

Solid Phases

Chemistry: <http://genest.weebly.com>

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

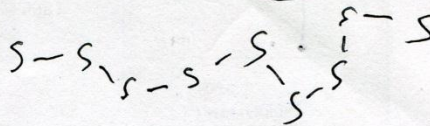
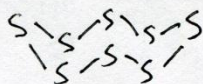
After-hours question? Email me at home: eagenest@madison.k12.wi.us



Name _____
Period _____

ANSWERS

- Write the standard temperature in 0 °C 273 kelvins
- ~~IF CHLORINE~~ gas at its boiling point, then you double the kinetic energy. What will its new temperature be in Celsius? $-34 + 273 = 239$ $239 \times 2 = 478 K$ $\rightarrow 205^\circ C$
- 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

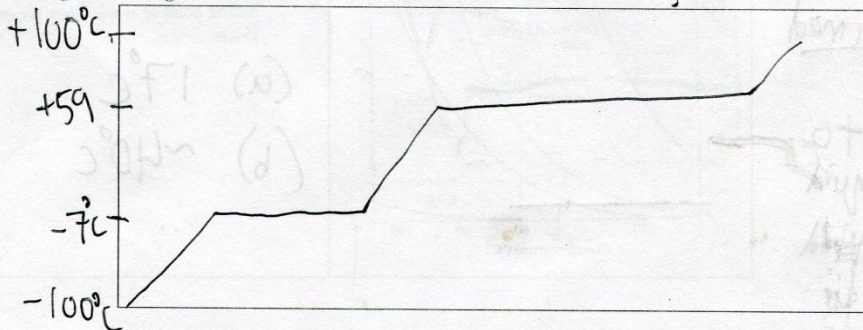
*measured at standard pressure

**sublimes instead of vaporizing at standard pressure

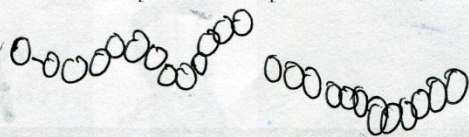
Use the table above to answer the following questions

- Scientists working in Antarctica frequently encounter temperatures of 313 kelvins. At this temperature predict the phase of each substance:
 - chlorine would be gas
 - bromine would be Liquid
 - iodine would be SOLID
- Add a line in the table above for H₂O. Fill in the numbers.
- Calculate the melting point of bromine to kelvins: $-7.2 + 273 = 265.8 \text{ kelvins}$

- 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

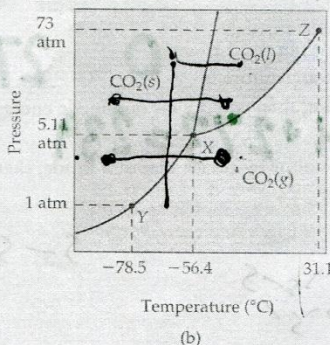
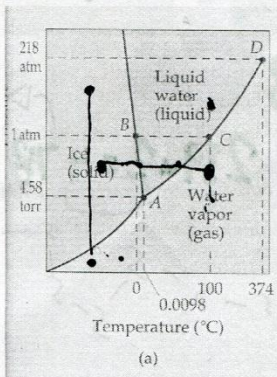


Figure 11.27 Phase diagram of (a) H_2O and (b) CO_2 . The axes are not drawn to scale in either case. In (a), for water, note the triple point A (0.0098°C, 4.58 torr), the normal melting (or freezing) point B (0°C, 1 atm), the normal boiling point D (100°C, 1 atm), and the critical point C (374.4°C, 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).

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 $-60^\circ C$: (a) Pressure increases at constant temperature to 60 atm. (b) Temperature increases from $-60^\circ C$ to $-20^\circ C$ at constant 60 atm pressure.

9.

11.49 Refer to Figure 11.27(a), and describe all the phase changes that would occur in each of the following cases:

10.

(a) Water vapor originally at 1.0×10^{-3} atm and $-0.10^\circ C$ is slowly compressed at constant temperature until the final pressure is 10 atm. (b) Water originally at $100.0^\circ C$ and 0.50 atm is cooled at constant pressure until the temperature is $-10^\circ C$.

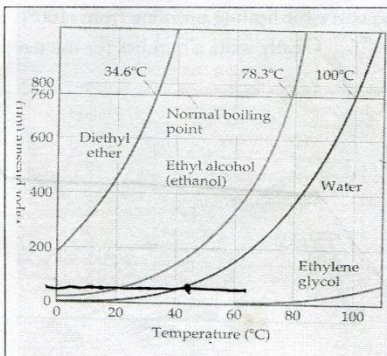
11.50 Refer to Figure 11.27(b), and describe the phase changes (and the temperatures at which they occur) when CO_2 is heated from $-80^\circ C$ to $-20^\circ C$ at (a) a constant pressure of 3 atm; (b) a constant pressure of 6 atm.

(A) (it deposited)
Gas to solid
(B)
changed from
solid to liquid

11.49 (a) (it melted)
gas to solid (it deposited)
11.49 (b) gas \rightarrow liquid \rightarrow solid

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) $17^\circ C$
(b) $\sim 40^\circ C$