

Analysis of Colorants

Materials:

Item	Amount per student	Amount for 24 students
Chalk or Whiting, CaCO_3	0.5 g	15 g
Lead White, $2 \text{PbCO}_3 \cdot \text{Pb(OH)}_2$	0.5 g	15 g
Zinc White, ZnO	0.5 g	15 g
Gypsum, CaSO_4	0.5 g	15 g
Titanium White, TiO_2	0.5 g	15 g
3 M HNO_3	5 mL	200 mL
3 M HCl	5 mL	200 mL
10% H_2SO_4	5 mL	200 mL
KI crystals	0.5 g	15 g
Potassium mercuric thiocyanate	5 mL	200 mL

Equipment:

Item	Amount per student	Amount for 24 students
Magnifying Glass	1	24
Microscope slides	5	125
Pasteur Pipettes	5	125

Staff Notes:

Safety Issues:

- All lead and mercury waste should be disposed of in a properly labeled waste bottle. Chronic exposure over long periods of time to these materials is a serious health risk and should be vigorously avoided!
- Nitric acid, hydrochloric acid, and sulfuric acid will damage your skin and clothing. Additionally, nitric acid will stain your skin yellow. Flush any skin surface with copious amounts of water upon exposure. Gloves are good....

Procedure:

1. You will follow the flow chart on the following page to help you characterize each of the five known pigments. Be sure to record the visual differences between the pigments themselves and the observed changes upon their exposure to each reagent.
2. You will be given an unknown (one of the five knowns) which you will characterize in the same manner.
3. Based upon your observations, you will identify the unknown.

CLEAN-UP: See the safety notes.

Reflections:

1. What adjustments would you make in your procedure to change or improve your finished product?

Recognition of Certain White Pigments and Inerts.

UNKNOWN
WHITE SAMPLE

Add dil. nitric acid

Rapid effervescence
and dissolution (a
carbonate)

No effervescence

Drop does not dry
completely; no crys-
talline residue (cal-
cium nitrate)

Dries completely;
latticework of den-
dritic crystals (lead
nitrate)

Dissolves at a mod-
erate rate; drop does
not dry completely;
no crystalline resi-
due; when warmed, a
crusty residue, in
which tiny rosettes
show at 100X-,200X
(zinc nitrate)

Does not appear to
dissolve

On standing, forma-
tion of acicular crys-
tals scattered or in
small sheaves (cal-
cium sulfate)

Evaporates to dry-
ness without appa-
rent dissolution or re-
crystallization

To confirm calcium,
add drop of water
and small drop of dil.
sulfuric acid; char-
acteristic needle-like
crystals of calcium
sulfate

To confirm lead, add
drop of water and
small crystal of po-
tassium iodide;
bright yellow plates
of lead iodide

To confirm zinc, add
drop of water and
crystal of potassium
mercuric thiocya-
nate; white precipi-
tate of feathery crys-
tals (zinc mercuric
thiocyanate)

For better recrystal-
lization, add drop of
dil. hydrochloric acid

Indicates CAL-
CIUM CARBON-
ATE (chalk or whit-
ing)

Indicates
LEAD NITRATE

Indicates
ZINC WHITE

Indicates GYPSUM
(plaster of Paris)

Indicates only a
white inert such as
CHINA CLAY,
BARYTES, or
SILICA