

CHEM 1031

DETERMINATION OF THE
FORMULA OF A HYDRATE

PURPOSE AND GOALS

- DETERMINE THE NUMBER OF MOLES OF WATER IN AN UNKNOWN HYDRATE.

PRINCIPLES

INORGANIC SALTS

- ANHYDROUS CONDITIONS
- HYDRATE-WATER MOLECULES
BOUND

WATER

- MECHANICALLY TRAPPED
- CHEMICALLY BOUND

FORMULA FOR THE HYDRATED SALT

HYDRATE = ANHYDROUS SALT + WATER

EXAMPLE:



IN THIS EXPERIMENT

- DETERMINE THE NUMBER OF WATERS OF HYDRATION PRESENT IN A SAMPLE



CALCULATIONS

- MASS OF SAMPLE=

MASS OF
CRUCIBLE/COVER/SAMPLE(C/C/S) -
MASS OF CRUCIBLE/COVER(C/C)

- SHOULD BE ~1 g.

- MASS OF WATER IN ORIGINAL SAMPLE=

WEIGHT OF C/C/S BEFORE
HEATING - WEIGHT OF C/C/S AFTER
HEATING

- MOLES OF WATER IN ORIGINAL SAMPLE=

$$\frac{\text{MASS OF WATER (g)}}{\text{MOLECULAR WEIGHT OF WATER (grams/mole)}}$$

- MASS OF ANHYDROUS SALT IN ORIGINAL SAMPLE=

WEIGHT OF C/C/S AFTER HEATING -
WEIGHT OF C/C

- MOLES OF ANHYDROUS SALT IN ORIGINAL SAMPLE=

MASS OF ANHYDROUS SALT (g)

MOLECULAR WEIGHT OF
ANHYDROUS SALT
(grams/mole)

- RATIO OF THE NUMBER OF MOLES OF WATER TO MOLES OF ANHYDROUS SALT =

$$\frac{\text{\# MOLES WATER}}{\text{\# MOLES ANHYDROUS SALT}}$$

- FORMULA OF HYDRATE:



*WHERE “x” EQUALS THE NUMBER OF
MOLES OF WATER PER MOLE OF
ANHYDROUS SALT

- PERCENT (%) OF WATER IN SAMPLE=

$$\frac{\text{MASS OF H}_2\text{O LOSS}}{\text{MASS OF SAMPLE}} \times 100$$

REMINDERS

- HEAT GENTLY FIRST THEN STRONGLY
- USE TONGS AND WIRE GAUZE
- RECORD UNKNOWN SAMPLE CODE