

## Weekly Sheet for PHYSICS 2

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### **Physics 2**

### **Week #T2-6 More Thermo**

**January School Wide Memory Verse:**

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

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

**Topics/Content/Skills: Heat, Temperature, Laws of Thermodynamics**

**Skills:**

Review- **Thermo Dynamics:**

- Temperature,
- 3 laws of Thermodynamics
  - Conservation of Energy
  - Entropy- Things get messy, socks (and energy), gets “misplaced” so no 100% engines.
  - Absolute zero means no movement
- Green house effect
- How Microwaves/Refrigerators work
- Buoyancy
- Heat ΔQ
- Linear Expansion
- Laws

Projects-Science Olympiad Topic Challenge.

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

	<u>In Class</u>	<u>Homework Due in this Class</u>
<b><u>This Monday</u></b>		<b><u>#20</u></b>
<b><u>Tuesday</u></b>		<b><u>#21</u></b>
<b><u>Wednesday</u></b> <span style="color: cyan;">Not HS1</span>		<b><u>#22</u></b>
<b><u>Thursday</u></b> <span style="color: cyan;">HS1 Double</span>		<b><u>#22 (HS1) #23</u></b>
<b><u>Friday</u></b>	<b><u>No Class on Fridays</u></b>	<b><u>NA</u></b>
<b><u>Next Week</u></b>		<b><u>#24</u></b>

**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.

**Vocabulary/Key Terms/Formulas:**

**The Three Laws of Thermodynamics** » from: <http://www.kids.esdb.bg/index.html>

- **The first law** of thermodynamics, also called **conservation of energy**, states that the total amount of energy in the universe is constant. This means that all of the energy has to end up somewhere, either in the original form or in a different form. We can use this knowledge to determine the amount of energy in a system, the amount lost as waste heat, and the efficiency of the system.

-**The second law** of thermodynamics states that the **disorder (Entropy) in the universe always increases**. After cleaning your room, it always has a tendency to become messy again. This is a result of the second law. As the disorder in the universe increases, the energy is transformed into less usable forms. Thus, the efficiency of any process will always be less than 100%.

- **The third law** of thermodynamics tells us that **all molecular movement stops at a temperature we call absolute zero**, or 0 Kelvin (-273°C). Since temperature is a measure of molecular movement, there can be no temperature lower than absolute zero. At this temperature, a perfect crystal has no disorder. When put together, these laws state that a concentrated energy supply must be used to accomplish useful work.

**Tests/Due Dates:** **Thermo TEST Thursday Jan. 12**

**Special Events/News:**

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**Extraordinaries/Mastery Review Topics:**

Summations, 15%, DVAJ, Trigonometry, Base 2, Imaginary numbers and powers.

**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 250°F is in Celsius \_\_\_\_\_
- d. Estimate what 25°C is in Fahrenheit \_\_\_\_\_

2.

NAME: \_\_\_\_\_ GRADE: \_\_\_\_\_

## Thermo Simulations-#21

Behavior of Gases Lab Sarah Borenstein PhET Simulation

### Learning Goals:

- Explore the relationships between pressure, volume, and temperature.
- Create graphs based on predictions and observations.
- Make qualitative statements about the relationships between pressure, volume and temperature.

**Background Information:** Air is a gas. Gases have various properties that

can be observed with our senses, including the gas pressure (p), temperature (t), and the volume (V), which contains the gas. Careful scientific observation has determined that these variables are related to one another. By understanding these relationships it is possible to explain how gases behave under certain conditions. **Set-Up:** 2 different colored pens or pencils.

**Procedure:** Open the PhET simulation “Gas Properties.”

Either type in: <http://www.colorado.edu/physics/phet> or Google “phet”.

Click on **Play with Sims**, then click on **Heat and Thermo** on the left side. Click on **Gas Properties**.

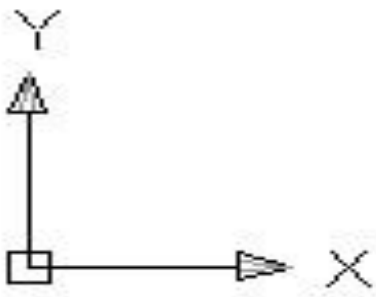
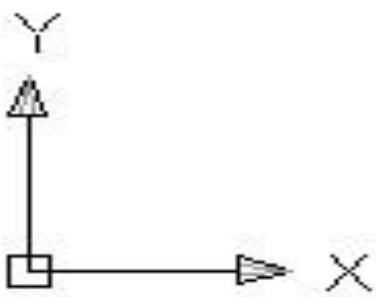
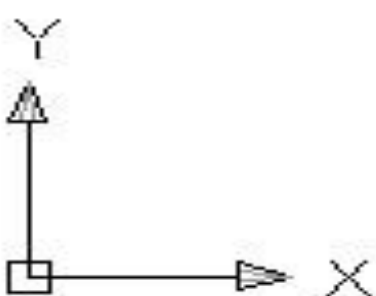


1. Investigate the simulation involving gas properties. Practice the following:
  - Adding air to the container
  - Changing the size of the container.
  - Adding and removing heat with the heat control.

**NOTE:** Be sure to keep the gravity and the type of the gas in the container constant (the same).

2. Make a chart like the one below in your lab notebook. Without using the simulation, sketch what you think the graphs would look like using one of your colored pencils. **Note: Be sure to label your x and y axes.**

Volume-Pressure graph	Explain your reasoning for the graph's appearance
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<p>Volume -Temperature graph</p> 	<p>Explain your reasoning for the graph's appearance</p>
<p>Temperature-Pressure graph</p> 	<p>Explain your reasoning for the graph's appearance</p>

3. Using the simulation, verify or correct your graphs and reasoning using a different colored pen or pencil.

Prediction color \_\_\_\_\_ Correction color \_\_\_\_\_

4. Looking at your graphs, draw or write in your own words the relationship that exists between pressure and volume.

5. Looking at your graphs, draw or write in your own words the relationship that exists between temperature and volume.

6. Using the data chart below, make a prediction for each of the following scenarios. Predict what you think the graphs will look like, then using the simulation, verify or correct your graphs and reasoning with a different colored pen or pencil. Make sure you label your axes and include a key to the colors you used for your predictions and corrections.

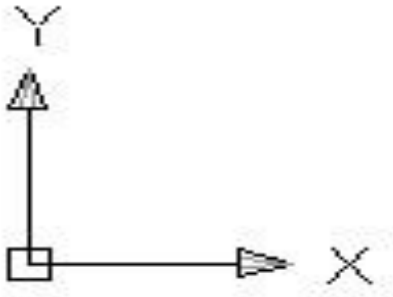
a. Explain why bicycle tires seem higher in the summer than in winter.

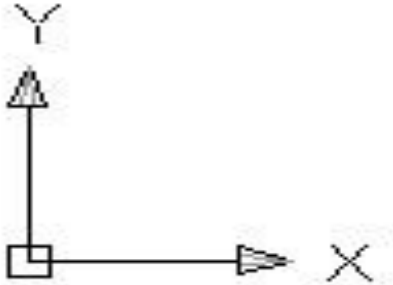
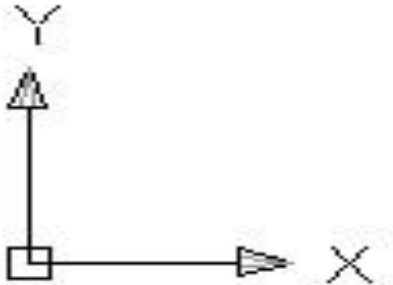
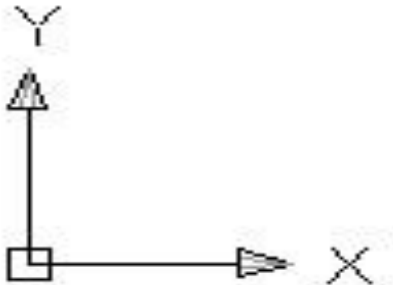
b. Explain why a can of soda pop explodes if left in the hot sun.

c. A rigid container filled with a gas is placed in ice (ex. nalgene bottle). What will happen to the pressure of the gas? What do you think will happen to the volume?

d. An infected tooth forms an abscess\* that fills with gas. The abscess puts pressure on the nerve of the tooth, causing a toothache. While waiting to see a dentist, the person with the toothache tried to relieve the pain by treating the infected area with moist heat. Will this treatment help? Why or why not?

\*area of infected tissue.

Scenario	Graph	Explanation of your reasoning
a. Bicycle tire		

<p>b. Soda pop in sun</p>		
<p>c. Container in ice</p>		
<p>d. Infected tooth</p>		

7. What other experiments would you like to try using this simulation?

# Buoyancy PHET Lab



**Directions: Sim Tip: The scales can be moved!**

## **Intro Tab:**

1. How can you use a block and the other tools on the **Intro** tab to determine the density of the "Oil"? You can put the force of buoyancy on to see what it is...
  - a. What is the equation of Density? \_\_\_\_\_
  - b. What is the Volume of the oil displaced? \_\_\_\_\_
  - c. The  $F_{\text{weight}}$  of the oil = Buoyancy =  $M \cdot g$  so the Mass = \_\_\_\_\_ (assume  $g=9.8\text{m/s}^2$ )
  - d. The density of the oil would therefore be? \_\_\_\_\_

2. Determine what forces act on an object when is it in a fluid. How are the forces similar and different when the object sinks, floats immersed in the fluid, and when it is only partially submerged.

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3. Give specific examples that you could use to explain what *buoyancy* is and how an objects *weight* can appear to change when in a fluid. Make sure to include situations where the object sinks, floats immersed in the fluid, and when it is only partially submerged.

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## **Playground Tab:**

4. Explain how you can use the information about the block and the fluid to determine if the block will sink, floats immersed in the fluid, and when it is only partially submerged.

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5. How can you determine the apparent mass of an object if you know the density of the object and the density of the fluid?

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6. **Challenge:** Explain how an object that is more dense than water can be kept afloat by placing it on an object that is less dense than water

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# TERM 2 #22 CFA/PCA PHYSICS I

Name/ Grade: \_\_\_\_\_ / Date: \_\_\_\_\_ (#

## 1. A. FROM MEMORY- Fill in

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 25°F is in Celsius \_\_\_\_\_

d. Estimate what 25°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. Describe what is going on in the Chart. \_\_\_\_\_

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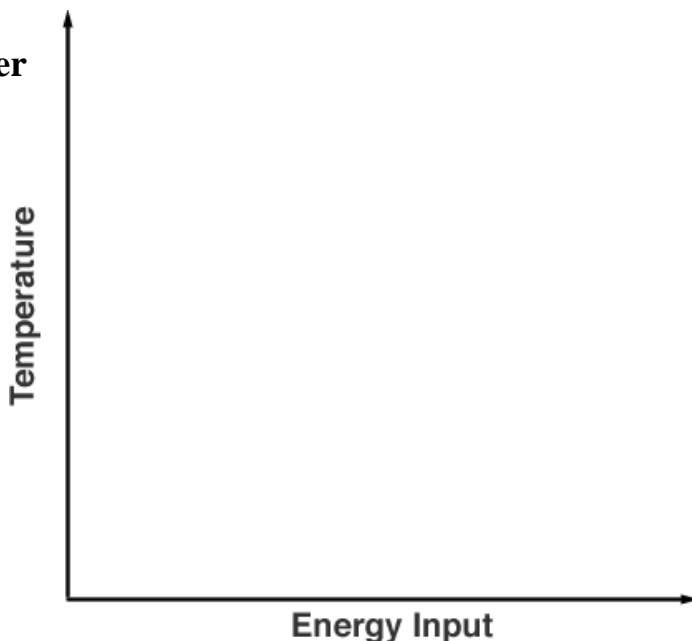
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c. What is a calorie and how is it different from a Calorie? \_\_\_\_\_

d. How does a Microwave work (draw a picture to help describe it to a 2<sup>nd</sup> grader)? What is the main component of a Microwave? (hint... Rhymes with Megatron)

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e. How does a Refrigerator work? What is the main component of a refrigerator? (draw a picture to help describe it to a 2<sup>nd</sup> grader)

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<p>13) a) Centripetal acceleration = _____</p> <p>b) What is the Cent. Acceleration of an object moving in a circle of radius 2m, with speed of 3m/s?</p> <p>Phys II</p>	<p>14) Cosine of an angle = <math>\frac{What}{What} =</math></p>	<p>15) <b>Unit</b> for</p> <p>a. Velocity=_____.</p> <p>b. Displacement = _____</p>
<p>16) The 2<sup>nd</sup> law of Thermodynamics is _____</p> <p>_____</p>	<p>17) <b>A _____ Calorie is _____</b></p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>18) What would happen to the Universal Gravitational Force if you kept everything else the same but doubled one of the Masses?</p>
<p>19) For Heat Q = _____</p>	<p>20) Isothermal means:</p>	<p>21) What heat needed to raise 3gms of water 2°C?</p>
<p>22) Water freezes at what temp in Kelvin=</p>	<p>23) Temperature is</p>	<p>24) <b>Unit</b> for Temperature = _____</p>
<p>25) Boyles law =</p>	<p>26) Ideal Gas Law =</p>	<p>27) The eff. Of a heat engine is:</p>
<p>28) Heat of vaporization means: _____</p> <p>_____</p>	<p>1. If you have 41860J of heat added to 1kg of water (<math>C_{sp} = 4.186 \text{ J/ g}^\circ\text{C}</math>), how much does the temperature rise?</p>	<p>30) <b>Unit</b> for</p> <p>a. Work=_____.</p> <p>b. Heat= _____</p>

HMWRK #24  
WRITE IT DO IT/SAT PREP PRACTICE...

Physics 1

SAT Diagnostic Test #1-7 (10 Minutes to Take, 10 Min to grade and UNDERSTAND).

1. Take,
2. Grade
3. Understand... What you got wrong and WHY

Physics 2

SAT Diagnostic Test #1-39 (32 Minutes to Take, 30 Min to grade and UNDERSTAND).

4. Take,
5. Grade
6. Understand... What you got wrong and WHY

Practice with  $F_{\text{grav}}$  &  $F_{\text{Elec}}$ . And proportions

Physics 1&2

1. If you double one mass what happens to the force: \_\_\_\_\_
2. If you Half the distance between two masses what happens to the force: \_\_\_\_\_
3. If you half each of the two masses what happens to the force: \_\_\_\_\_

Physics 2 Only

4. If you Double one charge and take  $1/4^{\text{th}}$  of the other, what happens to the force: \_\_\_\_\_
5. If you double one mass, Double the distance between the two masses, what happens to the force:  
\_\_\_\_\_
6. If you triple the distance between two charges and double both charges, what happens to the force: \_\_\_\_\_
7. If you triple each mass, and make the distance between the masses,  $1/4^{\text{th}}$  what it was, what happens to the force: \_\_\_\_\_

Name 3 people famous in Thermodynamics and What they are famous for.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_