GreatHearts Irving

Remote Learning Packet

Please submit scans of written work in Google Classroom at the end of the week.

May 4-8, 2020

Course: 10 Chemistry

Teacher(s): Ms. Oostindie megan.oostindie@greatheartsirving.org

Weekly Plan:

Monday, May 4
☐ Study guide day 1 (sections 10.1-10.4)
☐ Answer book questions 10.1-10.5

Tuesday, May 5
☐ Study guide day 2 (sections 10.5-10.7)
☐ Answer book questions 10.6-10.8, 10.10-10.11

Wednesday, May 6
☐ Study guide day 3 (sections 10.8-10.10)
☐ Answer book questions 10.12-10.15, 10.17

Thursday, May 7
☐ Chapter 10 Assessment (covers sections 10.1-10.10)

Friday, May 8
☐ Attend office hours
☐ Catch-up or review the week's work

Statement of Academic Honesty

I affirm that the work completed from the packet is mine and that I completed it independently.

I affirm that, to the best of my knowledge, my child completed this work independently

_____
Student Signature

_____
Parent Signature

This week we will have our first remote assessment. The assessment will cover chapter 10, sections 1-10. For the first three days of this week, you will be building a study guide and answering book questions to review the material. The study guide will be built in the same document or on the same paper across three days and it will be submitted for a grade. The review questions will be completed on paper, self-graded, and not submitted on Google Classroom. The assessment will be open note so you can expect to see many questions that are applications of the concepts you have learned rather than questions that test your memorization.

Two short videos reviewing the main concepts of chapter 10 titled "Acids and Bases Review" and "Indicator Demonstration" can be found in Google Classroom and should be viewed on one of the days leading up to the assessment (your choice of Monday, Tuesday, or Wednesday).

Monday, May 4

Complete the study guide day 1 questions in the document titled "Chapter 10 Study Guide." These questions cover sections 1-4. You may type your responses in a document or hand-write them on paper.

Answer book questions 10.1-10.5, found on pp. 298-299. After you have made an honest attempt at each question, reference the attached answer key and self-grade in a different color pen. Use the grading process to learn where you went wrong and improve upon your mistakes for the assessment on Friday.

Tuesday, May 5

Complete the study guide day 2 questions in the document titled "Chapter 10 Study Guide." These questions cover sections 5-7. You may type your responses in a document or hand-write them on paper.

Answer book questions 10.6-10.8 and 10.10-10.11, found on pp. 302-306. After you have made an honest attempt at each question, reference the attached answer key and self-grade in a different color pen. Use the grading process to learn where you went wrong and improve upon your mistakes for the assessment on Friday.

Wednesday, May 6

Complete the study guide day 3 questions in the document titled "Chapter 10 Study Guide." These questions cover sections 8-10. You may type your responses in a document or hand-write them on paper.

Answer book questions 10.12-10.15, 10.17, found on pp. 308-310. After you have made an honest attempt at each question, reference the attached answer key and self-grade in a different color pen. Use the grading process to learn where you went wrong and improve upon your mistakes for the assessment on Friday.

Thursday, May 7

Take the attached Chapter 10 Assessment. You should complete the assessment in 40 minutes. I strongly encourage you to complete the assessment digitally on Google Classroom, but you do have the option to hand-write and scan your responses.

Remember that assessments are tools for learning. Make an attempt at the question, if you are unsure of your answer, check your notes, make your corrections, and think about why your first answer was correct/incorrect. This is not an assessment of how well you have memorized the material but it is a way

of measuring how well you understand and can interpret the chemistry concepts related to acids and bases.

Friday, May 8

Use this day to attend office hours, catch up on work from this week, scan your documents, and enjoy the start of your weekend! *Do not include the book questions in your packet submission*, only the documents listed: Chapter 10 Study Guide, Chapter 10 Assessment (only if hand-written).

Chapter 10 Study Guide

Day 1 (Sections 10.1-10.4)

1. What is the difference between Arrhenius's definition of acids/bases and Brønsted-Lowry's definition of acids/bases?
2. What is transferred in an acid-base reaction?
3. Describe how conjugate acid-base pairs are related.
4. How can water act as both an acid and a base?

Day 2 (Sections 10.5-10.7)

1. What is the difference between strong and weak when you are describing acids and bases?
2. How would you describe the relationship between the strengths of the two substances in a conjugate acid-base pair?
3. How do you determine which side of the reaction is favored in an acid-base reaction?
4. What does the value of K_a tell us about an acid?
5. In an acidic solution, which compound has a high concentration?
6. In a basic solution, which compound has a high concentration?

Day 3 (Sections 10.8-10.10)

1. Why is pH a useful measure of acidity rather than only using the concentration of H_3O^+?
2. For any given solution: pH + pOH = 14. Why is this true?
3. Describe a laboratory situation where using an acid-base indicator would be helpful.
4. Why is it important for specialized regions of our bodies to be able to maintain specific pH levels? In other words, why is it important that our blood is pH 7.4 but our pancreatic juice is pH 8?

Chapter 10 Book Questions KEY

1. Which of the following would you expect to be Bronsted-Lowry acids?
    a. HCO_2H YES
    b. H_2S YES
    c. $SnCl_2$ NO
2. Which of the following would you expect to be Bronsted-Lowry bases?
    a. SO_3^{2-} YES
    b. Ag^+ NO
    c. F^- YES
3. Write formulas for:
    a. The conjugate acid of HS^- H_2S
    b. The conjugate acid of PO_4^{3-} HPO_4^{2-}
    c. The conjugate base of H_2CO_3 HCO_3^-
    d. The conjugate base of NH_4^+ NH_3
4. For the reaction shown, identify the Bronsted-Lowry acids, bases, and conjugate acid-base pairs

    From left to right: BASE, ACID, CONJUGATE ACID, CONJUGATE BASE
5. Is water an acid or a base in the following reactions?
    a. BASE
    b. ACID
    c. BASE
6. Use Table 10.1 to identify the stronger acid in the following pairs:
    a. NH_4^+
    b. H_2SO_4
    c. H_2CO_3
7. Use Table 10.1 to identify the stronger base in the following pairs:
    a. F^-
    b. OH^-

8. Write a balanced equation for the proton-transfer reaction between a hydrogen phosphate ion and a hydroxide ion. Identify each acid-base pair, and determine which direction the equilibrium is favored.

   $HPO_4^{2-} + OH^- \rightleftarrows PO_4^{3-} + H_2O$

   Pair 1: HPO_4^{2-} and PO_4^{3-}

   Pair 2: OH^- and H_2O

   Equilibrium is favored to the right (forward reaction)

10. Benzoic acid has $K_a = 6.5 \times 10^{-5}$ and citric acid has $K_a = 7.2 \times 10^{-4}$. Which of the two is the stronger acid?

    Citric acid

11. Identify the following solutions as either acidic or basic. What is the value of $[OH^-]$ in each?

    a. Beer, $[H_3O^+] = 3.2 \text{ X } 10^{-5}$ M — ACIDIC — $[OH^-] = 3.1 \text{ X } 10^{-10}$ M

    b. Household ammonia, $[H_3O^+] = 3.1 \times 10^{-12}$ M — BASIC — $[OH^-] = 3.2 \text{ X } 10^{-3}$ M

12. Which solution has the higher H_3O^+ concentration, one with pH = 5 or one with pH = 9? Which has the higher OH^- concentration?

    Higher $[H_3O^+]$: pH 5

    Higher $[OH^-]$: pH 9

13. Give the pH of solutions with the following concentrations:

    a. $[H_3O^+] = 1 \times 10^{-5}$ M — pH = 5

    b. $[OH^-] = 1 \times 10^{-9}$ M — pH = 5

14. Give the hydronium ion concentration of solutions with the following values of pH. Which solution is most acidic? Which solution is most basic?

    a. pH 13.0 — $[H_3O^+] = 1 \times 10^{-13}$ M — MOST BASIC

    b. pH 3.0 — $[H_3O^+] = 1 \times 10^{-3}$ M — MOST ACIDIC

    c. pH 8.0 — $[H_3O^+] = 1 \times 10^{-8}$ M

15. What is the pH of a 1×10^{-4} M solution of HNO_3?

    pH = 4

17. Find the pH of the following solutions:

    a. Seawater with $[H_3O^+] = 5.3 \times 10^{-9}$ M — pH = 8.3

    b. A urine sample with $[H_3O^+] = 8.9 \times 10^{-6}$ M — pH = 5.1

_____

_____

_____

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Chapter 10 Assessment
Acids and Bases

Directions: Write the letter of the correct answer on the line provided to the left of each question.

1. ____ When acids and bases react in a neutralization reaction the product other than water is a
   a. hydronium ion
   b. hydroxide ion
   c. metal
   d. salt
   e. hydrogen ion

2. ____ Given the equation $CH_3NH_2 + HCl \rightleftarrows CH_3NH_3^+ + Cl^-$, a conjugate acid-base pair in the reaction shown is _____ and _____.
   a. $CH_3NH_3^+$ and Cl
   b. CH_3NH_2 and HCl
   c. CH_3NH_2 and Cl
   d. HCl and $H3O^+$
   e. HCl and Cl^-

3. ____ Which reaction best illustrates the behavior of the weak base $H_2PO_4^-$ in aqueous solution?
   a. $H_2PO_4^- + H_2O \rightleftarrows H_3PO_4 + OH^-$
   b. $H_2PO_4^- \rightleftarrows H^+ + HPO_4^{2-}$
   c. $H_2PO_4^- + H_2O \rightleftarrows H_2PO_4^{2-} + H_3O^+$
   d. $H_2PO_4^- + H^+ \rightleftarrows H_3PO_4 + OH^-$
   e. $H_2PO_4^- \rightleftarrows 2H^+ + PO_4^{3-}$

4. ____ Which one of the following is the weakest acid?
   a. HClO ($K_a = 3.0 \times 10^{-8}$)
   b. HNO_2 ($K_a = 4.5 \times 10^{-4}$)
   c. HF ($K_a = 6.8 \times 10^{-4}$)
   d. HCN ($K_a = 4.9 \times 10^{-10}$)
   e. CH_3COOH ($K_a = 1.8 \times 10^{-5}$)

5. ____ Which solution is basic?
    a. $[H3O^+] = 1.0 \times 10^{-10}$
    b. $[H3O^+] = 1.0 \times 10^{-7}$
    c. $[OH^-] = 1.0 \times 10^{-10}$
    d. $[OH^-] = 1.0 \times 10^{-7}$
    e. $[H3O^+]= 1.0 \times 10^{-4}$

6. ____ If the concentration of H_3O^+ is 1.0×10^{-3} M, the concentration of OH^- is _____ M.
    a. 1.0×10^{-11}
    b. 1.4×10^{-12}
    c. 1.0×10^{-3}
    d. 1.0×10^{-7}
    e. 1.4×10^{-3}

7. ____ Which of the following pHs corresponds to a strongly basic solution?
    a. 6.9
    b. 4.3
    c. 2.7
    d. 11.5
    e. 7.4

8. ____ Which of the following pH's corresponds to a neutral solution?
    a. 8.5
    b. 14.0
    c. 7.0
    d. 1.8
    e. 6.2

9. ____ Which of the following pH's corresponds to a weakly acidic solution?
    a. 5.3
    b. 9.2
    c. 7.8
    d. 11.5
    e. 1.4

10. ____ Which reaction is favored when hydrochloric acid (HCl) is mixed with sodium hydroxide (NaOH)?
    a. Quick
    b. Slow
    c. Forward
    d. Reverse
    e. None of the above

Directions: Answer the question in the space provided. Be sure to show all work for calculations and write your final answer on the line provided. Make sure to include the unit and the correct number of significant figures.

11. The pH of a cup of coffee is measured as 5.45. Express this measurement as $[H_3O^+]$.

$[H_3O^+]$ = _____

12. What is the pH of a solution in which $[H_3O^+] = 1.2 \times 10^{-3}$ M?

pH = _____

13. What is the pOH of a solution in which $[H_3O^+] = 3.3 \times 10^{-10}$ M?

pOH = _____

Directions: Answer the following questions in complete sentences.

14. What makes an acid strong or weak?

15. How does an acid's strength or weakness relate to its concentration in water?

16. Why does taking an antacid counteract the effects of acid reflux (also known as GERD)?

Common Acid–Base Indicators

Indicator	Approximate pH Range for Color Change	Color Change
methyl orange	3.2–4.4	red to yellow
bromthymol blue	6.0–7.6	yellow to blue
phenolphthalein	8.2–10	colorless to pink
litmus	5.5–8.2	red to blue
bromcresol green	3.8–5.4	yellow to blue
thymol blue	8.0–9.6	yellow to blue

17. A chemist is conducting a reaction that performs optimally at pH 9.8. Using the chart, which acid-base indicator could they use to determine if their solution is at the optimal pH?

18. You mix calcium carbonate ($CaCO_3$) and a liquid that you thought was ammonia (NH_3). The mixture then bubbles and foams. What type of substance did you actually mix with the calcium carbonate and why were bubbles produced?