Thebes El Maadi International School Science Department Chemistry 2020/2021 Quarter 2 Exams- Revision Sheet- Paper 4- Ions in aqueous solutions

## **Chapter 13/ Ions in Aqueous Solutions**

## Q1) Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Which of the following is a spectator ion in the following equation?

 $Na^{+}_{(aq)} + CI^{-}(aq) + Ag^{+}(aq) + NO\bar{j}^{-}(aq) + NO\bar{j}^{-}(aq) + NO\bar{j}^{-}(aq) + AgCl (ppt)$ a.  $Na^{+}$ b.  $Ag^{+}$ c.  $CI^{-}$ d. None of the above

2. Which ions <u>do not</u> appear in the net ionic equation for the precipitation of  $CaCO_3$  when the solutions of  $CaCl_2$  and  $K_2CO_3$  are mixed?

a.	$K^+$ and $CO_3^{2-}$	c. $Ca^{2+}$ and Cl <sup>-</sup>
b.	$Cl^{-} and CO_{3}^{2-}$	d. $K^+$ and Cl <sup>-</sup>

3. How many moles of ions are produced by the dissociation of 1.0 mol of Na<sub>2</sub>SO<sub>4</sub>?

Na <sub>2</sub> SO <sub>4</sub> .			
a.	0.5	c.	3
b.	1.0	d.	2.0

4. Which of the following reactions is described by the net ionic equation

$$Ag+(aq) + Cl(aq) \rightarrow AgCl(s)$$

a. only the reaction between  $AgNO_3$  and KCl

- b. any reaction in which a precipitate of AgCl is formed
- c. only the reaction between AgNO<sub>3</sub> and NaCl
- d. None of the above

5. A solute whose water solution conducts electricity is called a(n)

- a. nonconductor c. nonelectrolyte
- b. electrolyte d. aqueous solution

6. Which of the following is an ionic compound that dissociates in water?

a.	NaCl	с.	$CCl_4$
b.	C1 <sub>2</sub>	d.	$C_6H_6$

\_\_\_\_\_7. Which of the following is a spectator ion in the following equation?

 $Cu<sup>2+</sup>(aq) + Zn<sup>2+</sup>(aq) + 2S<sup>2-</sup>(aq) \longrightarrow CuS(s) + ZnS(s)$ a. S<sup>2-</sup> b. Cu<sup>2+</sup> d. None of the above

- \_\_8. How many moles of Cl<sup>-</sup> are produced by the dissociation of 0.5 mol of NaCl? a. 0.5 c. 1.5
  - b. 1.0 d. 2.0

Use the following table to answer questions 9 and 10.

Solubility Rules for Some Common Ionic Compounds

Compounds containing these ions are soluble in water:
Alkali metals (Group 1), except LiF
Ammonium, NH <sub>4</sub> <sup>+</sup>
Bromides, Br <sup>-</sup> , except those of Ag <sup>+</sup> , Pb <sup>2</sup> , and Hg <sub>2</sub> <sup>2+</sup>
Chlorides, Cl <sup>-</sup> , except those of $Ag^+$ , $Pb^2$ , and $Hg_2^{2+}$
Nitrates, NO <sub>3</sub>
Sulfates, $SO_3^{2+}$ , except those of $Ca^{2+}$ , $Sr^{2+}$ , $Ba^{2+}$ , $Pb^{2+}$ , and $Hg_2^{2+}$
Compounds containing these ions are insoluble in water:
Carbonates, $CO_3^{2-}$ , except those of Group 1 and $NH_4^+$
Hydroxides, OH <sup>-</sup> , except those of Group 1
Oxides, O <sup>2-</sup> , except those of Group 1, Ca <sup>2+</sup> , Sr <sup>2+</sup> , and Ba <sup>2+</sup> (which form hydroxides)
Phosphates, $PO_4^{3-}$ , except those of Group 1 and $NH_4^*$
Sulfides, S <sup>2-</sup> , except those of Group 1, Mg <sup>2+</sup> , Ca <sup>2+</sup> , Ba <sup>2+</sup> , and $\rm NH_4^+$

\_\_\_\_\_9. Which of the following compounds is soluble in water?

a.	PbBr <sub>2</sub>	c.	$BaSO_4$
b.	$MgCl_2$	d.	CaCO <sub>3</sub>

\_\_\_\_10. Which of the following compounds is insoluble in water?

a.	$(NH_4)_2S$	c.	LiOH
b.	Na <sub>2</sub> O	d.	$Al_2O_3$

\_\_\_\_11. What is the ionic equation for the precipitation reaction between BaCl<sub>2</sub> and Na<sub>2</sub>SO<sub>4</sub>? a. Ba<sup>2+</sup>(aq) + SO<sub>4</sub><sup>2-</sup>(aq)  $\rightarrow$  BaSO<sub>4</sub>(s)

a.  $\operatorname{Ba}^{2^{+}}(aq) + \operatorname{SO}_{4}^{2^{-}}(aq) \rightarrow \operatorname{Ba}^{2^{+}}(s)$ b.  $\operatorname{Na}^{+}(aq) + \operatorname{Cl}^{-}(aq) \rightarrow \operatorname{Na}^{-}(s)$ c.  $\operatorname{Ba}^{2^{+}}(aq) + 2\operatorname{Cl}^{-}(aq) + 2\operatorname{Na}^{+}(aq) + \operatorname{SO}_{4}^{2^{-}}(aq) \rightarrow$   $\operatorname{Ba}^{2^{+}}(aq) + 2\operatorname{Cl}^{-}(aq) + 2\operatorname{Na}^{+}(aq)$ d.  $\operatorname{Ba}^{2^{+}}(aq) + \operatorname{Na}_{2}^{2^{-}}(aq) \rightarrow \operatorname{Ba}^{2^{-}}(aq) + 2\operatorname{Na}^{+}(aq)$ 

\_\_\_\_12. The hydronium ion forms when hydrogen ions?

a.	dissociate	c. combine with HCl
b.	ionize	d. combine with H <sub>2</sub> O.

Thebes El Maadi International School Science Department Chemistry 2020/2021 Quarter 2 Exams- Revision Sheet- Paper 4- Ions in aqueous solutions

- \_\_\_\_13. How many moles of ions are produced when 2 mol of Na<sub>2</sub>CO<sub>3</sub> dissociate?
  - a. 2 c. 6
  - b. 3

d. 7

- 14. What happens when acetic acid, (covalent compound), a weak electrolyte, dissolves in water?
  - a. Hydronium ions form
  - b. The resulting solution will conduct electricity.
  - c. Most of the acid remains as nonionized molecules in equilibrium with ions.
  - d. All of the above
- \_\_\_15. Which solution contains the strongest electrolyte?
  - a. 1.50 M NaCl
    b. 2.0 M C6H12O6
    c. 5.7 M NH3
    d. 0.80 M CH3COOH
  - 16. If the following equation were written as a net ionic equation, which ion(s) is (are) the spectator ion(s)?

 $Zn(s) + CuSO_4(aq) \longrightarrow Cu(s) + ZnSO_4(aq)$ 

## a. $Cu^{2+}(aq)$ c. $SO^{2-}(aq)$ b. $Zn^{2+}(aq)$ d. None of the above

\_\_\_\_17. Why is freezing-point depression a colligative property?

- a. It is not related to the number of particles in a solution.
- b. It is directly proportional to the number of particles in a solution.
- c. It depends on the identity of an electrolyte in a solvent.
- d. None of the above.

18. Compared with a 1.00 m NaI solution, a 1.00 m Na<sub>2</sub>SO<sub>4</sub> solution has\_\_\_\_\_

- a. the same boiling-point elevation.
- b. about twice the boiling-point elevation.
- c. a boiling-point elevation about two-thirds as high.
- d. a boiling-point elevation about 1.5 times as high.
- 19. When a nonvolatile solutes dissolve in a solvent, the vapor pressure of the
  - solvent\_\_\_\_\_
  - a. increases. c. stays the same.
  - b. decreases. d. changes depending on the solvent used.

20. Which of the following compounds would be most effective in lowering the freezing point of ice on roads?

a.	CaCl <sub>2</sub>	c. K <sub>3</sub> PO <sub>4</sub>
b.	NaCl	d. K <sub>2</sub> SO <sub>4</sub>

Thebes El Maadi International School Science Department Chemistry 2020/2021 Quarter 2 Exams- Revision Sheet- Paper 4- Ions in aqueous solutions 21. A water-based solution is also known as an (a) a. orange solution. c. aqueous solution. b. plot solution. d. non aqueous solution. 22. The separation of ions that occurs when an ionic compound dissolves is a. ionization. c. dissociation. b. electronegativity. d. speciation. 23. Solutes which loose ions that carry charges are called a. Powerade. c. aqueous solutes. b. electrolytes. d. non aqueous solutes. 24. \_\_\_\_\_electrolytes dissolve completely and conduct electricity very well. a. strong. c. weak. b. acid. d. base. 25. Solutes that don't conduct electricity at all in a solution are called a. electrolytes. c. both a and b. b. nonelectrolytes. d. none of the above. 26. Select the correctly balanced net ionic equation for this reaction.  $Ca^{2+}(aq) + OH^{-}(aq) + H^{+}(aq) + PO^{3-}(aq) - > Ca^{2+}(aq) + PO^{3-}(aq) + HO(1)$  as  $\begin{array}{l} OH'(aq) + H^{+}(aq) + --> Ca_{3-}^{2+}(aq) + H_{2}O(d) \\ b. OH'(aq) + H'(aq) + PO'(aq) --> PO'(aq) + H O(l) \\ c. Ca^{2+}(aq) + PO'_{4}(aq) --> Ca^{2+}(aq) + PO'_{4}(aq). \end{array}$ d.  $OH^{-}(aq) + H^{+}(aq) - H_2O(l)$ . 27. Select the correctly balanced net ionic equation for this reaction.  $Ba(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaNO_3(aq)$  $\begin{array}{l} a. \ 2Na^{+}(aq) + 2NO^{3\text{-}}(aq) -> 2NaNO_{3}(aq) \\ b. \ Ba^{2+}_{2+}(aq) + NO^{3\text{-}}_{2}(aq) -> BaSO_{4}(s) + NO^{3\text{-}}(aq) \\ c. \ Ba^{-}_{2+}(aq) + SO^{-}_{2}(aq) -> BaSO^{-}(s) \\ d. \ Na^{+}(aq) + SO^{-24}_{-4}(aq) -> BaSO^{-}(s)$ 28. What are the spectator ions in this reaction?  $CuCl_2(aq) + NaOH(aq) \rightarrow Cu(OH)_2(s) + NaCl(aq)$ a.  $Cu^{2+}$  and  $OH^{-}$ . c.  $Na^{2+}$  and  $Cl^{2-}$ . b. Na<sup>+</sup> and Cl<sup>-</sup>. d. Na<sup>+</sup> and OH<sup>-</sup>.

Thebes El Maadi International School Science Department Chemistry 2020/2021 Quarter 2 Exams- Revision Sheet	- Paper 4- Ions in aqueous solutions
29. How many moles of ions are prod	uced when 1 mol of magnesium chlorate
$Mg(CIO_3)_2$ are dissolved in water?	
a. 1 moles of ions.	c. 2 moles of ions
b. 3 moles of ions	d. 4 moles of ions.
30. When CaBr <sub>2</sub> is dissolved in water,	how many particles will be in solution?
a. 1.	c. 3.
b. 2.	d. 4.
31. Colligative properties depend on the solute.	heof the solute but not the
a. concentration; identity.	c. identity; concentration.
b. reactivity; nature.	d. nature; reactivity.
32. The freezing point of a solution is	the freezing point of the pure solvent.
a. the same as.	c. lower than.
b. higher than.	d. no relation to.
33. $\Delta Tb = Kb \times molality$	
What concentration of ethylene gly	col is needed to raise the boiling point of water
by 5 °C? (Kb= 0.51 °C/m).	
a. 1.5 m.	c. 2.5 m.
b. 9.8 m.	d. 205 m.
<u>34</u> . $\Delta$ Tb= Kb × molality What is the boiling-point elevation 0.514°C/m)).	of a 2.0 m glucose solution in water? (Kb =
a. 0.26°C.	c. 1.02°C.
b. 0.51°C.	d. 98.9°C.
35. When an ionic solid dissolve in wat	ter, which of the following does not occur?
a. The compound dissociates.	
b. Hydration occurs.	
c. The compound ionizes.	
d. Polar ends of water molecules appro	oach the ions, releasing energy
36. Colligative properties depend on th	e
a. number of solute particles present.	
b. size of solute particles present.	
c. mass of solute particles present.	
d. charge on solute particles present.	
37. Nonvolatile solute	
a. depresses both the freezing point an	nd the boiling point
b. elevates both the freezing point and	I the boiling point.
c. depresses the freezing point and elevates the boiling point.	
d. elevates the freezing point and depresses the boiling point.	

\_38. Which of these is a spectator ion in the following equation?

 $\begin{array}{ccc} Cu^{2+}\left(aq\right)+Zn^{2+}\left(aq\right)+2S^{2-}\left(aq\right)\rightarrow CuS(s)+ZnS(s)\\ a. & Cu^{2+} & c. \ S^{2-}\\ b. & Zn^{2+} & d. \ None \ of \ the \ above \end{array}$ 

- \_39. What happens when a weak electrolyte dissolves in water?
- a. The boiling point decreases.
- b. The solution does not conduct electricity.
- c. Few ions form.
- d. 100% of the molecules ionize.

\_40.  $\Delta Tb = Kb \times molality$ 

What concentration of ethylene glycol is needed to raise the boiling point of water to 105 °C? (Kb=  $0.51 \circ C/m$ ).

- a. 1.5 m.c. 2.5 m.b. 9.8 m.d. 205 m.
- 41. Electrolytes have a greater effect on colligative properties than nonelectrolytes do because electrolytes
- a. are volatile.
- b. have higher boiling points.
- c. produce fewer moles of solute particles per mole of solvent.
- d. produce more moles of solute particles per mole of solvent.

\_42. A 2 m solution contains

- a. 2 mol of solute dissolved in 1 L of solvent.
- b. 1 mol of solute dissolved in 2 L of solvent.
- c. 2 mol of solute dissolved in 1 mol of solvent.
- d. 2 mol of solute dissolved in 1 kg of solvent.
- 43. The hydronium ion forms when hydrogen ions
  - a. dissociate. c. combine with HCl.
  - b. ionize. d. combine with  $H_2O$ .
- \_44. Which of the following is not a colligative property?
  - a. boiling-point elevation. c. freezing-point depression.

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b. lowering vapor pressure. d. conducting electricity