

SLE155 Chemistry for the Professional Sciences

Burwood and Geelong



Practice questions Week 4

Advanced Solution Chemistry

Q 1

In a saturated solution, a dynamic equilibrium exists between the undissolved solute and the solute in the solution.

*a. True

b. False

Q 2

Liquids which are mutually miscible possess intermolecular forces of similar type and magnitude.

*a. True

b. False

Q 3

The process, $\text{MgSO}_4(\text{s}) \rightarrow \text{MgSO}_4(\text{aq})$, is an endothermic process. The solubility of magnesium sulfate in water should increase as the solvent temperature is increased.

*a. True

b. False

Q 4

The concentration of a gas in a liquid at a given temperature is directly proportional to the partial pressure of the gas above the solution.

*a. True

b. False

Q 5

The addition of a solute to a solution lowers the boiling point.

a. True

*b. False

Q 6

The common ion effect can be used to explain the reduced solubility of an ionic salt in a solution that contains an ion that is in the ionic salt.

*a. True

b. False

Q 7

Osmosis is the net shift of solute through a semi-permeable membrane from the most concentrated side to the least concentrated side.

a. True

*b. False

Q 8

If a salt has a solubility product constant, $K_{sp} < 10^{-10}$, we say that it is insoluble.

a. True

*b. False

Q 9

Wax is a solid mixture of hydrocarbon compounds consisting of molecules with long chains of carbon atoms. Which solvent below would you expect to be most capable of dissolving wax by loosening the molecules in the solid and separating them?

a. H_2O

*b. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

c. CF_3OH

d. CH_3OH

Q 10

A solution in a beaker has some undissolved solute lying on the bottom of the beaker. If the rate of crystallization is equal to the rate of dissolution of the excess solute, the solution is described as:

- a. dilute.
- b. unsaturated.
- *c. saturated.
- d. supersaturated.

Q 11

Consider a 0.900 M $\text{Al}(\text{NO}_3)_3$ solution. This solution has a nitrate ion concentration of:

- a. 0.300 M
- b. 0.900 M
- *c. 2.70 M
- d. 3.60 M

Q 12

The expression for the solubility product of $\text{Fe}_2(\text{CrO}_4)_3$ is:

a. $[\text{Fe}^{2+}]^3 \times [\text{CrO}_4^{3-}]^2$

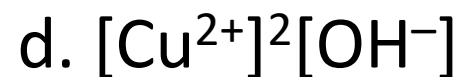
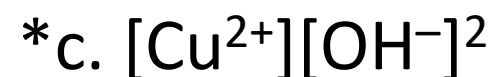
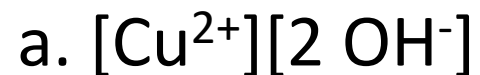
b. $[2 \times \text{Fe}^{2+}]^3 \times [3 \times \text{CrO}_4^{3-}]^2$

c. $3[\text{Fe}^{2+}] \times 2[\text{CrO}_4^{3-}]$

*d. $[\text{Fe}^{2+}]^2 \times [\text{CrO}_4^{3-}]^3$

Q 13

The expression for the solubility product of copper(II) hydroxide is:



Q 14

Which one of the following aqueous solutions will have the lowest boiling point?

- a. $0.100 \text{ mol kg}^{-1} \text{ NiBr}_2(\text{aq})$
- *b. $0.250 \text{ mol kg}^{-1} \text{ CH}_3\text{OH}(\text{aq})$
- c. $0.150 \text{ mol kg}^{-1} \text{ NH}_4\text{NO}_3(\text{aq})$
- d. $0.150 \text{ mol kg}^{-1} \text{ Na}_2\text{SO}_4(\text{aq})$

Q 15

Which one of the following aqueous solutions will have the highest freezing point temperature?

- a. $0.100 \text{ mol kg}^{-1} \text{ MgBr}_2(\text{aq})$
- b. $0.250 \text{ mol kg}^{-1} \text{ sucrose}(\text{aq})$
- c. $0.150 \text{ mol kg}^{-1} \text{ KClO}_3(\text{aq})$
- *d. $0.100 \text{ mol kg}^{-1} \text{ MgSO}_4(\text{aq})$

Q 16

Which one of the following salts has the highest solubility in water, expressed in moles per litre?

- *a. BaF_2 , $K_{\text{sp}} = 1.7 \times 10^{-6}$
- b. Ag_2CrO_4 , $K_{\text{sp}} = 1.2 \times 10^{-12}$
- c. CaF_2 , $K_{\text{sp}} = 3.9 \times 10^{-11}$
- d. PbF_2 , $K_{\text{sp}} = 3.6 \times 10^{-8}$

Q 17

The K_{sp} of calcium fluoride is 3.9×10^{-11} . A 0.420 g sample of NaF and a 1.110 g sample of calcium chloride were added to a 1.000 L volumetric flask, and distilled water was added to the mark. After placing the stopper and shaking the flask to dissolve as much chemicals as would dissolve, what would be the calcium ion concentration remaining in solution afterwards?

- a. 0.0036 mol L⁻¹
- b. 0.0058 mol L⁻¹
- c. 0.0054 mol L⁻¹
- *d. 0.0050 mol L⁻¹

Q 18

300 mL of $1.1 \times 10^{-3} \text{ mol L}^{-1} \text{ MgCl}_2$ solution is added to 500 mL of $1.2 \times 10^{-3} \text{ mol L}^{-1} \text{ NaF}$? Given, the K_{sp} of MgF_2 is 6.6×10^{-9} , will a precipitate of MgF_2 form?

- *a. No, because the ionic product, $Q_{sp} < K_{sp}$
- b. Yes, because the ionic product, $Q_{sp} > K_{sp}$
- c. No, because the ionic product, $Q_{sp} = K_{sp}$
- d. Yes, because the ionic product, $Q_{sp} < K_{sp}$