

chapter 13 (Homework)

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1.

The molar heat of fusion of benzene is 9.92 kJ/mol. Its molar heat of vaporization is 30.7 kJ/mol.

Calculate the heat required to melt 8.27 g of benzene at its normal melting point.

Calculate the heat required to vaporize 8.27 g of benzene at its normal boiling point

Why is the heat of vaporization more than three times the heat of fusion?

2.

The molar heats of fusion and vaporization for water are 6.02 kJ/mol and 40.6 kJ/mol, respectively, and the specific heat capacity of liquid water is 4.18 J/g°C.

(a) What quantity of heat energy is required to melt 27.0 g of ice at 0°C?

(b) What quantity of heat is required to vaporize 33.5 g of liquid water at 100°C?

(c) What quantity of heat is required to warm 50.7 g of liquid water from 0°C to 100°C?

3.

Which types of intermolecular forces are acting in the liquid state of each of the following substances? (Select all that apply.)

(a) HI

(b) N₂

(c) NF₃

(d) Kr

4.

Which substance in each pair would be expected to show the largest vapor pressure at a given temperature?

(a) H₂O(l) or HF(l)

Explain your reasoning.

(b) CH₃OCH₃(l) or CH₃CH₂OH(l)

Explain your reasoning.

(c) CH₃OH(l) or CH₃SH(l)

Explain your reasoning.

5.

Some properties of aluminum are summarized in the following list.

normal melting point 658°C

heat of fusion 3.95 kJ/g

normal boiling point 2467°C

heat of vaporization 10.52 kJ/g

specific heat of the solid 0.902 J/g°C

(a) Calculate the quantity of energy required to heat 1.21 mol of aluminum from 21°C to its normal melting point.

(b) Calculate the quantity of energy required to melt 1.66 mol of aluminum at 658°C.

(c) Calculate the amount of energy required to vaporize 1.58 mol of aluminum at 2467°C.

6.

As the temperature of a gas increases the average speed of its molecules

7.

In a closed container, what happens to the vapor pressure inside the container as the temperature of a liquid increases? Assume there is enough liquid present to maintain equilibrium.

8.

When solid carbon dioxide is placed on a table at room temperature and 1.0 atmosphere pressure, which of the following phase changes represents what occurs?

9.

The heat energy released when liquid water becomes ice is measured in units of

10.

When you are determining the amount of heat energy necessary to melt 30 g of ice at 0°C, which of the following values do you need to complete the calculation?

11.

What happens to the temperature of boiling water when heat is added to the boiling water?

12.

How many joules of heat energy are needed to completely change 28.0 g of water to steam at the boiling temperature?

13.

The average kinetic energy of water molecules decreases if

14.

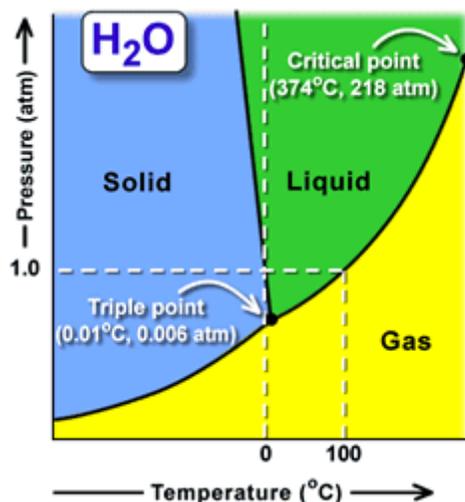
How does the average speed of gas molecules change as the molar mass of the gas increases?

15.

When the particles of a liquid gain enough kinetic energy to completely break free of one another, which process is occurring?

16.

The phase diagram for water is shown below.



(1) Type your answer for physical states using the format of g for gas, l for liquid, and s for solid. If more than one physical state is present, enter the physical states separated by a comma.

(2) Type your answer for trends using the format of increase, decrease, remains constant.

(3) Type your answer for changes in physical state, for example solid to liquid to gas, using the format s>l>g.

(a) What physical state(s) is/are present at 100°C and 2 atm?

(b) What physical state(s) is/are present at 110°C and 1 atm?

(c) What physical state(s) is/are present at 400°C and 200 atm?

(d) What physical state(s) is/are present at -50°C and 1 atm?

(e) What physical state(s) is/are present at the triple point?

(f) How does the melting point change with increasing pressure?

(g) How does the boiling point change with increasing pressure?

(h) What change(s) in physical state occur if water at -50°C and 1 atm is heated to 200°C and 1 atm?

(i) What change(s) in physical state occur if water at 100°C and 0.5 atm is pressurized to 100°C and 5 atm?

(j) What change(s) in physical state occur if water at -10°C and 0.005 atm is heated to 50°C and 0.005 atm?

(k) What change(s) in physical state occur if water at -1°C and 1 atm is pressurized to -1°C and 5 atm?

17.

Which of the following has the highest vapor pressure?

18.

Why is water considered a polar molecule? (Select all that apply.)

19.

Which of the following attractive forces between particles is the weakest?