

2nd Semester 2012

8/4/2012

Registration Number:

[illegible]

1.	a	b	c	d	e	11.	a	b	c	d	e
2.	a	b	c	d	e	12.	a	b	c	d	e
3.	a	b	c	d	e	13.	a	b	c	d	e
4.	a	b	c	d	e	14.	a	b	c	d	e
5.	a	b	c	d	e	15.	a	b	c	d	e
6.	a	b	c	d	e	16.	a	b	c	d	e
7.	a	b	c	d	e	17.	a	b	c	d	e
8.	a	b	c	d	e	18.	a	b	c	d	e
9.	a	b	c	d	e	19.	a	b	c	d	e
10.	a	b	c	d	e	20.	a	b	c	d	e

Techniques and Measurement and safety rules.

1. Which of the following are used for precise measurement of liquid volume?

- a) beaker and buret b) pipet and buret
c) beaker and graduated cylinder d) Erlenmeyer flask and pipet
e) beaker and pipet

2. A student obtained the following set of data:

Volume of a liquid = 10.00 mL

Mass of empty beaker = 42.60 g

Mass of beaker with the liquid = 52.10 g } → mass of liquid =

Calculate the density of the liquid (in g/mL).

Record the value to the correct number of significant figures.

- a) 0.9500 b) 0.95 c) 0.9 d) 0.950 e) 0.95000

density = $\frac{\text{mass}}{\text{volume}}$
 $= \frac{9.50}{10.00}$

3. Which of the following statements is incorrect?

- a) Food, drinks and gum are not allowed in the labs at any time.
b) All injuries should be reported to your laboratory instructor.
c) Dispose excess chemical by returning it into the original reagent bottle
d) Safety goggles must be worn at all times when working with chemicals or near others doing so.
e) Whenever your hands come into contact with chemicals in laboratory, wash them quickly with soap and water.

Formula of a Hydrate

4. Given the following set of data:

Mass of empty crucible = 19.72 g

Mass of crucible with the hydrate ($\text{KFe}(\text{SO}_4)_2 \cdot x\text{H}_2\text{O}$) = 21.34 g

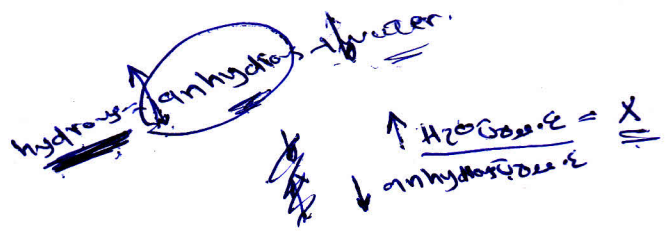
Mass of the crucible with anhydrous salt ($\text{KFe}(\text{SO}_4)_2$) = 20.58 g.

Molar masses: $\text{KFe}(\text{SO}_4)_2 = 287 \text{ g/mol}$; $\text{H}_2\text{O} = 18.0 \text{ g/mol}$.

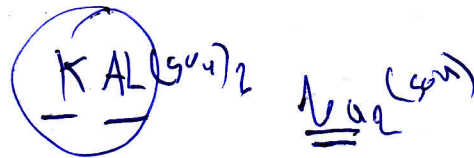
Calculate the value of "x" in ($\text{KFe}(\text{SO}_4)_2 \cdot x\text{H}_2\text{O}$).

- a) 12 b) 10 c) 13 d) 14 e) 11

mass of hydrate = 1.62
mass of anhydrous = 0.86
mass of water = 0.76
 $\frac{0.76}{18.0} = 0.0422$
 $\frac{0.86}{287} = 0.003$
 $\frac{0.0422}{0.003} = 14$



5. A student determined value of 'x' in the formula of alum $\text{KAl}(\text{SO}_4)_2 \cdot x\text{H}_2\text{O}$ greater than should be. A possible reason for that could be:
- a) Incomplete dehydration of alum. ✓
 - b) Some of the alum was lost during heating.
 - c) The mass recorded for the crucible with anhydrous salt was higher than actual value.
 - d) Answers a and b.
 - e) Answers a and c. ✓



Formula of an Oxide

6. A sample of metal, M, was burned in air to produce a metal oxide. Given the following set of data:

Mass of empty crucible	=	20.18 g	} → mass of metal = .36	
Mass of crucible with metal	=	20.54 g		oxide = .63
Mass of crucible with metal oxide	=	20.81 g		o = .27

Molar mass of metal = 24.0 g/mol and of oxygen = 16.0 g/mol
 Determine the value x in the formula(MO_x).
 Report x to two significant figures.

- a) 1.0 b) 1.4 c) 1.3 d) 1.2 e) 1.1

7. A student heated 2.75 g of sodium sulfate hydrate, $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}$ in a crucible to get 1.56 g of anhydrous salt. What is the value of "x"? (Formula weight of Na_2SO_4 = 142).

- a) 4 b) 6 c) 7 d) 8 e) 5

hydrate = 2.75
 anhydrate = 1.56 → 1.1
 water = 1.19 → 1.77 and

8. In "the empirical formula of an oxide" experiment, after burning magnesium in air and allowing the crucible to cool, 10 drops of water were added to:

- Convert magnesium nitride into magnesium hydroxide.
- Convert magnesium oxide into magnesium nitride.
- Convert unreacted magnesium into magnesium oxide.
- Convert magnesium nitride into magnesium oxide.
- Convert magnesium oxide into magnesium hydroxide.

9. A student burned 0.310 g of white phosphorus in air and obtained 0.710 g of phosphorous oxide. What is the empirical formula of the oxide produced? (atomic weights: P = 31.0, O = 16.0)

a) PO_3

b) P_2O_3

c) P_2O_5

d) PO

e) PO_2

Limiting Reactant

10. Given the following set of data for the determination of % composition of a mixture of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ and $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$.

Mass of salt mixture = 1.20 g

Mass of precipitate formed = 0.360 g

Molar mass of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ = 244 g/mol

Molar mass of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ = 380 g/mol

Molar mass of $\text{Ba}_3(\text{PO}_4)_2$ = 601 g/mol

When a drop of BaCl_2 solution was added to the filtrate a white precipitate was formed.

Calculate the mass % of the limiting reactant in the salt mixture.

a) 36.5

b) 32.5

c) 28.4

d) 24.4

e) 20.4

11. Calculate the mass of $\text{Ba}_3(\text{PO}_4)_2$ produced from the reaction of 0.84 g of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ with excess $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$.

a) 0.51

b) 0.43

c) 0.59

d) 0.73

e) 0.66

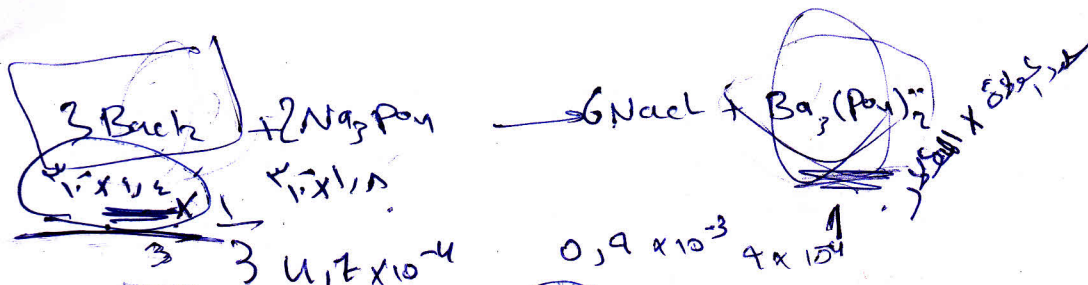
2.2×10^{-3}
mol

$\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O} \rightarrow \text{Na}_3\text{PO}_4$

$\text{BaCl}_2 \cdot 2\text{H}_2\text{O} \rightarrow \text{BaCl}_2$

$2\text{Na}_3\text{PO}_4 + 3\text{BaCl}_2 \rightarrow \text{Ba}_3(\text{PO}_4)_2 + 6\text{NaCl}$

$6\text{NaCl} + \text{Ba}_3(\text{PO}_4)_2$



12. A mixture of 0.35 g of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ and 0.69 g of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ was dissolved in water and heated at $80-90^\circ\text{C}$ for 20 minutes. Calculate the mass of the precipitate. (Molar masses from question 10 above).

$$\frac{m}{M_{\text{molar}}} = n$$

- a) 0.38 g b) 0.34 g c) 0.31 g **d) 0.29 g** e) 0.26 g

Determination of Acetic Acid in Vinegar

13. A solution of NaOH of unknown concentration was standardized using potassium hydrogen phthalate (KHP).

Given the following set of data:

Mass of (KHP) = 0.32 g

Initial reading of buret (NaOH) = 12.40 mL

Final reading of buret (NaOH) = 22.40 mL

Molar mass of KHP = 204.6 g/mol.

Calculate the molar concentration of NaOH

- a) 0.20 b) 0.30 **c) 0.16** d) 0.11 e) 0.13

14. A sample of 10.00 mL of vinegar was titrated 0.15 M NaOH solution using phenolphthalein as an indicator.

Given the following set of data:

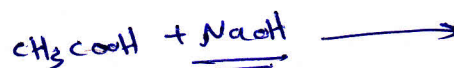
Initial reading of buret (NaOH) = 12.60 mL

Final reading of buret (NaOH) = 28.60 mL

Calculate the molar concentration of acetic acid in vinegar solution.

Record the value to the correct number of significant figures.

- a) 0.240 **b) 0.24** c) 0.2400 d) 0.2 e) all wrong



$$M = 10$$

$$n = 1 \times 17$$

$$n = 1 \times 17$$

15. If concentration of acetic acid, CH_3COOH , in a vinegar solution is 0.40 M . Calculate the mass percent of acetic acid in this solution. Given: Density of solution is 1.05 g/mL and molar mass of acetic acid is 60.0 g/mol .

a) 1.7 b) 1.1 c) 2.7 d) 1.4 e) 2.3

$$d = \frac{m}{V}$$

$$M = \frac{m}{M}$$

$$\frac{24}{1.05}$$

$$\frac{\text{mass of } \text{CH}_3\text{COOH}}{\text{mass of vinegar}}$$

$$\frac{M \times \text{molar mass}}{\text{density}}$$

$$\frac{.4 \text{ (b)} \times 60}{1.05}$$

The Neutralization Capacity of Antacid Tablets

16. A 0.16 g sample of an antacid was dissolved in 25.00 mL of 0.15 M HCl solution. The excess acid was back titrated with 0.10 M NaOH solution.

Given the data:

Initial reading of buret (NaOH) = 12.60 mL

Final reading of buret (NaOH) = 20.60 mL

Calculate the number of moles of HCl neutralized by one gram antacid.

a) 0.018 b) 0.016 c) 0.012 d) 0.010 e) 0.014

17. Given:

The antacid capacity of a substance is $0.0200 \text{ mol HCl / g antacid}$.

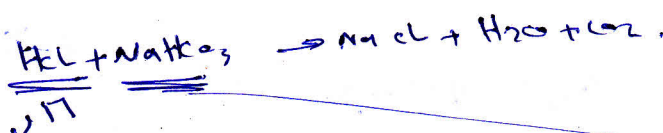
The stomach acid is 0.100 M HCl .

Calculate the volume of stomach acid that can be neutralized by 0.80 g antacid tablet.

a) 100. mL b) 120. mL c) 140. mL d) 160. mL e) 180. mL

$$M = \frac{n}{V}$$

$$V = \frac{n}{M}$$



18. Calculate the volume of 0.160 M HCl needed to react 3.36 g NaHCO₃.
(Atomic weights: Na = 23.0; H = 1.0; C = 12.0; O = 16.0).

- a) 200. mL b) 125 mL **c) 250. mL** d) 400 mL e) 450. mL

$$\text{m.e.} = \frac{\text{wt}}{\text{eq}} = \frac{84}{1+1+3} = 21.0$$

$$M = \frac{n}{V}$$

$$V = \frac{n}{M}$$

Bleach Analysis

19- Given the following set of data;

Volume of 0.010 M K₂Cr₂O₇ = 25.0 mL

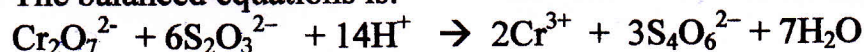
Mass of KI = 1.0 g

Volume of HCl solution = 5.0 mL

Volume of Na₂S₂O₃ needed to titrate the liberated iodine = 30.0 mL.

Calculate the molar concentration of Na₂S₂O₃ solution

The balanced equations is:



- a) 0.10 b) 0.12 c) 0.075 d) 0.060 **e) 0.050**

20. Which of the following statements is correct concerning bleach analysis?

- a) I₃⁻ oxidizes Na₂S₂O₃ to Na₂S₄O₆.**
b) Na₂S₂O₃ solution cannot be oxidized by oxygen or bacterial action.
c) Sodium thiosulfate, Na₂S₂O₃, oxidizes I₃⁻ to I⁻.
d) Sodium thiosulfate can readily be prepared from solid Na₂S₂O₃ as
e) Potassium dichromate, K₂Cr₂O₇, cannot be used as a primary standard solution.

