

NAME: _____
STUDENT ID#: _____

CHEM 207 EXAM1
2/22/16

Print your **NAME**, your **STUDENT ID#**, and the **COLOR OF YOUR TEST** on your Scantron answer sheet. Also, **SIGN THE SCANTRON SHEET** as well. Record your answers on the **FRONT ("PART 1")** side of the answer sheet. Note that **the correct response to some of the questions may require you to black out more than one answer on a single line.**

1. A student adds 10mL of 5.0 M HCl to a 100mL volumetric flask filled with approximately 50mL of distilled water, then fills the flask to the line with water, and mixes the solution so that the final H⁺ concentration is 0.50M. What is the pH of this solution?

- a) 0.50
- b) 0.05
- c) 0.30
- d) 0.70
- e) none of the above

2. A student determines that the pH of a solution is 2.00. What are the pOH of this solution and the concentration of OH⁻ in solution, respectively?

- a) 8.00 and 10⁻⁸ M
- b) 12.00 and 10⁻¹² M
- c) 2.00 and 10⁻² M
- d) pOH and OH⁻ are zero since the solution is acidic
- e) none of the above

3. In performing Experiment 5, a student carefully standardizes his/her NaOH solution with 0.5000g of primary standard KHP and determines the concentration of the NaOH to be 0.140M. As it turns out, the true concentration of the NaOH solution is actually 0.150M. What is the % RELATIVE ERROR? (formula weight of KHP = 204.23 g/mole; formula weight of NaOH = 40.00 g/mole)

- a) 0.667%
- b) 0.0667%
- c) 93.3%
- d) 6.67%
- e) none of the above

4. In Experiment 6, a student weighs 0.3745 g of unknown and dissolves it in 45 mL of water. A 0.1125 M solution of HCl is used as titrant. When the first equivalence point of the titration (i.e., the **phenolphthalein color change**) is reached, the volume of HCl used is 17.21 mL. What is the estimated % Na₂CO₃ in the student's unknown? (formula weight of Na₂CO₃ = 105.99g/mole; formula weight of HCl = 36.46g/mole)

- a) 27.4%
- b) 110.%
- c) 54.8%
- d) 11.3%
- e) none of the above

5. In Experiment 6, a student weighs out 0.1521g of Na_2CO_3 and dissolves it in 55.00mL of water. How many moles of HCl will be needed to reach the **methyl orange equivalence point** of the titration? (formula weight of Na_2CO_3 = 105.99g/mole; formula weight of HCl = 36.46g/mole)

- a) 0.00144 moles
- b) 0.00287 moles
- c) 0.0287 moles
- d) 0.0574 moles
- e) none of the above

Consider the reactions **A-F** below and use them to answer questions **6-9**. Each question may have MORE than one correct answer.

- A) $\text{Cu (s)} + 4\text{HNO}_3\text{(aq)} \rightarrow \text{Cu(NO}_3)_2\text{(aq)} + 2\text{H}_2\text{O} + \text{NO}_2\text{(g)}$
- B) $\text{Cu(NO}_3)_2\text{(aq)} + 2\text{NaOH} \rightarrow \text{Cu(OH)}_2\text{(s)} + 2\text{NaNO}_3\text{(aq)}$
- C) $\text{Cu(OH)}_2\text{(s)} \rightarrow \text{CuO (s)} + \text{H}_2\text{O}$
- D) $\text{CuO (s)} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4\text{(aq)} + \text{H}_2\text{O}$
- E) $\text{CuSO}_4\text{(aq)} + \text{Zn (s)} \rightarrow \text{Cu (s)} + \text{ZnSO}_4\text{(aq)}$
- F) $\text{Zn (s)} + \text{HCl (aq)} \rightarrow \text{ZnCl}_2\text{(s)} + \text{H}_2\text{(g)}$

6. Which of the following reactions is a redox reaction (a reaction where reduction or oxidation of a reactant occurs)? **(More than one correct answer possible)**

- a) Reaction A
- b) Reaction B
- c) Reaction D
- d) Reaction E
- e) Reaction F

7. Which of the above reactions are NOT balanced? **(More than one correct answer possible)**

- a) Reaction A
- b) Reaction B
- c) Reaction D
- d) Reaction E
- e) Reaction F

8. Looking at Reaction E above, what is the correct NET ionic equation?

- a) $\text{Cu}^{2+} + \text{Zn}^0 \rightarrow \text{Cu}^0 + \text{Zn}^{2+}$
- b) $\text{Cu}^0 + \text{SO}_4^{2-} + \text{Zn}^{2+} \rightarrow \text{Cu}^{2+} + \text{Zn}^0 + \text{SO}_4^{2-}$
- c) $\text{Cu}^{2+} + \text{SO}_4^{2-} + \text{Zn}^0 \rightarrow \text{Cu}^0 + \text{Zn}^{2+} + \text{SO}_4^{2-}$
- d) $\text{Cu}^0 + \text{Zn}^{2+} \rightarrow \text{Cu}^{2+} + \text{Zn}^0$
- e) $\text{Cu}^{2+} + \text{SO}_4^{2-} + \text{Zn}^0 \rightarrow \text{Cu}^0 + \text{Zn}^{2+} + \text{SO}_4^{2-}$

9. In Reaction D, what is the oxidation number of Cu in CuO?

- a) -2
- b) -1
- c) 0
- d) +1
- e) +2

10. In statistics, the standard deviation is a very important parameter that is used to evaluate the precision of a set of repeated laboratory measurements. Which of the following is required in order to calculate the standard deviation of a data set? **(More than one correct answer possible)**

- a) each of the individual experimental results
- b) the number of results obtained
- c) the range
- d) the mean
- e) the true value

11. A student transfers 15 mL of a 5.0×10^{-3} M NaOH stock solution into a 50 mL volumetric flask and fills it to the mark with deionized water. What is the molarity of the new solution?

- a) 1.0×10^{-4} M
- b) 1.67×10^{-4} M
- c) 1.5×10^{-3} M
- d) 4.0×10^{-3} M
- e) none of the above

12. In Experiment 3, you constructed a straight-line calibration curve by plotting which two parameters?

- | | <u>x-axis</u> | <u>y-axis</u> |
|----|-------------------|---------------|
| a) | c | A |
| b) | λ | c |
| c) | c | %T |
| d) | A | c |
| e) | none of the above | |

13. Consider the following data that were obtained when an unknown sample was analyzed four times: 41.27, 41.67, 41.84, 41.77. Which of the results should be rejected (90% confidence level)?

- a) 41.27 only
- b) 41.84 only
- c) 41.27 and 41.84
- d) 41.27 and 41.67
- e) None

14. What is the absolute error (in mL) associated with a 25 mL buret?

- a) 0.12 mL
- b) 0.03 mL
- c) 3.0 mL
- d) this depends on the volume of the solution measured out
- e) no error if you are very careful

15. Which of the following terms appear in Beer's Law? **(More than one correct answer possible)**

- a) concentration
- b) wavelength
- c) Planck's constant
- d) transmittance
- e) path length

16. A 6.50×10^{-5} M solution of potassium permanganate (KMnO_4) has a % transmittance of 27.3% when measured in a 1.15-cm cell at a wavelength of 525 nm. What is the absorbance of this solution?

- a) 1.44
- b) 27.3
- c) 0.273
- d) 0.39
- e) 0.56

17. The absorbance of a solution is 0.02. What is its % transmittance (%T)?

- a) 1.0%
- b) 2.0%
- c) 95%
- d) 98%
- e) none of the above

18. Acids and bases can be classified as either strong or weak. Which of the following statements are correct? **(More than one correct answer possible)**

- a) KHP is a weak acid.
- b) KHP is a strong acid.
- c) NaOH is strong base.
- d) Na_2CO_3 is a weak base.
- e) HCl is a strong acid.

19. The pH of a solution is found to be 13. What is the pOH of this solution?

- A) 0
- B) 1.0
- C) 7.0
- D) 13
- E) can't be calculated from this information.

Commented [BP1]:

20. What is the absorbance of a solution whose % transmittance (%T) is 10%?

- A) -10
- B) -1.0
- C) 1.0
- D) 10.0
- E) none of the above

BONUS QUESTION: What did God say after creating Adam?

