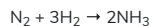




HW 01 - CH301 Review, Phase Changes, and Vapor Pressure

Question 1 2.0 pts

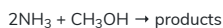
Given that you have 14.5 moles of N_2 , how many moles of H_2 are theoretically needed to produce 30.0 moles of NH_3 according to reaction below?



- a. 15.0 moles of H_2
- b. No matter how many moles of H_2 are added, 30.0 moles of NH_3 cannot be produced.
- c. 45.0 moles of H_2
- d. 33.8 moles of H_2

Question 2 1.75 pts

Consider the following reaction:



How much NH_3 is needed to react completely with 34g of CH_3OH ?

- a. 9g NH_3
- b. 36g NH_3
- c. 128g NH_3
- d. 1.3g NH_3

Question 3 1.75 pts

Ice is heated at a constant pressure until it melts and vaporizes. What signs are associated with the total change in entropy and enthalpy (ΔS and ΔH) for this sample of water?

- a. $\Delta S = +$, $\Delta H = +$
- b. $\Delta S = -$, $\Delta H = -$
- c. $\Delta S = +$, $\Delta H = -$
- d. $\Delta S = -$, $\Delta H = +$

Question 4 1.75 pts

Which of the phase changes below might have a $\Delta H = 11.6 \text{ kJ}\cdot\text{mol}^{-1}$?

- a. evaporation
- b. freezing
- c. deposition
- d. condensation

Question 5 1.75 pts

Which of the following statements is ALWAYS true about deposition?

- a. $\Delta S > 0$
- b. None of the other answers are correct
- c. $\Delta H < 0$
- d. $\Delta G < 0$

Question 6 1.75 pts

Consider liquid ethane (CH_3CH_3) and liquid methanol (CH_3OH). Which would you expect to have a larger ΔH of vaporization?

- a. Ethane, because it has stronger IMFs.
- b. Methanol because it has a larger molar mass.
- c. Methanol, because it has stronger IMFs.
- d. It is impossible to tell unless you know the amount of each liquid involved.

Question 7 1.75 pts

What is the change in entropy (ΔS_{vap}) for the vaporization of ethanol ($\Delta H_{\text{vap}} = 38.6 \text{ kJ}\cdot\text{mol}^{-1}$) at its standard boiling temperature (78.4 °C)?

- a. $0.110 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$
- b. $492 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$
- c. $0.492 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$
- d. $110 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$

Question 8 1.75 pts

The ΔH_{vap} of methane is $8.519 \text{ kJ}\cdot\text{mol}^{-1}$ and its ΔS_{vap} is $85.58 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$. What is the boiling point of methane?

- a. 99.54 K
- b. 0.09954 K
- c. 372.54 K
- d. 0.09954 °C

Question 9 1.75 pts

How much heat is required to heat 2 grams of ice at -30°C to steam at 100°C . Use the approximate values below for your calculations:

$$c_{\text{ice}} = 2 \text{ J g}^{-1}\cdot\text{C}^{-1}$$

$$\Delta H_{\text{fus}} = 340 \text{ J g}^{-1}$$

$$c_{\text{water}} = 4 \text{ J g}^{-1}\cdot\text{C}^{-1}$$

$$\Delta H_{\text{vap}} = 2260 \text{ J g}^{-1}$$

$$c_{\text{steam}} = 2 \text{ J g}^{-1}\cdot\text{C}^{-1}$$

- a. 6.12 kJ
- b. 1.60 kJ
- c. 6.00 kJ
- d. 6120 kJ

Question 10

1.75 pts

Which of the following would change the vapor pressure of a sample of water in a closed container?

1. decreasing the size of the container
 2. lower the container temperature
 3. removing water from the container
- a. 1, 2, and 3
 - b. 2 only
 - c. 1 and 2
 - d. 2 and 3

Question 11

1.75 pts

Which would have a higher vapor pressure: ethanol (C_2H_5OH) or dimethyl ether (CH_3OCH_3)?

- a. ethanol
- b. dimethyl ether
- c. They would have the same vapor pressure as their molecular weights are the same.
- d. It is impossible to tell unless the amount of each substance is known.

Question 12

1.75 pts

Rank the following liquids by vapor pressure from lowest to highest:

C_5H_{12} , CH_4 , C_3H_8 , C_2H_6 , C_4H_{10} .

- a. $C_2H_6 < C_3H_8 < C_4H_{10} < C_5H_{12} < CH_4$
- b. $CH_4 < C_2H_6 < C_3H_8 < C_4H_{10} < C_5H_{12}$
- c. $CH_4 < C_5H_{12} < C_4H_{10} < C_3H_8 < C_2H_6$
- d. $C_5H_{12} < C_4H_{10} < C_3H_8 < C_2H_6 < CH_4$

Question 13

1.75 pts

In a closed vessel containing water, the pressure is 18 torr. If we add more water to the vessel, this equilibrium pressure would...

- a. increase.
- b. decrease.
- c. change, but it is not possible to know if it will increase or decrease without more information.
- d. remain the same.

Question 14

1.75 pts

Consider two empty containers A and B whose volumes are 10mL and 20mL respectively. 1mL of liquid water is put into each container and the temperature of each container is adjusted to 20°C. The gas pressure in container B, which still has some liquid water in it, is found to be 17 torr. How would the pressure in container A and the amount of liquid water in container A compare to that of container B?

- a. the pressure would be the same, there would be an equal amount of liquid water
- b. the pressure would be greater, there would be an equal amount of liquid water
- c. the pressure would be the same, there would be more liquid water
- d. the pressure would be greater, there would be less liquid water

Question 15

1.75 pts

What is the vapor pressure of carbon disulfide at its normal boiling point?

- a. 22.4 atm
- b. 1.0 atm
- c. 2.0 atm
- d. Not enough information.

Question 16

1.75 pts

At 20°C the vapor pressure of dry ice is 56.5 atm. If 10g of dry ice (solid CO_2) is placed in an evacuated 0.25 L chamber at a constant 20°C, will all of the solid sublime?

- a. Some of the dry ice will sublime, but not all of it.
- b. None of dry ice would sublime.
- c. There is not enough information to answer this question.
- d. Yes.

Question 17

1.75 pts

An unknown liquid has a vapor pressure of 88 mmHg at 45°C and 39 mmHg at 25°C. What is its heat of vaporization?

- a. 2000 kJ/mol
- b. 32,000 kJ/mol
- c. 32 kJ/mol
- d. 2000 J/mol