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**Include file name:** Chemistry\_Worksheet\_0110

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**1.**

Which of the following are colligative properties?

Student Response

a. freezing point depression

b. boiling point elevation

c. osmotic pressure

d. solubility

**2.**

The predominant intermolecular force in  $(\text{CH}_3)_2\text{NH}$  is \_\_\_\_\_.

Student Response

1. London dispersion forces

2. ion-dipole forces

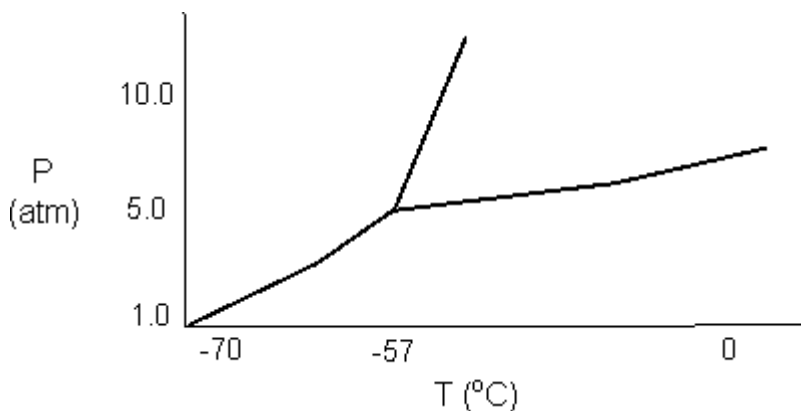
3. ionic bonding

4. dipole-dipole forces

5. hydrogen bonding

**3.**

A sample consisting of  $\text{CO}_2(\text{g})$  and  $\text{CO}_2(\text{s})$  at equilibrium at  $-78^\circ\text{C}$  and 1 atm pressure is heated to  $-30^\circ\text{C}$  and the pressure is increased to 8 atm. Based on the phase diagram given here, what will happen?



Student Response

- a. At equilibrium, only CO<sub>2</sub>(g) will be present.
- b. All the CO<sub>2</sub>(g) will be converted to CO<sub>2</sub>(l).
- c. At equilibrium, CO<sub>2</sub>(g) and CO<sub>2</sub>(l) will be present.
- d. The melting point of the CO<sub>2</sub>(s) will decrease.
- e. None of these.

4.

A 44.5% (mass/mass) solution of compound Buba {FW = 189} has a density of 0.857 g/mL. What is the molality of this solution?

5.

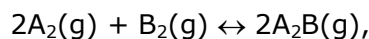
A titration of a 28.4 mL sample of a monoprotic acid required 19.3 mL of 0.2189 M sodium hydroxide to reach the endpoint. What is the concentration of the monoprotic acid?

6.

Suppose the hypothetical compound **A** decomposes by a first order process and has a half life of  $t_{1/2} = 44.8$  min. If the initial concentration of A is 9.28 M, what will the concentration of A be after 66.3 minutes have elapsed?

7.

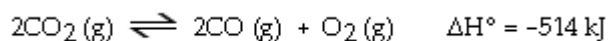
A reaction flask is charged with 2.2 atm of A<sub>2</sub> and 2.4 atm of A<sub>2</sub>B. When equilibrium occurs via:



the equilibrium partial pressure of B<sub>2</sub> is 0.3 atm. Determine K<sub>p</sub>.

8.

Consider the following reaction at equilibrium.



Le Châtelier's principle predicts that the equilibrium partial pressure of CO (g) can be maximized by carrying out the reaction \_\_\_\_\_.

Student Response

1. at high temperature and high pressure
2. at high temperature and low pressure
3. at low temperature and low pressure
4. at low temperature and high pressure
5. in the presence of solid carbon

9.

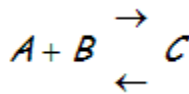
According to LeChatelier's Principle:

Student Response

a. an increase in pressure always causes a change in the position of equilibrium

b.

the equilibrium constant for the reaction



will decrease if some B

is removed.

c. the equilibrium constant of an endothermic reaction will decrease if the reaction is heated

d. when an equilibrium system is stressed, the system will react to offset the stress

10.

What is the K<sub>sp</sub> of M<sub>3</sub>X<sub>2</sub> if the solubility is 0.0075 M?

Student Response	Value	Correct Answer
Answer 2.6E-9	100%	2.6E-9 (2.6 × 10 <sup>-9</sup> )

Score: 5/5

11.

What is the pH of a solution that is made by dissolving 3.63 g of  $\text{Sr}(\text{OH})_2$  {FW= 121.63} to a total volume of 226.7 mL?

12.

Calculate the pH of a solution that is 1.98 M in the weak acid HA and 2.37 M in NaA, a salt of this weak acid. ( $K_a = 4.45 \times 10^{-12}$ )

13.

What is the  $K_a$  of a weak acid if a 0.46 M solution has  $\text{pOH} = 8.20$ ?

14.

What amount of heat is produced when 83.7 g of  $\text{B}_4\text{H}_9$  {FW = 63.13} is combusted with excess oxygen according to:

15.

At 342 K, the equilibrium constant for a given reaction is  $K = 0.1766$ . What is the free energy for this reaction in kJ/mol?

16.

A spontaneous process

Student Response

a. always happens quickly

b. will continue on its own once begun by an external action

c. never requires an external action in order to begin

d. is never endothermic

17.

A certain equilibrium reaction has an equilibrium constant of  $K = 6.75$  at a temperature of 460K. If the reaction quotient is 0.48 what is  $\Delta G$  (in kJ/mol)?

18.

When 25.1-g sample of an unknown solute is dissolved in 331-g of solvent, the boiling

point increases by  $4.80^\circ$ . Given that the molal boiling point constant for the solvent is  $K_b = 3.43^\circ\text{C}/m$ , calculate the molar mass of the unknown solute.

19.

The following data were obtained for the reaction of NO with  $\text{O}_2$ :

Experiment	$[\text{NO}]_0$ $10^{18}$ molecules/ $\text{cm}^3$	$[\text{O}_2]_0$ $10^{18}$ molecules/ $\text{cm}^3$	Initial Rate $10^{16}$ molecules/ $\text{cm}^3\text{s}$
1	0.2	0.2	0.50
2	0.4	0.2	2.00
3	0.8	0.2	8.00
4	0.2	0.4	1.00
5	0.2	0.8	2.00

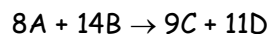
The rate law for this reaction has the general form

$$\text{Rate} = k[\text{NO}]^m[\text{O}_2]^n$$

Determine (1)  $m$ , the order with respect to  $\text{NO}_2$ ; (2)  $n$ , the order with respect to  $\text{O}_2$ ; (3) the overall order

20.

Calculate the enthalpy change  $\Delta H_{\text{rxn}}$  (in kJ) for the following hypothetical reaction:



The formation enthalpies are tabulated as follows:

	A	B	C	D
$\Delta H_f^\circ$ (kJ/mol)	752.1	-445.2	248.4	-267.7