I apologize for the spraeling messiness of this packet. It is a combination of 1) things to know 2) unsolved problems 3) solved problems. It is a broad survey meant to be a starting point that jogs your memory.

Review for the June 2014 Chemistry Final Exam

(The exam covers only second semester, from Jan 27 to June 6th)

Disclaimer: Studying this packet is a great start but is not a substitute for actually studying all 80 days of material. Hopefully time spent with this packet will help you find what parts of the semester you need to go back and study in depth, either from your notes or from http://genest.weebly.com

Of the 80 days we have been together this semester, the things in this packet are the ones that came up over and over.

About a third of what you need to know are specific facts. Get these from your notes.

Two thirds of what you need to know are skills. Get these by doing, redoing, and redoing one more time, all of the old homework problems that you learned to solve this semester.

<u>UNIT 7 PHASES, PHASE DIAGRAMS, VAPOR PRESSURE</u>

VOCABULARY

allotrope
atmospheric pressure
barometer
boiling point
energy
heating curve (sometimes called a cooling curve)
kinetic energy
kinetic molecular theory
melting point
pascal (a unit, abbreviated Pa)
phase diagram
a unit abbreviated atm
triple point
vacuum
vapor
vapor pressure

For full credit: 1) you must work where your partner is working
2) Be in your regular desk 6 minutes before the bell for credit check.

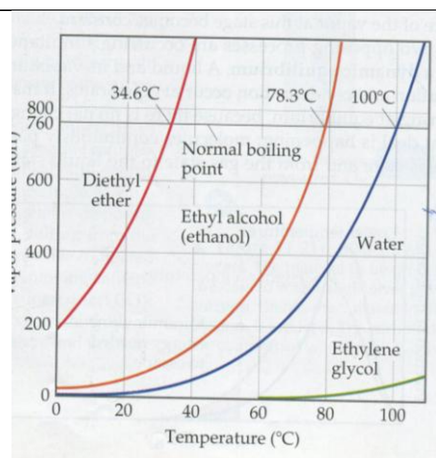
1. Write the standard pressure in ________ kPa ________ mmHg

Using the chart at right, answer each:

2. If diethyl ether in this room had a vapor pressure of 600 mmHg would it be boiling?

3. How high must the vapor pressure of a substance be at East High School for that substance to boil?

4. Will the boiling point of a substance be higher on top of a mountain or in Madison?



5. Fill in the empty boxes using the vapor pressure from the graph above.

substance	vapor pressure	the ambient pressure	Is the substance boiling?	temperature
ethyl alcohol		500 mmHg	yes	

diethyl ether	400mmHg	400 mmHg	yes	
	600 mmHg	760 mmHg	no	74 °C
water	200 mmHg		yes	64 °C

6. Draw your own heating curve for aluminum, knowing that it melts at 660 °C and vaporizes at 2467 °C Label the x-axis time and label the y-axis temperature.

7. As temperature rises what happens to vapor pressure?

8. The temperature at which all motion stops is ________ K   or __________°C

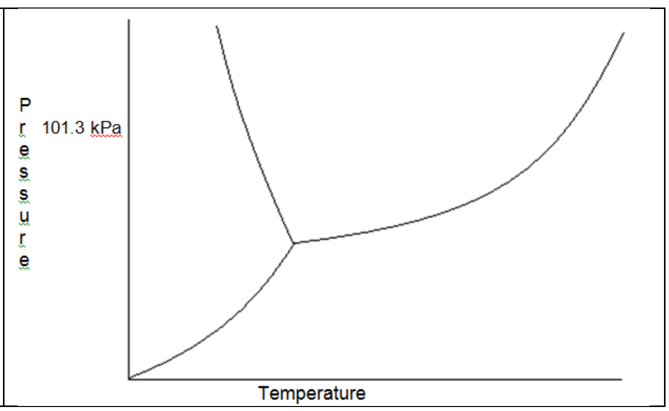
9. If the absolute temperature is increased four times higher what happens to the kinetic energy?

10. Explain one way each of the following could happen.
    a. Water boils at a temperature above 100 °C.

    b. Water boils at a temperature below 100 °C.

10. Show the work need to convert 50 mm Hg to kPa.

11. The graph below is a phase diagram for substance. Label the following parts on the graph: **sublimation line, normal boiling point, vapor/gas, liquid, solid, triple point, and critical point.**



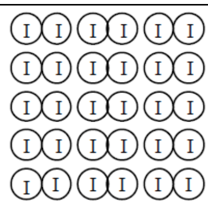
12. The normal melting and boiling points of O_2 are −218°C and −183°C, respectively. Its triple point is at −219°C and 1.14 torr, and its critical point is at −119°C and 49.8 atm. **(a)** Sketch the phase diagram for O_2, showing the four points given and indicating the area in which each phase is stable. **(b)** Will $O_2(s)$ float on $O_2(l)$? Explain. **(c)** As it is heated, will solid O_2 sublime or melt under a pressure of 1 atm?	

13. Diamond and graphite are both made out of carbon. Explain how it is possible that one substance is one of the hardest things on Earth while the other breaks on us constantly.

1. Write the definition of energy given in class:

2. When kinetic energy of a gas doubles, what other measurement also exactly doubles?

3. How many of the molecules in this picture are compounds?
   a. 0
   b. 2
   c. 15
   d. 30



4. Convert 44.1 atm to mmHg

(Recall that the following are all equal:

760 mmHg = 101 kPa = 1.00 atm)

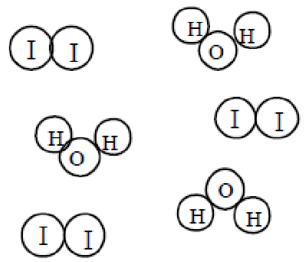
5. States of matter can be changed. What is needed to make this possible?

1. Write the definition of energy given in class:

2. When kinetic energy of a gas doubles, what other

measurement also exactly doubles?

3. How many of the molecules in this picture are compounds?
   a. 3
   b. 6
   c. 9
   d. 15

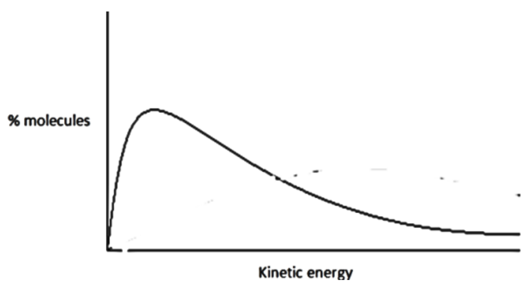


4. Convert 67.5 kilopascals to atm

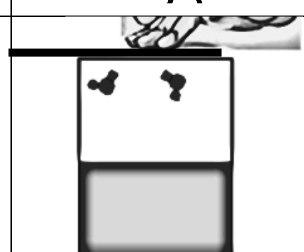
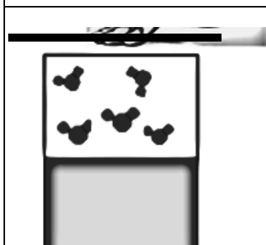
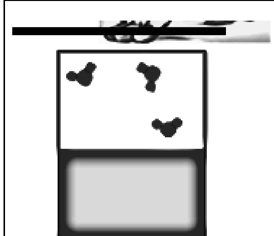
(Recall that the following are all equal:

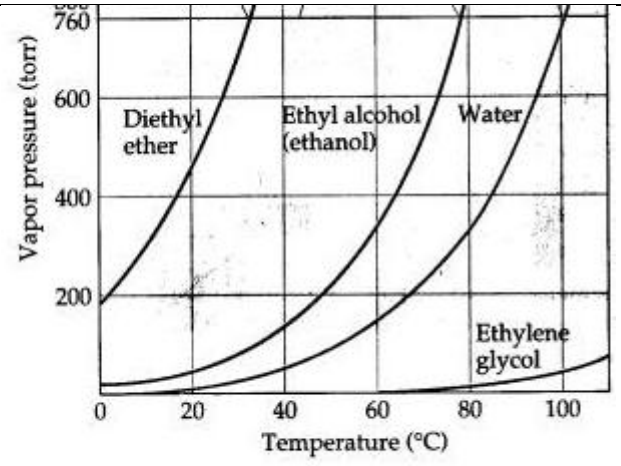
760 mmHg = 101 kPa = 1.00 atm)

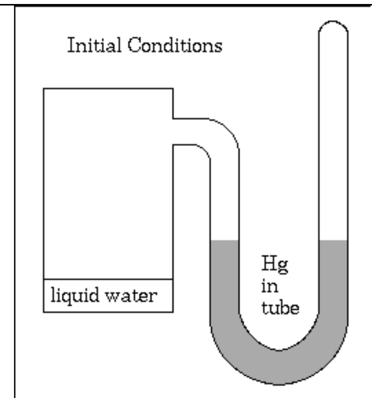
1. Use this drawing or a similar one of your own to *explain how* perspiration (sweating) cools a person.



1. Consider these liquids at room temperature:

SUBSTANCE	A	B	C
			
What temperature?			
HOW MUCH VAPOR PRESSURE			





2. Label the three boxes below as “60 degrees C”

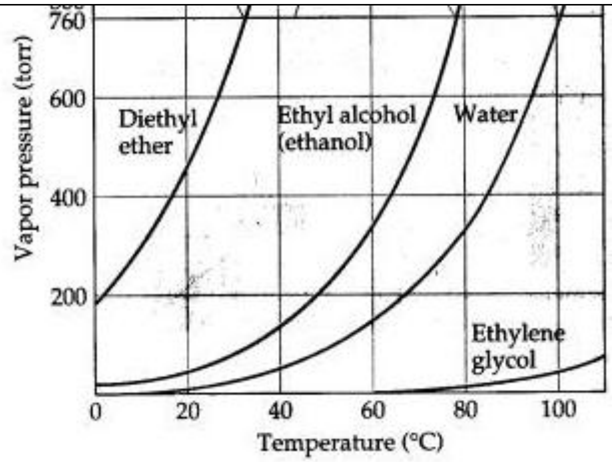
Draw a manometer in each box. Instead of water, label the liquid in each as either degree ethanol, water, or diethyl ether. Draw how many particles would be vapor. Move the Hg to show your prediction for how far it would be pushed to the right.

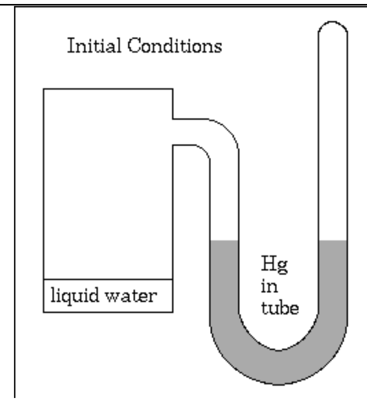
3. Graph this data. Label the X-Axis *temperature*. Number it from 0 to 100. Label the Y-Axis vapor pressure. Number it from 0 to 900. Draw dots with circles for data points. Connect your data points with a line.

temperature [°C]	vapor pressure [torr]
30	20
50	110
60	200
70	300
80	400
90	600
100	800

The graph you made above shows that as temperature decreases, the vapor

pressure of a substance will become (lower / higher). This makes sense because as temperature decreases, the kinetic energy of the liquid (decreases / increases) and therefore the amount of liquid changing to vapor will be (less / more)





L

Solid Phases

CλeMis+ry: http://genest.weebly.com

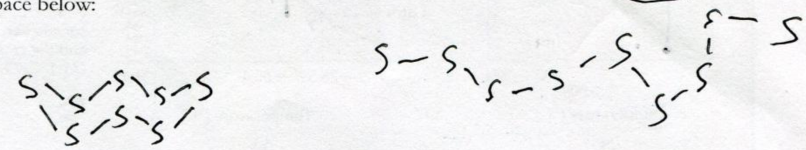
Stop in for help every day at lunch and Tues, Weds., &Thurs after school!

After-hours question? Email me at home: eagenest@madison.k12.wi.us

Name ANSWERS

Period ______

1. Write the standard temperature in **0** °C **273** kelvins
2. IF CHLORINE gas at its boiling point, then you double the kinetic energy. What will its new temperature be in Celsius? → 205°C
   -34 + 273 = 239   239 × 2 = 478 K
3. Indicating atoms of sulfur by circles with an S inside, sketch two different allotropes of sulfur in the space below:



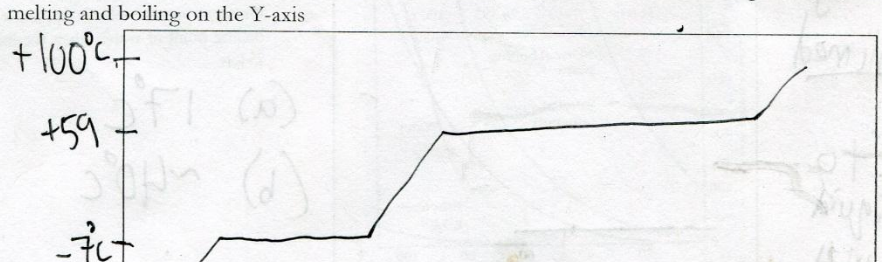
substance	melting point [°C]*	boiling point [°C]*
chlorine (Cl_2)	-102	-34
bromine (Br_2)	-7.2	59
iodine (I_2)	114	**
water	0	100

*measured at standard pressure

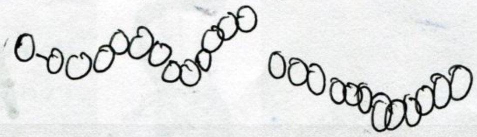
**sublimes instead of vaporizing at standard pressure

Use the table above to answer the following questions

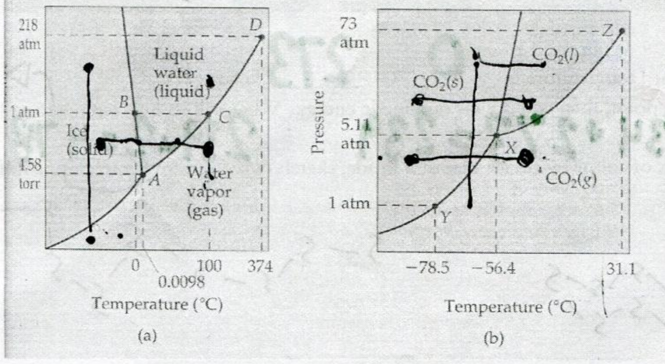
4. Scientists working in Antarctica frequently encounter temperatures of 313 kelvins. At this temperature predict the phase of each substance: 313 - 273 = 40°C
   a. chlorine would be gas
   b. bromine would be Liquid
   c. iodine would be SOLID
5. Add a line in the table above for H_2O. Fill in the numbers.
6. Calculate the melting point of bromine to kelvins: ______
   -7.2 + 273 = 265.8 kelvins
7. In the square below, sketch a crude heating curve for heating bromine from -100°C to +100°C. Label your axes *time[minutes]* and *temperature[°C]*. Clearly write a number for the temperature of melting and boiling on the Y-axis



8. Sketch an example of an amorphous substance, from class notes, using circles as atoms.



examples: plastic glass



◀ **Figure 11.27** Phase diagram of (a) H_2O and (b) CO_2. The axes are not drawn to scale in either case. In (a), for water, note the triple point *A* (0.0098°C, 4.58 torr), the normal melting (or freezing) point *B* (0°C, 1 atm), the normal boiling point *C* (100°C, 1 atm), and the critical point *D* (374.4°C, 217.7 atm). In (b), for carbon dioxide, note the triple point *X* (−56.4°C, 5.11 atm), the normal sublimation point *Y* (−78.5°C, 1 atm), and the critical point *Z* (31.1°C, 73.0 atm).

9.

PRACTICE EXERCISE

Using Figure 11.27(b), describe what happens when the following changes are made in a CO_2 sample initially at 1 atm and −60°C: **(a)** Pressure increases at constant temperature to 60 atm. **(b)** Temperature increases from −60°C to −20°C at constant 60 atm pressure.

(A) (it deposited) Gas to SOLID
(B) Changed from SOLID to LIQUID (it melted)

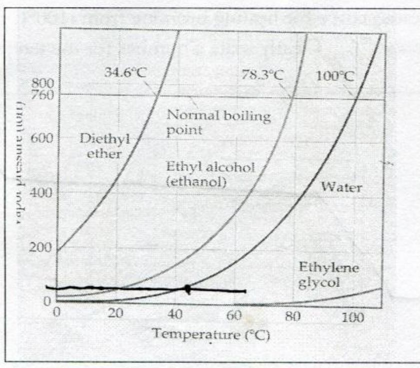
10.

11.49 Refer to Figure 11.27(a), and describe all the phase changes that would occur in each of the following cases: **(a)** Water vapor originally at 1.0×10^{-3} atm and −0.10°C is slowly compressed at constant temperature until the final pressure is 10 atm. **(b)** Water originally at 100.0°C and 0.50 atm is cooled at constant pressure until the temperature is −10°C.

11.49 (a) gas to solid (it deposited)
11.49(b) gas → liquid → solid

11.50 Refer to Figure 11.27(b), and describe the phase changes (and the temperatures at which they occur) when CO_2 is heated from −80°C to −20°C at **(a)** a constant pressure of 3 atm; **(b)** a constant pressure of 6 atm.

11.50
(a) Solid to gas
it sublimed
(b) SOLID to Liquid
it melted



11.43 **(a)** Use the vapor-pressure curve in Figure 11.22 to estimate the boiling point of diethyl ether at 400 torr. **(b)** Use the vapor-pressure table in Appendix B to determine the boiling point of water when the external pressure is 25 torr.

(a) 17°C
(b) ~40°C