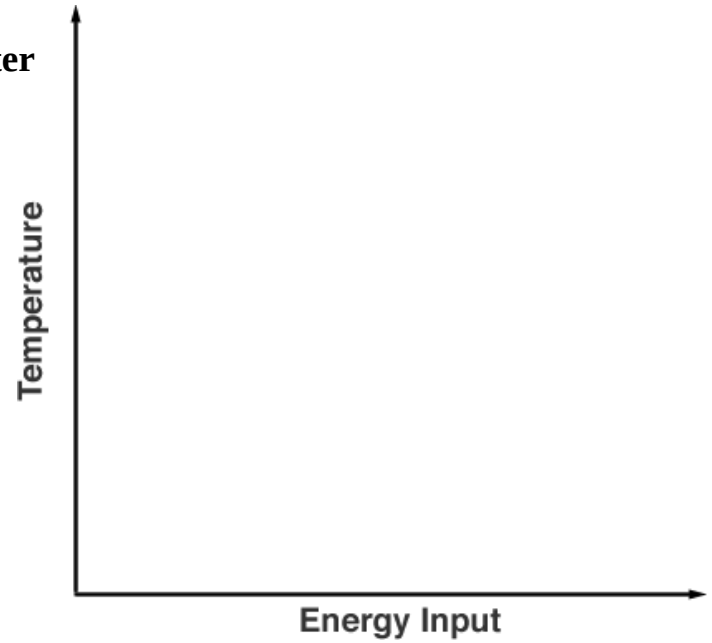
Thermo Basics-#17

1. **FROM MEMORY- Fill in**
   a.

Temp	Kelvin	Fahrenheit	Celsius
Abs. Zero		-460°	
Water Freezes			
Room Temp			
Body Temp			
Water Boils			

   b. **What equation can you use to estimate Fahrenheit temperature from Celsius Quickly?_____ What are the limits of this estimation equation?_____**
   c. **Estimate what 40°F is in Celsius_____**
   d. **Estimate what 40°C is in Fahrenheit_____**

2. For the phase chart to the right:



a. **Draw in how it should look for water (put in temps)**

b. **What is the name for going from a solid to a liquid?**

c. **What is the name for going from a solid to a gas? Is it on this chart yes or no?**

d. **What is a thermal insulator?**

Bonus: How many types of ice are there? _____Where might ice VII be found?
Hint they use roman numerals…

TERM 2 #18 CFA/PCA PHYSICS I

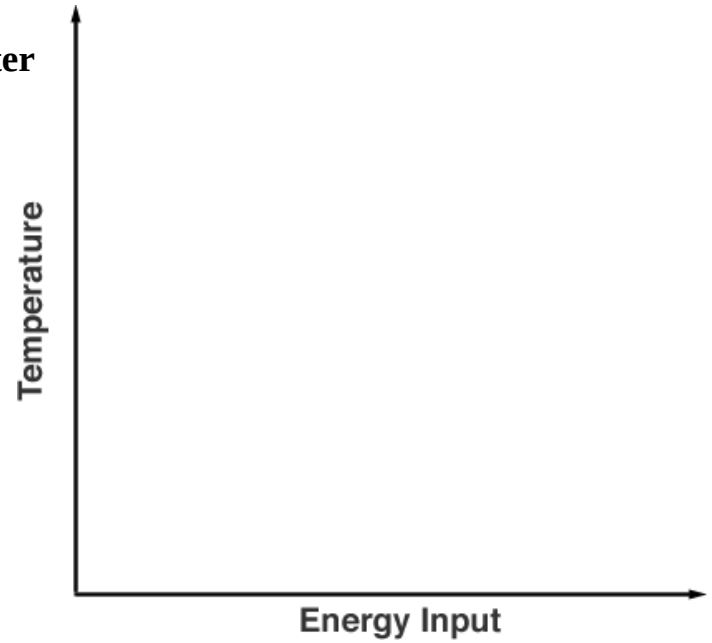
Name/ Grade:_____/ Date:_____(#

1. **FROM MEMORY- Fill in**
   a.

Temp	Kelvin	Fahrenheit	Celsius
Abs. Zero			
Water Freezes			
Room Temp			
Body Temp			
Water Boils			

e. **What equation can you use to estimate Celsius temperature from Fahrenheit quickly?_____ What are the limits of this estimation equation?_____**
f. **Estimate what 30°F is in Celsius_____**
g. **Estimate what 30°C is in Fahrenheit_____**

2. For the phase chart to the right:



e. Draw in how it should look for water (put in temps)

f. What is the name for going from a gas to a liquid?

g. What is the name for going from a liquid to a gas? Is it on this yes or no?

h. What is a thermal conductor?

i. How do coats work?

Bonus: What is the slowest we have been able to get the speed of light? _____ Fermi: What fraction of it's speed in a vacuum is that?_____

Review Practice

1) A Gold, Blue, white, Red, Resistor has what value? _____	2) Let's suppose, Carbon 27* has a half -life of 5seconds. If a sample currently has 2gms of Carbon 27, how much did it have a 1 minute ago? _____ Also How many neutrons would Carbon 27 have?_____	3) Give an example of the 2 main types of circuits.
4) (eqn) Boyle's law=	5) (eqn) Ideal Gas Law=	6) A. Unit for Electric Power=_____ b. Current is like the _____ of a waterfall.

7) What are the 4 Fundamental forces? 1._____ 2. _____ 3. _____ 4. _____ What is wrong with the atomic nucleus?	8) What are the 3 Types of heat transfer? 1._____ 2. _____ 3. _____ 4. _____	9) The eff. Of a heat engine is: It Flo's Car's engine has a cool cycle of 300K and a hot cycle of 500K, what is the maximum efficency of the engine?
10) Extra ordinaries/Bonus: D= -2cos ($4t^{-7}$) V=_____ A=_____	11) D= $3e^{-3t^5}$ V=_____	12) D= _____ V= $e\ t^{-\frac{9}{3}}$ A=_____

TERM 2 #19 CFA/PCA PHYSICS I

Name/ Grade:_____ / Date: _____ (#

1. **FROM MEMORY- Fill in**
   a.

Temp	Kelvin	Fahrenheit	Celsius
Abs. Zero			
Water Freezes			
Room Temp			
Body Temp			
Water Boils			

   b. What equation can you use to estimate Celsius temperature from Fahrenheit quickly?_____ What are the limits of this estimation equation?_____
   c. Estimate what 15^{o}F is in Celsius_____
   d. Estimate what 15^{o}C is in Fahrenheit_____

2. **Physics Homework Practice- Review Problems:**

1) a) Centripetal acceleration = _____ b) What is the Cent. Acceleration of an object moving in a circle of radius 5m, with speed of 6m/s?	2) What would happen to the Universal Gravitational Force if you kept everything else the same but doubled the radius?	3) What heat needed to raise 700gms of water 50^{o}C?
4) Room Temperature is at what temp in Kelvin=	5) If you have 500J of heat added to 300gm of water (C_{sp}~ 4.2 J/ g^{o}C), how much does the temperature rise?	6) Heat of **Fusion** means:_____

7) Charles law = If the pressure remains constant, the initial volume of a gas is 20 liters, and the initial temperature is 280K, if the temperature is raised to 300K what would the new volume be?	8) Ideal Gas Law =	9) The eff. Of a heat engine is: It Flo's Car's engine has a cool cycle of 100K and a hot cycle of 500K, what is the maximum efficency of the engine?
10) Extra ordinaries/Bonus: D= 5 cos ($2t^{-7}$) V=_____ A=_____	11) D= $3e^{-2t^{e}}$ V=_____	12) D= _____ V= $\pi t^{-\frac{5}{3}}$ A=_____

HMWRK #20
WRITE IT DO IT PRACTICE…

1. How many more people are in the world as of Jan 1, 2012 vs Jan. 1 2011?_____
   Put in Sci. Notation: _____
2. At this rate of increase per year how many people will be in the world by the time you are 30? _____
   Is this rate a good approximation or a bad one and why? Do you think there will be more or less than your estimate? _____
3. What are the 3 types of heat tranferance?
   a. _____
   b. _____
   c. _____

d. Describe to a 2nd grader why space is so cold, despite the fact the sun is so hot? _____

e. Describe how global warming works _____

f. Describe how a Microwave works: _____

Hint: there are PHET Simulations for Microwaves, States of matter, and global warming…