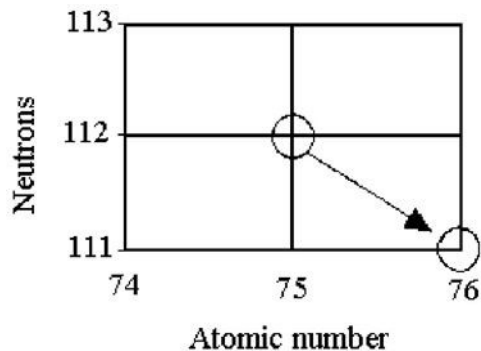


- Choose the statement below that is TRUE.
  - A) A solution will form between two substances if the solute-solvent interactions are of comparable strength to the solute-solute and solvent-solvent interactions.**
  - B) A solution will form between two substances if the solute-solvent interactions are small enough to be overcome by the solute-solute and solvent-solvent interactions.
  - C) A solution will form between two substances if the solute-solute interactions are strong enough to overcome the solvent-solvent interactions.
  - D) A solution will form between two substances only if the solvent-solvent interactions are weak enough to overcome the solute-solvent interactions.
  - E) None of the above are true.
- Which of the following compounds will be most soluble in ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ )?
  - trimethylamine ( $\text{N}(\text{CH}_3)_3$ )
  - acetone ( $\text{CH}_3\text{COCH}_3$ )
  - C) ethylene glycol ( $\text{HOCH}_2\text{CH}_2\text{OH}$ )**
  - hexane ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ )
  - None of these compounds should be soluble in ethanol.
- Choose the situation below that would result in an exothermic  $\Delta H_{\text{solution}}$ .
  - When  $|\Delta H_{\text{solute}}| > |\Delta H_{\text{hydration}}|$
  - When  $|\Delta H_{\text{solute}}|$  is close to  $|\Delta H_{\text{hydration}}|$
  - C) When  $|\Delta H_{\text{solute}}| < |\Delta H_{\text{hydration}}|$**
  - When  $|\Delta H_{\text{solvent}}| \gg |\Delta H_{\text{solute}}|$
  - There isn't enough information to determine
- Identify the colligative property.
  - vapor pressure lowering
  - freezing point depression
  - boiling point elevation
  - osmotic pressure
  - E) all of the above**
- Place the following aqueous solutions of nonvolatile, nonionic compounds in order of **decreasing** osmotic pressure.
 

I. 0.011 M sucrose    II. 0.00095 M galactose    III. 0.0060 M glycerin

  - A) I > III > II**
  - B) I > II > III
  - C) II > III > I
  - D) III > I > II
  - E) II > I > III
- The number of nucleons in an atom or ion is the same as the
  - atomic number.
  - charge on the atom or ion.
  - C) mass number.**
  - none of these
- The nuclear decay process that involves the particle having the greatest mass is \_\_\_\_\_ emission.
  - A) alpha**
  - B) beta
  - C) gamma
  - D) positron
- Which one of the following statements about isotopes is **false**?
  - The ratio of neutrons to protons is about 1:1 for elements lighter than Ca.
  - The ratio of neutrons to protons is  $> 1:1$  for elements heavier than Ca.
  - C) Nonradioactive isotopes generally have an odd number of neutrons.**
  - All isotopes beyond  $^{209}\text{Bi}$  are radioactive.

Tell the type of decay process occurring in the following nuclear reaction.



- A)  $\alpha$  emission  
**B)  $\beta$  emission**  
 C)  $\gamma$  emission  
 D) electron capture or positron emission

8. A binding energy curve is a plot of binding energy per nucleon versus atomic number. In what region of the binding energy curve are the most stable elements found?

- A) in the lower left region (low atomic mass)  
**B) in the central top region (moderate atomic mass)**  
 C) in the lower right region (heavy atomic mass)  
 D) binding energy is not dependent on atomic mass

### Short answers:

1. Indicate how many particles are formed when the following solutes dissolve.

SOLUTE	# OF PARTICLES
Acetone ( $C_3H_6O$ )	
Ammonium chloride ( $NH_4Cl$ )	

2. How does a solution of two volatile components with strong solute-solvent attractions deviate from Raoult's law? Why?

3. Explain why the van't Hoff factor for  $MgCl_2$  is less than its predicted value.

4. The loss in mass that occurs when protons and neutrons combine to form a nucleus is called the \_\_\_\_\_ of the nucleus, and the corresponding energy released during the formation of that nucleus is the \_\_\_\_\_ that holds the nucleus together.

Answer: mass defect, binding energy

5. In an electron capture reaction a proton is converted into a \_\_\_\_\_.

Answer: neutron

## Chapter 13

3. What mass (in g) of  $\text{NH}_3$  must be dissolved in 475 g of methanol to make a 0.250 *m* solution?

**2.02 g**

4. Calculate the freezing point of a solution of 500.0 g of ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ) dissolved in 500.0 g of water.  $K_f = 1.86^\circ\text{C}/m$  and  $K_b = 0.512^\circ\text{C}/m$ .

**$-30.0^\circ\text{C}$**

5. A 150.0 mL sample of an aqueous solution at  $25^\circ\text{C}$  contains 15.2 mg of an unknown nonelectrolyte compound. If the solution has an osmotic pressure of 8.44 torr, what is the molar mass of the unknown compound?

**223 g/mol**

6. The boiling point of an aqueous 1.83 *m*  $(\text{NH}_4)_2\text{SO}_4$  (molar mass = 132.15 g/mol) solution is  $102.5^\circ\text{C}$ . Determine the value of the van't Hoff factor for this solute if the  $K_b$  for water is  $0.512^\circ\text{C}/m$ .

**2.7**

