

Review for Exam # 5 (Module 7- Intermolecular forces and Module 8- Solutions with acids & bases)

Solve all the Questions and then check Answers from Ans key provided at the end.

Feel as if you are taking the Real Exam.

Note- Print out Periodic table provided under Study materials in module 3 and use it.

Ques. 1. The boiling point of CH_4 is much lower than that of HF. This is because:

- a) of hydrogen bonding in HF.
- b) of London dispersion in HF.
- c) of dipole-dipole interactions in CH_4 .
- d) CH_4 is polar.

Ques. 2. Which of the following is expected to have the highest boiling point?

- a) C_3H_8
- b) C_5H_{12}
- c) C_4H_{10}
- d) CH_4

Ques. 3. Which molecule would have the strongest tendency to form hydrogen bonds with other identical molecules?

- a) C_2H_4
- b) CO_2
- c) F_2
- d) $\text{C}_2\text{H}_5\text{OH}$

Ques. 4. What is the name of the intermolecular force caused by an instantaneous dipole in the particles?

- a) Ionic attraction
- b) London dispersion force
- c) dipole-dipole force
- d) hydrogen bond

Ques. 5. Each option has two molecules. Highlight the one with low Vapor pressure in each option.

- a) CH_3COOH or C_2H_6
- b) CHF_3 or CF_4
- c) $\text{C}_{20}\text{H}_{42}$ or $\text{C}_{30}\text{H}_{62}$
- d) Br_2 or I_2

Ques. 6. Liquids are characterized as having _____ volume which means they are _____.

- a) definite, compressible
- b) indefinite, incompressible
- c) definite, incompressible
- d) indefinite, compressible

Ques. 7. Which of the following is an endothermic process?

- a) freezing
- b) formation of snow in clouds
- c) evaporation
- d) deposition

Ques. 8. Which of the following is *not* an endothermic process?

- a) ice melting
- b) water evaporating
- c) boiling soup
- d) condensation of water vapor

Ques. 9. If the vapor pressure of a given compound is high, the boiling point of the compound will ?

- a) increase
- b) decrease
- c) no change
- d) insufficient information given

Ques.10. Molarity is defined as

- a. moles of solute / Liter of Solution
- b. moles of solute / Kilogram of solvent
- c. grams of solute / grams of solvent
- d. grams of solute / liters of solution x 100

Ques.11. Mass percentage, parts per million and molarity are

- a. Quantitative analysis
- b. Qualitative analysis
- c. Concentration analysis
- d. All the above

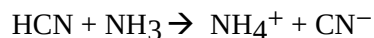
Ques.12. Which of the following is polyprotic acid?

- a) $\text{HC}_2\text{H}_3\text{O}_2$
- b) HCl
- c) H_3PO_4
- d) HNO_3

Ques.13 (I). Which of the following is **not a conjugate acid and conjugate base** pair?

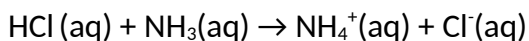
- a) $\text{PH}_4^+ / \text{PH}_3$
- b) $\text{H}_3\text{O}^+ / \text{OH}^-$
- c) $\text{HSO}_4^+ / \text{SO}_4^{2-}$
- d) $\text{S}^{2-} / \text{H}_2\text{S}$

Ques. 13 (II). The Bronsted-Lowry concept, locate the **conjugate base and conjugate acid** pair for the given reaction



- a) CN^- and NH_4^+
- b) NH_4^+ and HCN
- c) CN^- and HCN
- d) NH_4^+ and CN^-

Ques. 13 (III) . The Bronsted-Lowry concept, locate the **B-L acid and conjugate base** for the given reaction:



- a) NH_3 and Cl^-
- b) NH_4^+ and HCl
- c) HCl and NH_4^+
- d) HCl and Cl^-

Ques. 14. The neutralization of $\text{Cr}(\text{OH})_3$ with H_2SO_4 produces which of the following products?

- a) OH^-
- b) H_3O^+
- c) $\text{Cr}_2(\text{SO}_4)_3$
- d) SO_2

Ques. 15. If you had 75.0 mL of a 5.00% (**m/v or mass/volume**) NaOH solution, what mass of NaOH does it contain?

- a) 5.00 g
- b) 3.75 g
- c) 6.67 g
- d) 15.0 g

Ques. 16. What is the pH of a solution with an $[\text{H}_3\text{O}^+]$ of $6.0 \times 10^{-4} \text{ M}$?

- a) 3.22
- b) 4.22
- c) 5.22
- d) None

Ques. 17. What is the molarity of a solution made by dissolving 58.5 g of NaCl in 10.0 L of water?

- a) 0.001 M
- b) 0.0001 M
- c) 0.100 M
- d) 1.00 M

Ques. 18. Fill in the blanks :

- a) Solution is a Mixture.
- b) The main components of solution are and
.....
- c) Coke is example ofdissolve in
- d) Sterling Silver is example of dissolve in
.....
- e) Sugar solution is example of Solution.
- f)is always in small quantity and is in large quantity
when a solution is made.

Ques. 19. What is the pH of a solution that has a hydronium ion concentration of $3.98 \times 10^{-9} \text{ M}$?

$$\text{pH} = -\log [\text{H}_3\text{O}^+] = -\log [3.98 \times 10^{-9} \text{ M}] = -(-8.400) = +8.400$$

Ques. 20 (I). How much water would be required to dilute 20 mL of 2.5 M Salt solution to make a 1.0 M Salt solution? $M_1 \times V_1 = M_2 \times V_2$

$$2.5 \text{ M} \times 20 \text{ mL} = 1.0 \text{ M} \times V_2$$

Divide both side by 1.0 M

$$2.5 \text{ M} \times 20 \text{ mL} / 1.0 \text{ M} = V_2$$

$$V_2 = 50 \text{ mL}$$

$$V_{\text{solvent}} = V_{\text{solution}} - V_{\text{solute}}$$

$$V_{\text{water}} = V_2 - V_1 = 50 \text{ mL} - 20 \text{ mL} = 30 \text{ mL}$$

Ques. 20 (II). How would you dilute a 2 M solution so that you have 100 mL of a .5 M solution.

$$V_1 = \frac{V_2 \cdot M_2}{M_1} \quad \begin{matrix} M_1 & V_1 = ? & V_2 & M_2 \\ & 2.5 \text{ mL} & & \end{matrix}$$

Ques. 21 (I). To prepare 100 mL of a 2 M NaOH solution, how many grams would you need to weigh out?

$$\text{moles of solute} = \text{Molarity} \times \text{Liter}$$

Expand 2M as 2 moles / L and Convert 100 mL to L and switch in the above equation to get moles of solute as L unit will be canceled out

Step 1. $\text{moles of solute (NaOH)} = 2 \text{ moles/L} \times 0.1 \text{ L} = 0.2 \text{ moles NaOH}$

To convert moles to g of NaOH, molar mass of NaOH is needed (Molar mass of NaOH using Periodic Table provided to you in D2L). Remember “mole’ or “mol’ are same thing.

$$\text{Molar mass of NaOH} = 22.99 \text{ g/mol Na} + 16.00 \text{ g/mol O} + 1.01 \text{ g/mol H} = 40.00 \text{ g/mol NaOH}$$

Step 2. Convert moles of NaOH to g

$0.2 \text{ mole NaOH} \times 40.00 \text{ g NaOH} / 1 \text{ mole NaOH} = 8 \text{ g NaOH}$ (as mole units canceled out)

Ques. 21 (II). What is Arrhenius acid-base theory? How Bronsted- Lowry acid base theory is different from it?

Hint: See explanation in LECTURE on Solutions- acids and bases.

Ques. 21 (III). Indicate true or False

- a) Intramolecular forces such as Ionic and covalent bonds are within the molecules and intermolecular forces such as dipole-dipole and London dispersion are attractive forces between the molecules.
- b) London dispersion forces are the strongest attraction forces between the molecules.
- c) Weak intermolecular forces in given molecules will result in high vapor pressure but low boiling point.
- d) Hydrogen bonding is special form of dipole-dipole attraction forces between polar molecules and form between Hydrogen and Fluorine or Oxygen or Nitrogen atoms of the molecules.
- e) Stronger the intermolecular forces, higher will be the boiling point.

Hint: See explanation in LECTURE on Intermolecular forces and go through handout on intermolecular forces.

Ans. Key for Review # 5

Ques 1. a)

Ques 2. b)

Ques 3. d)

Ques 4. b)

Ques 5. a) CH_3COOH b) CHF_3 c) $\text{C}_{30}\text{H}_{62}$ d) I_2

Ques 6. c)

Ques 7. c)

Ques 8. d)

Ques 9. b)

Ques 10. a

Ques 11. d

Ques 12. c

Ques 13 (I). d

Ques 13 (II). a

Ques 13 (III). d

Ques 14. c

Ques 15. b

Ques 16. a

Ques 17. c

Ques 18. a) homogeneous mixture b) solute; solvent c) gas in liquid d) solid in solid
 e) solid in liquid f) solute; solvent

Ques 19. Ans 8.400

Ques 20 (I). Ans 30 mL

Ques 20 (II). Ans 25 mL

Ques 21 (I). Ans 8 grams

Ques 21 (II). See explanation in lecture video on Acid and bases ppt slides

Ques 21 (III). a) True b) False c) True d) True e) True