

Chapter 12 Worksheet 2

Name:

UGA myID:

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is aw00285). **Do not use your 81x number.**
- If you do not have a printer, type your answers in the boxes then upload the worksheet template to Gradescope by Sunday, January 24th at 11:59 p.m. Write your work on separate sheets of paper, convert to a PDF and upload to the dropbox on eLC.
- If you have a printer download the worksheet, write your answers and show your work on the worksheet template, convert it to a PDF and upload to Gradescope by Sunday, January 24th at 11:59 p.m.

Chapter 12 (Cont.)

Question 1: Which of the following processes is endothermic? (Select all that apply, enter options separated by columns).

- A. Evaporation of ammonia
- B. Freezing of water
- C. Condensation of Ammonia
- D. Sublimation of CO₂
- E. Deposition of CO₂

Question 2: Which of the following pure substances has the highest freezing point?

- A. CH₃OCH₃
- B. CH₄
- C. H₂O
- D. CH₃Cl
- E. HCl

Question 3: The vapor pressure of liquid bromine at room temperature is 168 torr. Suppose that bromine is introduced drop by drop into a closed system containing air at 775 torr and room temperature. (The volume of liquid bromine is negligible compared to the volume of the system.)

- A) If the bromine is added until no more vaporizes and a few drops of liquid are present in the flask, what would be the total pressure?

torr

- B) What would be the total pressure if the volume of this closed system were decreased to one half its original value at the same temperature?

torr

Question 4: At 10.0 °C, the vapor pressure of nitric acid is 26.6 mm Hg, and at 50.0 °C, the vapor pressure is 208 mm Hg. Using this information, calculate the heat of vaporization (ΔH_{vap}) of nitric acid. (The unit to report is shown to the right of the box).

 kJ/mol

Question 5: Ethanol has an enthalpy of vaporization of 42.3 kJ/mol. The compound has a vapor pressure of 1.00 atm at 78.3 °C. At what temperature is the vapor pressure equal to 0.800 atm? ($R = 8.3145 \text{ J/K} \cdot \text{mol}$) (The unit to report is shown to the right of the box).

 °C

Question 6:

A bottle is filled with a small amount of a volatile liquid and sealed. Sometime later it is observed that no liquid is evident in the sealed bottle. Which of the following statements would explain this observation?

- A. More time is needed to establish equilibrium.
- B. Liquid and vapor are at equilibrium in the bottle.
- C. The vapor state is favored when equilibrium is established.
- D. The liquid has undergone sublimation.
- E. Too little liquid was added to achieve a liquid vapor equilibrium in the closed system.

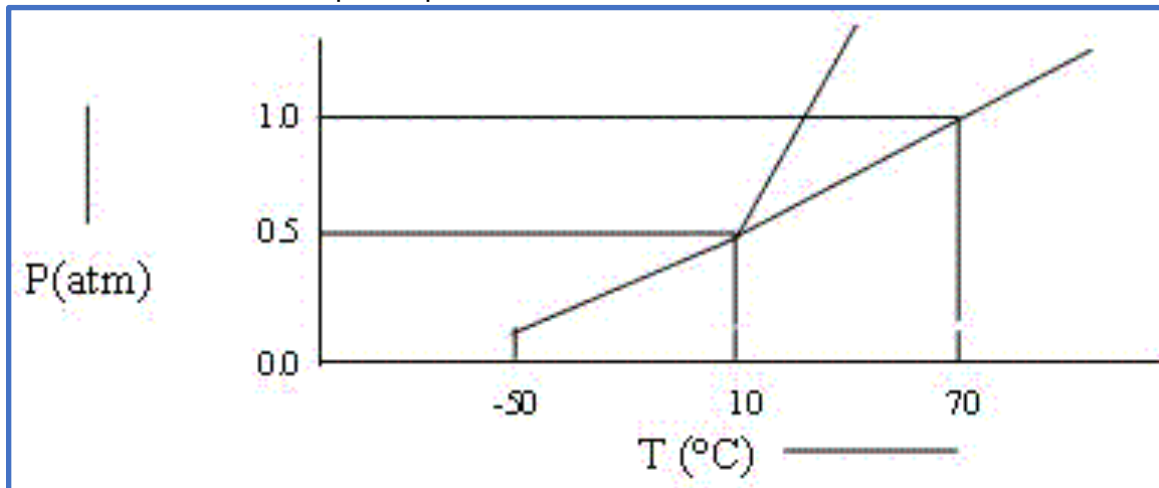
Question 7: At 75.0 °C, water has an equilibrium vapor pressure of 289.1 mm Hg. If 4.22 g H₂O is sealed in an evacuated 5.00 L flask and heated to 75.0 °C, what mass of H₂O will be found in the gas phase when liquid-vapor equilibrium is established? Assume any liquid remaining in the flask has a negligible volume. ($R = 0.082057 \text{ L} \cdot \text{atm/mol} \cdot \text{K}$, 1 atm = 760 mm Hg)

- A. 1.20 g
- B. 4.22 g
- C. 2.64 g
- D. 3.02 g
- E. 0.240 g
- F. None of these.

Question 8: Among the options shown, which chemical formula is paired up with an INCORRECT crystal type? Select all that apply.

- A. Ni, metallic
- B. Xe, metallic
- C. Sn, molecular
- D. Cholesterol (C₂₇H₄₅OH), molecular
- E. SiC, network covalent
- F. KCl, ionic
- G. IF₇, molecular
- H. C(diamond), network covalent

Question 9: A certain substance has the phase diagram shown below. At which of the following values of T and P is the substance a pure liquid?



- A. $T = 70\text{ }^{\circ}\text{C}$, $P = 1.2\text{ atm}$
- B. $T = 8\text{ }^{\circ}\text{C}$, $P = 1\text{ atm}$
- C. $T = 10\text{ }^{\circ}\text{C}$, $P = 0.5\text{ atm}$
- D. $T = 80\text{ }^{\circ}\text{C}$, $P = 1\text{ atm}$
- E. $T = 10\text{ }^{\circ}\text{C}$, $P = 1\text{ atm}$

Question 10: Choose the response that lists the member of each of the following pairs that has the *lower* boiling point.

- i. H_2O or LiBr
- ii. HF or HCl
- iii. CH_3CH_3 and $\text{HO-CH}_2\text{CH}_2\text{-OH}$

- A. H_2O , HF , CH_3CH_3
- B. H_2O , HCl , CH_3CH_3
- C. H_2O , HF , $\text{HO-CH}_2\text{CH}_2\text{-OH}$
- D. LiBr , HCl , $\text{HO-CH}_2\text{CH}_2\text{-OH}$
- E. LiBr , HF , $\text{HO-CH}_2\text{CH}_2\text{-OH}$

Question 11: What quantity of heat is required to melt 500 g of ice at 0°C and then to heat the resulting water to steam at 100°C ? Heat of fusion of ice = 333 J/g ; Specific heat of water = $4.184\text{ J/g}\cdot\text{K}$; Heat of vaporization = 2260 J/g . (Report your answer using scientific notation. The unit to use is shown to the right of the box.)

 J

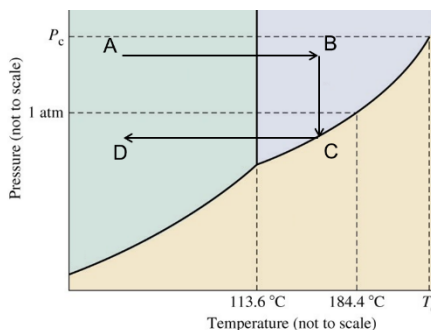
Question 12:

Which has the largest temperature change, melting 100. g of ice or converting 100. g of water to steam?

- A. Melting 100. g of ice
 - B. Evaporating 100. g of water
 - C. They're the same
- Heat of Fusion for water = 333 J/g
Heat of Vaporization for water = 2256 J/g

Question 13: To the right is the phase diagram for iodine. Which of the following transitions occur when the temperature and pressure conditions are changed from A to B to C to D?

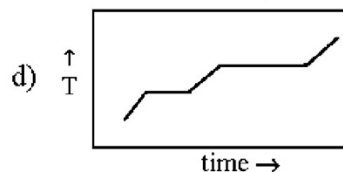
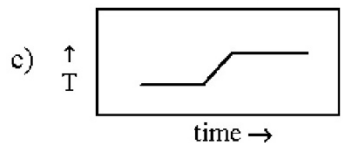
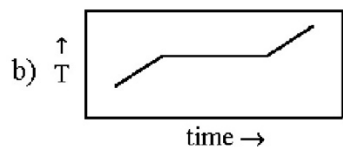
- A. $l \rightarrow s \rightarrow g \rightarrow l$
- B. $s \rightarrow l \rightarrow g \rightarrow s$
- C. $g \rightarrow s \rightarrow l \rightarrow g$
- D. $s \rightarrow l \rightarrow g \rightarrow l \rightarrow s$
- E. $s \rightarrow g \rightarrow l \rightarrow g \rightarrow s$



Question 14: At high altitudes, the boiling point of water is

- A. 100 degrees Celsius.
- B. less than 100 degrees Celsius.
- C. greater than 100 degrees Celsius.
- D. equal to its freezing point.

Question 15: Consider a compound that undergoes sublimation at 125°C and a pressure of one atm. Which of the following could be a heating curve appropriate for heating the compound from 100°C to 150°C?



- A. graph a)
- B. graph b)
- C. graph c)
- D. graph d)

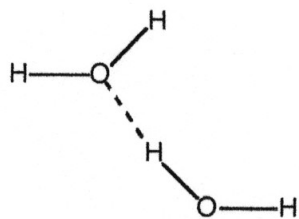
Question 16: Which drawing best represents hydrogen bonding?



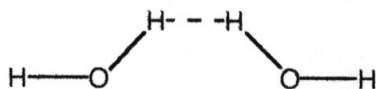
(1)



(2)



(3)



(4)

- A. drawing (1)
- B. drawing (2)
- C. drawing (3)
- D. drawing (4)
- E. None of these.

Question 17: The metal rubidium crystallizes in a body-centered cubic lattice. If the density of rubidium is 1.53 g/cm^3 , what is the atomic radius of rubidium?

- A. 134 pm
- B. 196 pm
- C. 56 pm
- D. 169 pm
- E. 246 pm

Question 18: A metal crystallizes in a face-centered cubic lattice. The radius of the atom is 125 pm and the density of the element is 8.91 g/cm^3 . What is the volume of the unit cell?

- A. $1.95 \times 10^6 \text{ pm}^3$
- B. $3.27 \times 10^7 \text{ pm}^3$
- C. $1.12 \times 10^9 \text{ pm}^3$
- D. $4.42 \times 10^7 \text{ pm}^3$
- E. $8.18 \times 10^6 \text{ pm}^3$

Question 19 : Aluminium crystallizes with a face-centered cubic unit cell. The radius of aluminum atom is 143 pm. Calculate the density of solid crystalline aluminum in g/cm^3 .

g/cm^3 .

Question 20: Barium is packed as a body-centered cubic unit cell and a density of 3.62 g/cm^3 . What is the atomic radius of Barium? (Volume of a sphere: $V = \frac{4}{3} \pi r^3$). (The unit to report is to the right of the fillable box.)

Strategy:

Density \rightarrow Volume of Ba Metal \rightarrow Volume of Ba atoms \rightarrow Volume 1 Ba atom \rightarrow Radius (cm) of Ba

cm.