LATEST SYLLABUS FOR STD. IX - PRACTICAL CHEMISTRY

INTERNAL ASSESSMENT OF PRACTICAL WORK

Candidates will be asked to observe to the effect of reagents and/or of heat on substances supplied to them. The exercises will be simple and may include the recognition and identification of certain gases listed below.

Gases: Hydrogen, Oxygen, Carbon dioxide, Chlorine, Hydrogen chloride, Sulphur dioxide, Hydrogen sulphide, Ammonia, Water vapour, Nitrogen dioxide.

Candidates are expected to have completed the following minimum practical work.

SIMPLE EXPERIMENTS ON:

1. **Heat the given (unknown) substance, make observations – Identify any products and make deductions where possible.**
   (a) copper carbonate, zinc carbonate (b) washing soda, copper sulphate crystals
   (c) zinc nitrate, copper nitrate, lead nitrate (d) ammonium chloride, iodine, ammonium dichromate
2. **Add dilute sulphuric acid to the unknown substance – Warm if necessary, make observation, identify the product and make deductions.**
   (a) a sulphide (b) a carbonate (c) a metal
3. **Apply the flame test – to identify the metal in the unknown substance.**
   (a) a sodium salt (b) a potassium salt (c) a calcium compound
4. **The percentage composition – of a mixture of powdered salt and water-washed sand.**
   The experiment would test techniques in dissolving, filtering or decanting, washing and weighing. It may be counted out as taking too much time. The weakness could be met by supplying a given weight of the mixture; also by choosing sand of such grain size that filtering or decanting will not be slow and yet not so large that separation of salt and sand cannot be done simply by sorting out mechanically the sand from the salt. The experiment should take about 20 minutes using 10g mixture (4g sand, 6g salt).
5. **Simple experiments – based on hard water and soft water –** identification of hardness – simple softening – by heating the temporary hard water,
   using washing soda and advantage of using detergents over soap in hard water.
6. **Find out the sources of pollution of water bodies in the locality and determine the quality of water.**

PRACTICAL CHEMISTRY CHART

I. IDENTIFICATION OF GASES

NEUTRAL GASES	
1. **WATER VAPOUR** **Colour:** Colourless **Odour:** Odourless	**LITMUS TEST :** Neutral to litmus. *TESTS FOR THE GAS:* • Turns ***white*** anhydrous copper sulphate – ***blue***. **$CuSO_4$ [white] + $5H_2O$ → $CuSO_4 \cdot 5H_2O$ [blue]** • Turns ***blue*** cobalt chloride paper – ***pink***. **$CoCl_2$ [blue] + $2H_2O$ → $CoCl_2 \cdot 2H_2O$ [pink]**
2. **HYDROGEN [H_2]** **Colour:** Colourless **Odour:** Odourless	**LITMUS TEST :** Neutral to litmus. *TESTS FOR THE GAS:* • Burning wooden splinter is– ***extinguished*** in hydrogen. • Hydrogen burns with a – ***pale blue*** flame producing a '***pop***' sound. **$2H_2 + O_2 \rightarrow 2H_2O$ [on kindling]**
3. **OXYGEN [O_2]** **Colour:** Colourless **Odour:** Odourless	**LITMUS TEST :** Neutral to litmus. *TESTS FOR THE GAS:* • ***Rekindles*** – a glowing wooden splinter. • Absorbed in colourless alkaline pyrogallol solution which turns – ***brown***.
ACIDIC GASES	
4. **CARBON DIOXIDE [CO_2]** **Colour:** Colourless **Odour:** Odourless	**LITMUS TEST :** Moist blue litmus turns faint red. *TESTS FOR THE GAS:* • Burning wooden splinter is – ***extinguished*** in carbon dioxide. • On passage through lime water, it turns lime water – ***milky***. **$Ca(OH)_2 + CO_2 \rightarrow CaCO_3\downarrow$ [white ppt. - insoluble] + H_2O** The ***milkiness disappears*** – on passage of excess carbon dioxide. **$CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$ [soluble]** • The gas has ***no effect*** on acidified $KMnO_4$ or $K_2Cr_2O_7$ solution.
5. **SULPHUR DIOXIDE [SO_2]** **Colour:** Colourless **Odour:** Suffocating	**LITMUS TEST :** Moist blue litmus turns red. *TESTS FOR THE GAS:* • Burning wooden splinter is – ***extinguished*** in sulphur dioxide. • On passage through lime water, it turns lime water – ***milky***. **$Ca(OH)_2 + SO_2 \rightarrow CaSO_3\downarrow$ [white ppt. - insoluble] + H_2O** The ***milkiness disappears*** – on passage of excess sulphur dioxide. **$CaSO_3 + H_2O + SO_2 \rightarrow Ca(HSO_3)_2$ [soluble]** • Turns acidified potassium permanganate from – ***pink*** to ***clear colourless***. **$2KMnO_4 + 2H_2O + 5SO_2 \rightarrow K_2SO_4 + 2MnSO_4 + 2H_2SO_4$** • Turns acidified potassium dichromate from – ***orange*** to ***clear green***. **$K_2Cr_2O_7 + H_2SO_4 + 3SO_2 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + H_2O$**

ACIDIC GASES [Contd.]	
6. CHLORINE [Cl_2] **Colour:** Greenish yellow **Odour:** Pungent	**LITMUS TEST:** Moist blue litmus turns red and then gets bleached. ***TESTS FOR THE GAS:*** • Turns moist ***blue*** litmus ***red*** and then – ***bleaches*** it. **$Cl_2 + H_2O \rightarrow HCl + HOCl$; $HOCl \rightarrow HCl + [O]$ [nascent]** Colouring matter [litmus] + [O] → Colourless or bleached product • Turns moist starch iodide paper [KI + starch solution] – ***blue black***. **$Cl_2 + 2KI \rightarrow 2KCl + I_2$** **Starch + I_2 → Blue black colour**
7. HYDROGEN CHLORIDE [HCl] **Colour:** Colourless **Odour:** Pungent	**LITMUS TEST:** Moist blue litmus turns red. ***TESTS FOR THE GAS:*** • Gives ***dense white fumes*** when a glass rod dipped in ammonia solution is brought near hydrochloric acid vapours. **$NH_3 + HCl$ [vapours] → NH_4Cl [dense white fumes]** • Forms a ***curdy white precipitate*** – on passage through $AgNO_3$ solution. **$AgNO_3$ [aq.] + HCl → AgCl↓ [curdy white ppt.] + HNO_3** The precipitate of AgCl is ***soluble*** in NH_4OH but ***insoluble*** in dil. HNO_3.
8. HYDROGEN SULPHIDE [H_2S] **Colour:** Colourless **Odour:** Rotten egg	**LITMUS TEST:** Moist blue litmus turns red. ***TESTS FOR THE GAS:*** • Turns acidified potassium permanganate from – ***pink*** to ***colourless***. **$2KMnO_4 + 3H_2SO_4 + 5H_2S \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 5S$** • Turns acidified potassium dichromate from – ***orange*** to ***green***. **$K_2Cr_2O_7 + 4H_2SO_4 + 3H_2S \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 7H_2O + 3S$** The above tests are answered also by sulphur dioxide [SO_2], but in case of H_2S, ***yellow particles of sulphur*** are seen and the solution – is hence not clear colourless or clear green respectively. • Turns moist lead acetate paper – ***silvery black***. **$Pb(CH_3COO)_2$ [colourless] + H_2S → PbS↓ [black] + $2CH_3COOH$**
9. NITROGEN DIOXIDE [NO_2] **Colour:** Reddish brown **Odour:** Irritating	**LITMUS TEST:** Moist blue litmus turns red. ***TESTS FOR THE GAS:*** • It liberates iodine [***violet vapours***] from potassium iodide [KI] solution. **$2KI + 2NO_2 \rightarrow 2KNO_2 + I_2$ [Turns potassium iodide paper brown]** • It dissolves in cold water to give a mixture of nitrous and nitric acid in solution which acts on – ***blue*** litmus and turns it ***red***. **$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$ [hence NO_2 is called a mixed acid anhydride]**

BASIC GAS	
10. AMMONIA [NH_3] **Colour:** Colourless **Odour:** Pungent	**LITMUS TEST:** Moist red litmus turns blue.. *TESTS FOR THE GAS:* • Gives ***dense white fumes*** when a glass rod – dipped in conc. HCl acid is brought near ammonia gas. **NH_3 + HCl [conc.] → NH_4Cl [dense white fumes]** • On passage through copper [II] sulphate solution [$CuSO_4$] – it gives a ***pale blue precipitate***. [NH_3 dissolved in H_2O gives NH_4OH] **$CuSO_4 + 2NH_4OH \rightarrow (NH_4)_2SO_4 + Cu(OH)_2\downarrow$ [pale blue ppt.]** On passage of excess ammonia [or excess NH_4OH solution] the ***pale blue precipitate*** dissolves to give a ***deep blue*** or ***inky blue*** solution of the complex salt – tetramine copper [II] sulphate. **$Cu(OH)_2 + (NH_4)_2SO_4 + 2NH_4OH \rightarrow [Cu(NH_3)_4]SO_4 + 4H_2O$** [pale blue ppt.] [tetramine copper (II) sulphate] • Turns Nessler's reagent from **– *colourless*** to pale brown or gives a ***reddish brown ppt.*** [iodide of Millon's base] on passage of NH_3 in excess. Nessler's reagent is an alkaline soln. of potassium mercuric iodide [K_2HgI_4]

II ACTION OF HEAT – On the given [unknown] substance

SUBSTANCE	*PRODUCTS*	*OBSERVATION AND DEDUCTION*
1. Copper carbonate **$CuCO_3$ →** [Copper carbonate] [light green]	**CuO + CO_2 [g]** [Copper oxide] [Carbon dioxide] [black]	• **Original colour** - Light green • **Colour change** - Turns black on strong heating • **Gas evolved - Carbon dioxide** a] ***Colour & odour*** - Colourless, odourless b] ***Nature*** - Slightly acidic to litmus c] ***Test*** - Lime water turns milky [$KMnO_4$-no effect]. • **Residue -** Black copper oxide formed. **Deductions :** The light green powder is ***copper carbonate***.
2. Zinc carbonate **$ZnCO_3$ →** [Zinc carbonate] [white]	**ZnO + CO_2 [g]** [Zinc oxide] [Carbon dioxide] [yellow - hot] [white - cold]	• **Original colour** - White • **Colour change** - Turns yellow on heating. • **Gas evolved - Carbon dioxide** a] ***Colour & odour*** - Colourless, odourless b] ***Nature*** - Slightly acidic to litmus c] ***Test*** - Lime water turns milky [$KMnO_4$-no effect]. • **Residue -** Zinc oxide formed. [yellow-hot, white-cold] **Deductions :** The white powder is ***zinc carbonate***.

SUBSTANCE	PRODUCTS	OBSERVATION AND DEDUCTION
3. Washing soda $Na_2CO_3.10H_2O$ → [Washing soda] [white]	$Na_2CO_3.H_2O$ + $9H_2O$ [Sodium carbonate] [white] [water vapour]	• **Original colour** - White • **Colour change** - Remains white on heating. • **Gas evolved - Water vapour** [water of crystallization] a] *Colour* - Colourless liquid b] *Nature* - Neutral to litmus c] *Test* - Turns cobalt chloride blue to pink. • **Residue** - White sodium carbonate is formed. **Deductions:** The white powder is ***washing soda.***
4. Copper sulphate $CuSO_4.5H_2O$ → [Copper sulphate] [hydrous - blue] *On strong heating* $2CuSO_4$ →	$CuSO_4$ + $5H_2O$ [Copper sulphate] [anhydrous-white] [water vapour] $2CuO + 2SO_2 + O_2$ [Copper oxide] [black] [Sulphur dioxide] [Oxygen]	• **Original colour** - Blue [hydrous] • **Colour change** - Turns white [anhydrous] on heating. On strong heating a black residue is formed. • **Gas evolved - [Water vapour** [initial]] - SO_2 & O_2 ***Sulphur dioxide*** - colourless, acidic to litmus, turns $KMnO_4$ soln. pink to colourless. *Oxygen* - colourless, odourless, neutral to litmus, relits glowing splint. • **Residue-***Initial* - anhydrous copper sulphate, *On strong heating* - copper oxide. **Deductions:** The blue powder is ***copper sulphate.***
5. Zinc nitrate *On strong heating* $2Zn(NO_3)_2$ → [white]	$2ZnO$ + $4NO_2$+O_2 [yellow - hot] [white - cold] [nitrogen dioxide]	• **Original colour** - White • **Colour change** - Turns yellow on strong heating. • **Gas evolved - [Water vapour** [initial]] NO_2 & O_2 ***Nitrogen dioxide*** - reddish brown, acidic to litmus, turns acidified ferrous sulphate solution brown. *Oxygen* - colourless, neutral, relits glowing splint. • **Residue -** Zinc oxide - formed [Yellow-hot, white-cold] **Deductions :** The white powder is ***hydrated zinc nitrate.***
6. Copper nitrate $2Cu(NO_3)_2$ → [Copper nitrate] [blue]	$2CuO$ + $4NO_2$+ O_2 [Copper oxide] [black] [Nitrogen dioxide] [Oxygen]	• **Original colour** - Blue • **Colour change** - Turns black on heating. • **Gas evolved - [Water vapour** [initial]] NO_2 & O_2 ***Nitrogen dioxide*** - reddish brown, acidic to litmus, turns acidified ferrous sulphate soln. brown. *Oxygen* - colourless, neutral, relits glowing splint. • **Residue -** Black copper oxide is formed. **Deductions:** The blue powder is ***copper nitrate.***

SUBSTANCE	PRODUCTS	OBSERVATION AND DEDUCTION
7. Lead nitrate $2Pb(NO_3)_2$ → [lead nitrate] [white]	$2PbO + 4NO_2 + O_2$ [litharge] [yellow] [nitrogen dioxide] [Oxygen]	• **Original colour** - White crystalline solid • **Colour change** - Turns yellow on heating, decrepitates and melts. • **Gas evolved - [Water vapour** [initial]] NO_2 &O_2 *Nitrogen dioxide* - reddish brown, acidic to litmus, turns acidified ferrous sulphate solution brown. *Oxygen* - colourless, neutral, relits glowing splint. • **Residue -** Litharge is formed on strong heating which fuses with the glass. **Deductions :** The white powder is ***lead nitrate***.
8. Ammonium chloride $NH_4Cl \underset{\text{cool}}{\overset{\text{heat}}{\rightleftharpoons}}$ [Ammonium chloride] [white]	$NH_3 + HCl$ [Ammonia] [colourless] [Hydrogen chloride] [colourless]	• **Original colour** - White crystalline • **On heat** - Sublimes on heating, evolving a basic [NH_3] and an acidic [HCl] gas which on cooling combines to form ammonium chloride sublimate which condenses on the cooler parts of the test tube. • **Residue -** No residue is left in the test tube. **Deductions :** The white powder is ***ammonium chloride***.
9. Iodine I_2 [s] → [Iodine - solid] [violet]	2 I [vapours] [Iodine - vapours] [violet vapours]	• **Original colour** - Violet crystals. • **Colour change** - Sublimes on heating evolving violet vapours. • **Gas evolved - Iodine vapours** a] *Colour* - Violet vapours b] *Test* - Fumes turns silver nitrate paper yellow • **Residue -** No residue is left in the test tube. **Deductions :** The violet crystals are of ***iodine***.
10. Ammonium dichromate $(NH_4)_2Cr_2O_7$ → [Ammonium dichromate] [orange]	$Cr_2O_3 + 4H_2O + N_2$ [Chromic oxide] [green]	• **Original colour** - Orange • **On strong heating -** decomposes violently with flashes of light leaving a voluminous green residue. • **Gases evolved - [Water vapour** [initial]], N_2 • **Residue -** Green chromic oxide on strong heating. **Deductions:** The orange powder is ***ammonium dichromate.***

III ADDITION OF DIL. SULPHURIC ACID – To the given [unknown] substance

SUBSTANCE	*OBSERVATION*	*INFERENCE*
1. SULPHIDE	• Colourless gas is evolved with a rotten egg smell. • Gas turns lead acetate paper silvery black	**Gas** : Hydrogen sulphide **Substance:** A sulphide **Equation** : $Na_2S + H_2SO_4 \rightarrow Na_2SO_4 + H_2S$
2. CARBONATE	• Colourless, odourless gas • Gas turns lime water milky but has no effect on potassium permanganate solution.	**Gas** : Carbon dioxide **Substance:** Carbonate or hydrogen carbonate **Equation** : $Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + H_2O + CO_2$ $2NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O + 2CO_2$
3. METAL	• Colourless, odourless gas is evolved with brisk effervescence • Gas burns with a 'pop' sound when burning splint brought near it.	**Gas** : Hydrogen **Substance:** Active metal **Equation** : $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

IV APPLICATION OF FLAME TEST - To identify the metal in the substance

METHOD	*Colour imparted to the flame*	*Colour - through blue glass*	*Metallic radical*
• Thin platinum wire is thoroughly cleaned and then heated – in a non-luminous flame of a burner.	Golden yellow	Pale yellow	Sodium [Na^{1+}]
• When the wire imparts no colour it is dipped in conc. HCl and then– into the substance to be identified.	Lilac	Violet	Potassium [K^{1+}]
• The wire is then reintroduced into the – non-luminous flame and the – colour imparted is noted.	Brick red	Pale green	Calcium [Ca^{2+}]

V DETERMINATION OF % COMPOSITION OF – MIXTURE

METHOD	*CALCULATIONS*
• Given mixture of – powdered salt & water wash sand is – taken in a beaker and weighed. • Add water to the mixture – to dissolve the salt and filter. Collect the filtrate & the residue [sand] separately. • Weigh the washed and dried sand.	Mass of beaker = X g. Mass of beaker + mixture = Y g. $\therefore$ Mass of mixture = [Y – X] g Mass of washed & dried sand = Z g. $\therefore$ [Y – X] g of mixture contains Z g. of sand $\therefore$ 100 g of mixture contains $\frac{Z \times 100}{[Y - X]}$ = 'A' $\therefore$ A = Percentage of sand in mixture.

VI EXPERIMENTS BASED ON – Hard & Soft water

Hard water – is water which *does not lather* with ordinary soap & contains dissolved – *Ca & Mg* [*bicarbonates, sulphates, chlorides*]. ***Soft water*** – is water which *lathers readily* with ordinary soap & *does not contain* dissolved calcium and magnesium salts.

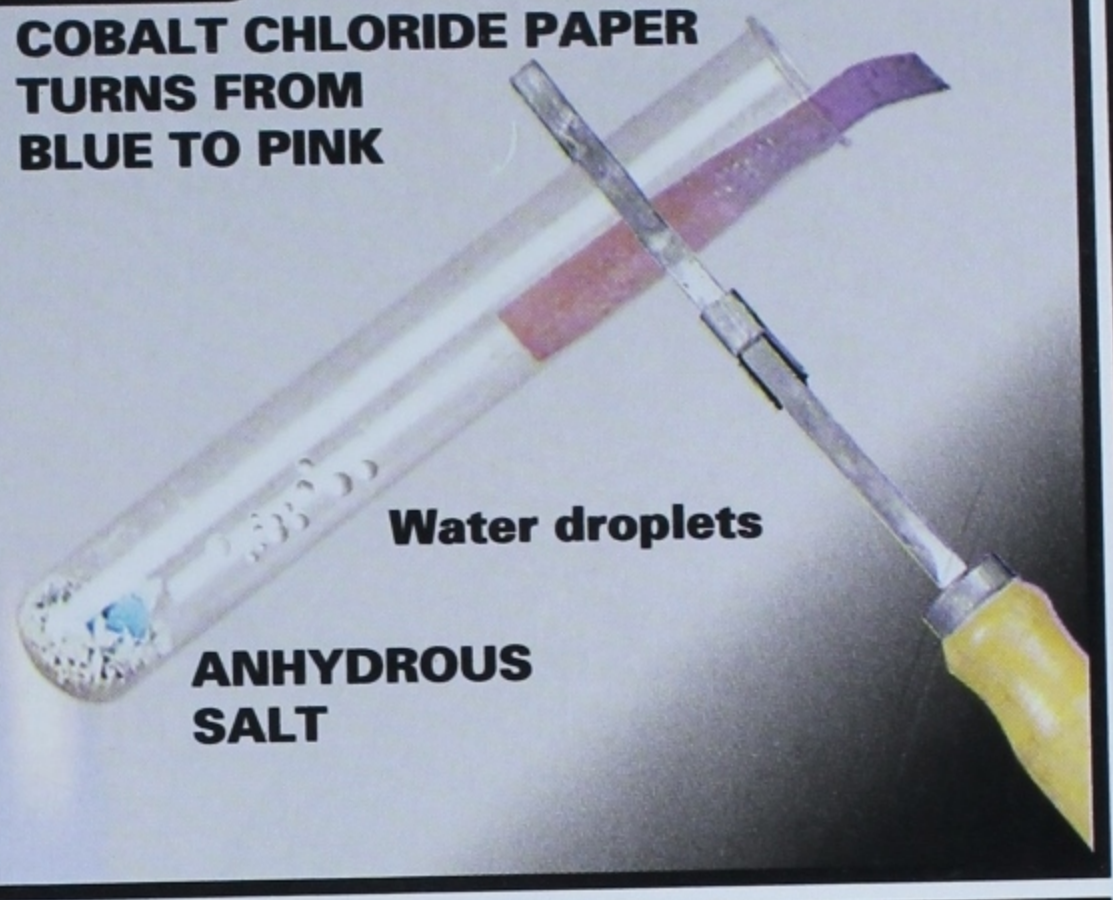
Hard water is further subdivided into – a] Temporary b] Permanent hard water

- ***Temporary hard water*** – contains *Ca* and *Mg - bicarbonates* in water.
- ***Permanent hard water*** contains *Ca & Mg - chlorides & sulphates* in water.

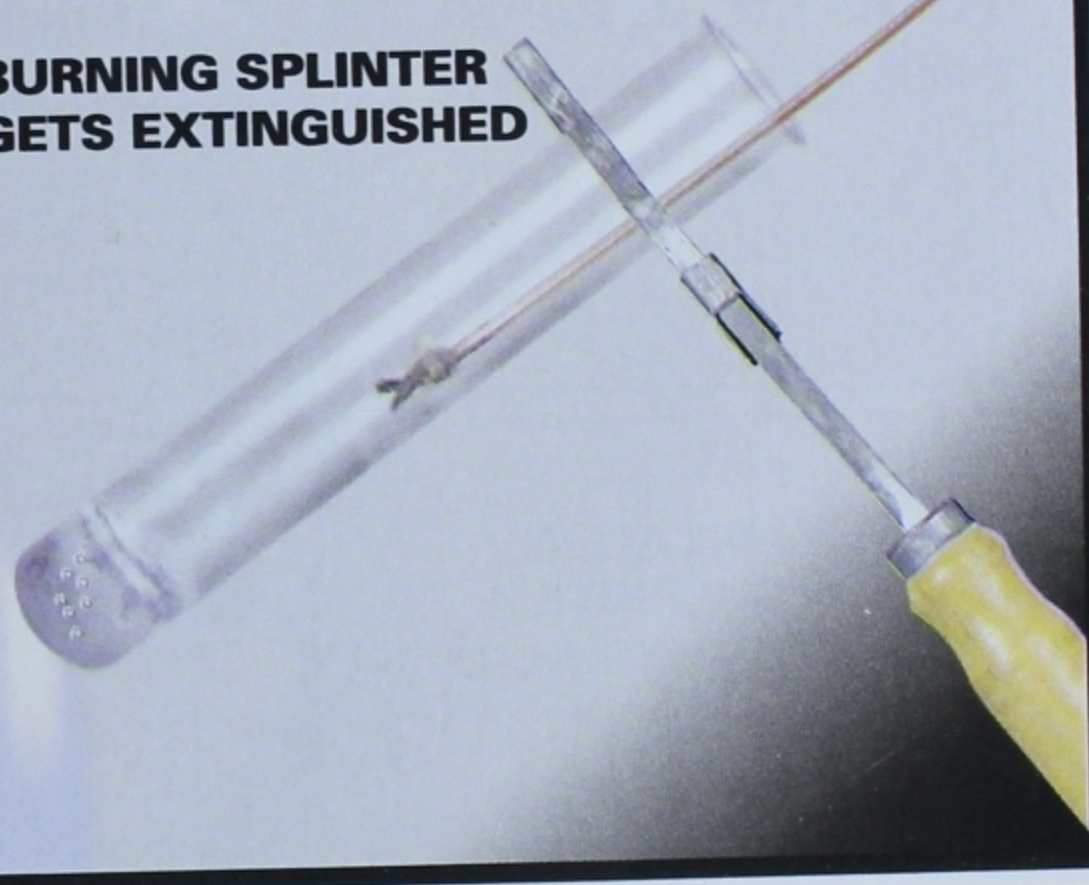
Experiment – Method	*Observation – Result*
EXPERIMENT – I **Differentiating hard water from soft water** • Two unknown samples 'X' and 'Y' containing *hard water* and *soft water* are taken – separately in a trough or beaker. • Ordinary soap is rubbed by the hands – inside each sample.	*Observation* • One sample of water 'X' lathers with soap. • The sample of water 'Y' does not lather with soap. *Result* • Sample 'X' which lathers is – *soft water.* • Sample 'Y' which does not lather is – *hard water.*
EXPERIMENT – II **Differentiating temporary & permanent hard water** • Two unknown samples 'A' and 'B' containing temporary & permanent hard water are taken– separately in a trough or beaker. • The water is boiled slowly, gases allowed to escape out, and then the water is filtered. • Ordinary soap is rubbed by the hands – inside each filtered sample.	*Observation* • One sample of water 'A' – *lathers with soap.* • The sample of water 'B' – *does not lather with soap.* *Result* • The boiled & filtered sample 'A' which lathers is *temporary hard water* – whose *hardness is removed by boiling.* Sample 'B' is *permanent hard water* – whose *hardness cannot be removed by boiling.*
EXPERIMENT – III **Temporary hard water softened by heating** • Temporary hard water is taken in a beaker and heated slowly. • After the gases escape out, the water is filtered through a filter paper. • Ordinary soap is rubbed – inside the filtered solution.	*Observation* • The boiled and filtered sample of – temporary hard water lathers readily with soap. *Result* • Temporary hard water can be – *softened by heating.* $Ca(HCO_3)_2 \longrightarrow CaCO_3\downarrow + CO_2 + H_2O$ [in temporary hard water] [ppt. filtered out] [filtered water is soft]
EXPERIMENT – IV **Temporary and permanent hard water softened by addition of washing soda** • Temporary & permanent hard water are taken separately in beakers & washing soda is added to each sample of water. The above solutions are filtered – to remove the precipitate formed. • Ordinary soap is rubbed – inside the filtered solution.	*Observation* • The filtered sample of temporary & permanent hard water lathers – readily with ordinary soap. *Result* • *Temporary hard water & Permanent hard water* can be – softened by using washing soda.
EXPERIMENT – V **Advantage of using detergents over soap** • A sample of hard water 'X' is taken and ordinary soap is rubbed inside the water. • Another sample of hard water 'Y' is taken and detergent is rubbed inside the water. [Detergents are sodium salts of sulphonic acid and do not form scum.]	*Observation* • Lather forms in 'Y' but not in 'X'. *Result* • Detergents form lather even with hard water, while ordinary soap is wasted due to formation of scum. $Ca(HCO_3)_2 + 2NaSt \longrightarrow Ca(St)_2\downarrow + 2NaHCO_3$ [in hard water] [soap] [scum]

I. Identification of Gases

1. WATER VAPOUR



2. HYDROGEN



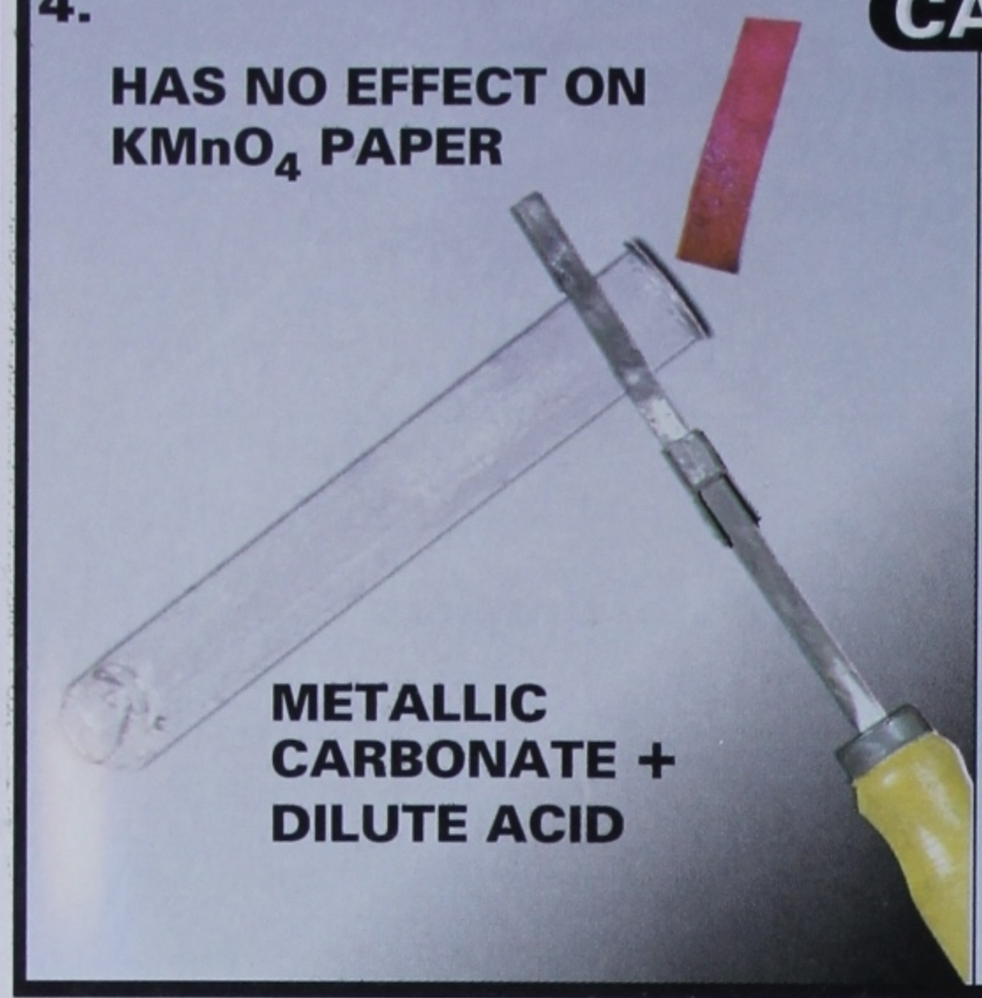
3. OXYGEN

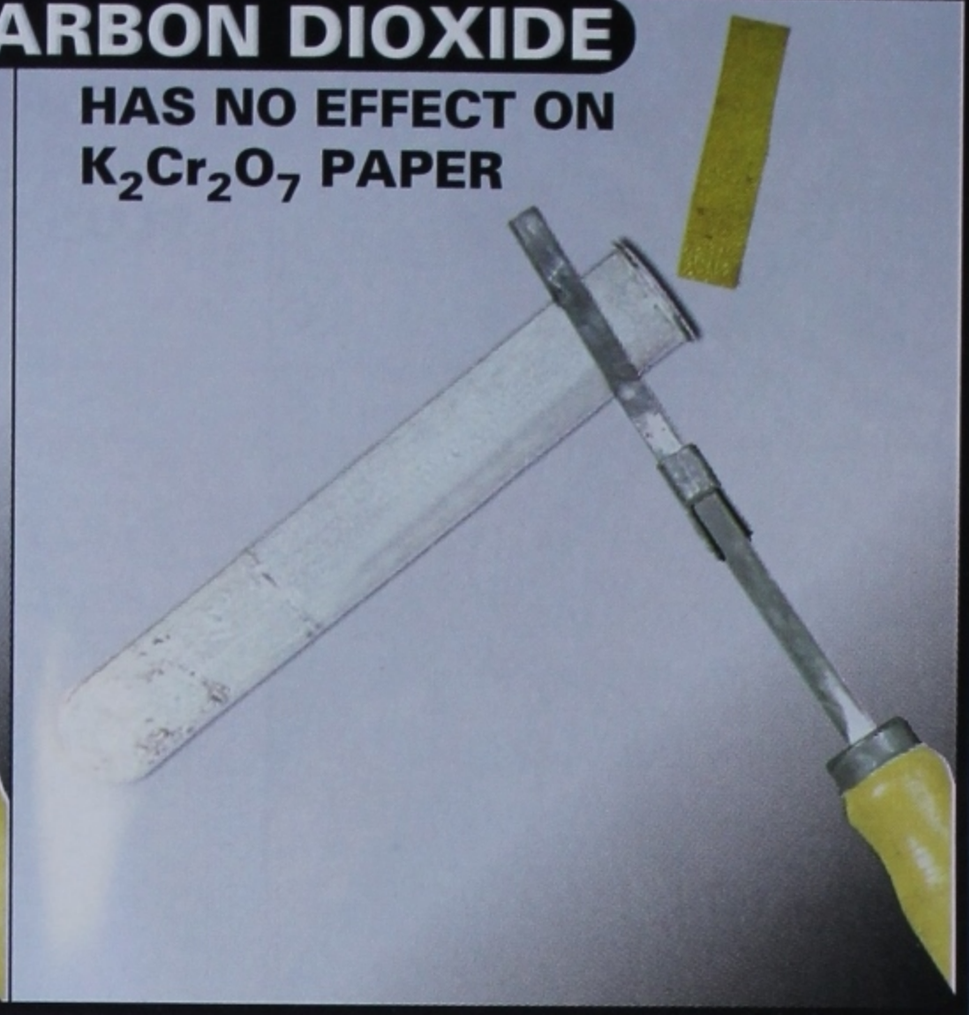
Identification of Gases

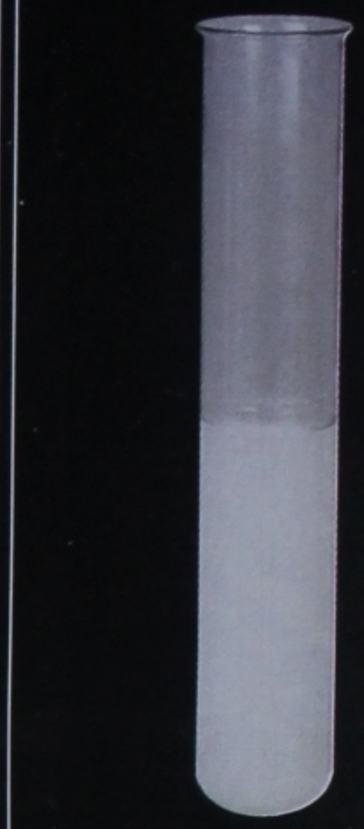
4. CARBON DIOXIDE

HAS NO EFFECT ON $KMnO_4$ PAPER

HAS NO EFFECT ON $K_2Cr_2O_7$ PAPER





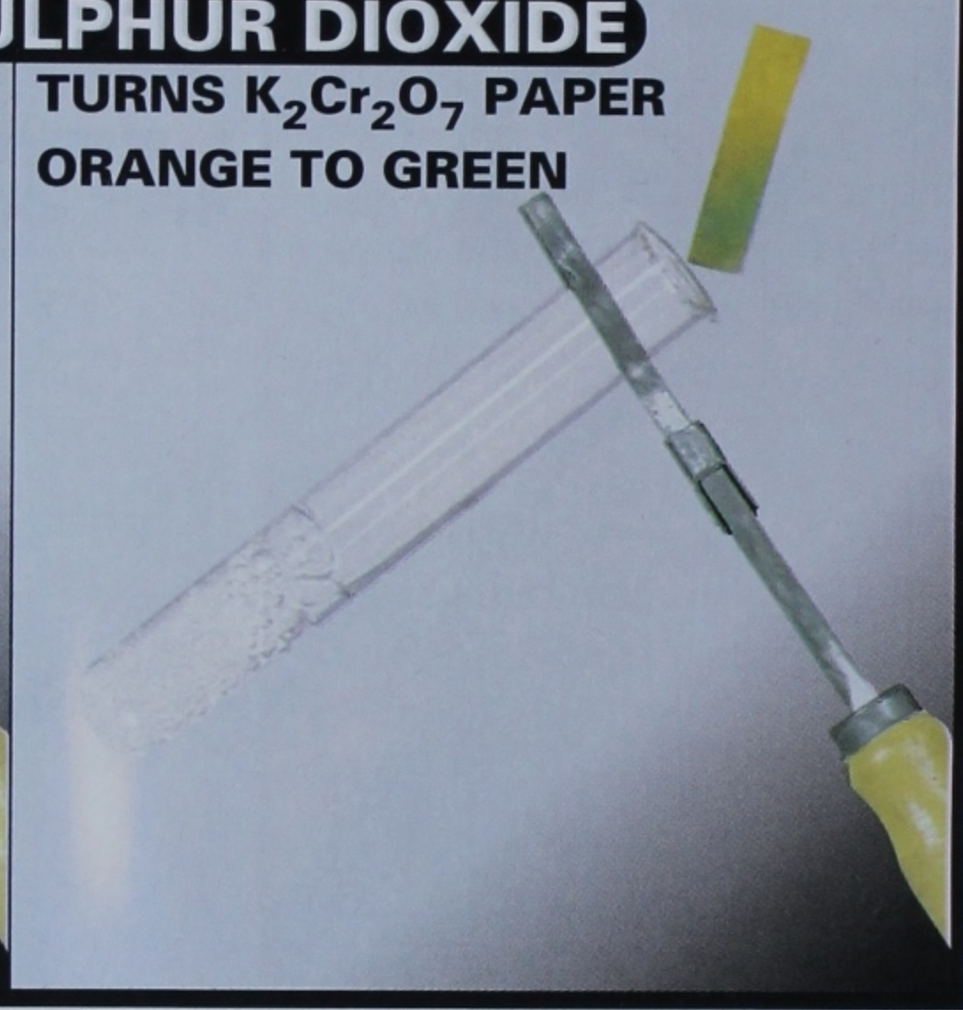


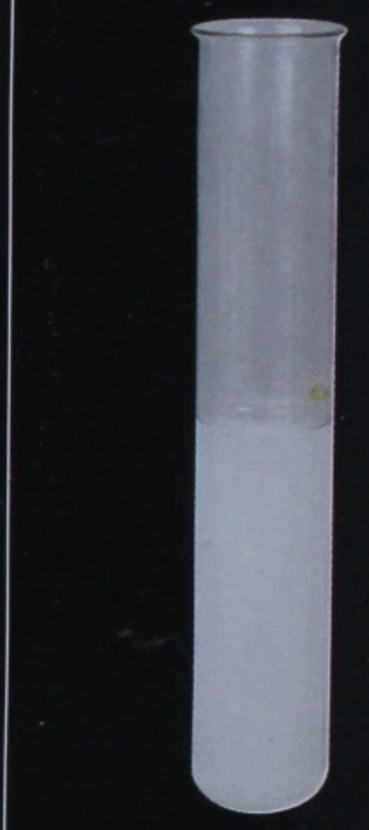
GAS TURNS
LIME WATER MILKY

5. SULPHUR DIOXIDE

TURNS $KMnO_4$ PAPER
PINK TO COLOURLESS

TURNS $K_2Cr_2O_7$ PAPER
ORANGE TO GREEN



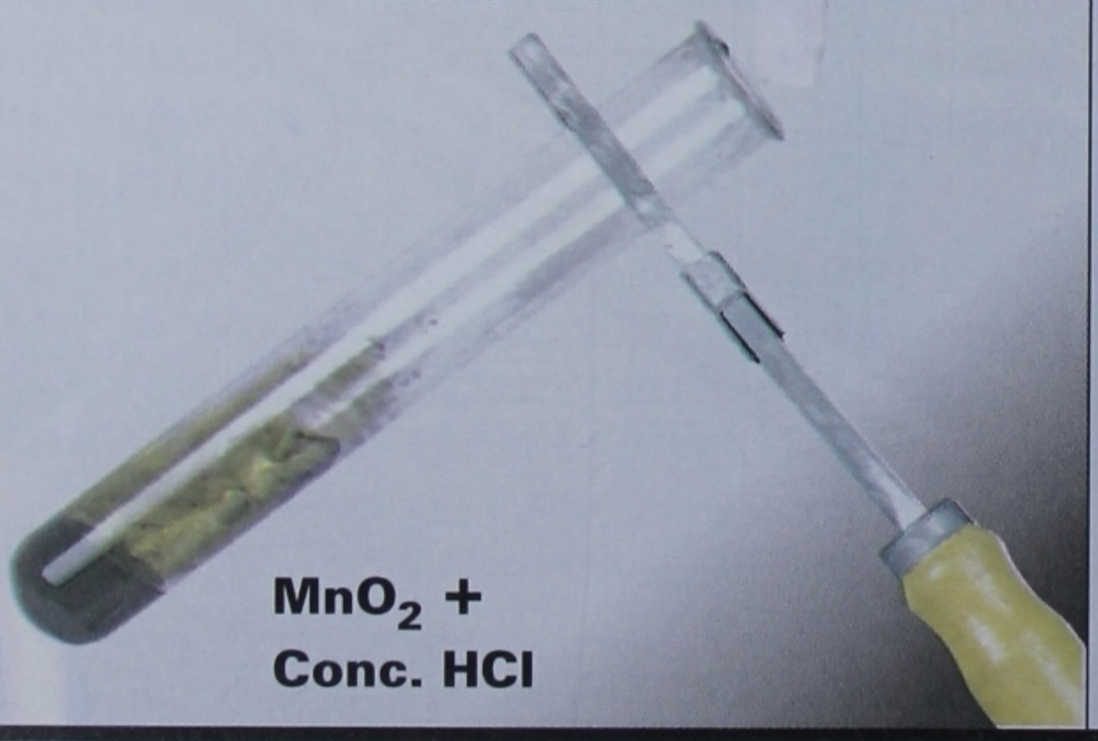


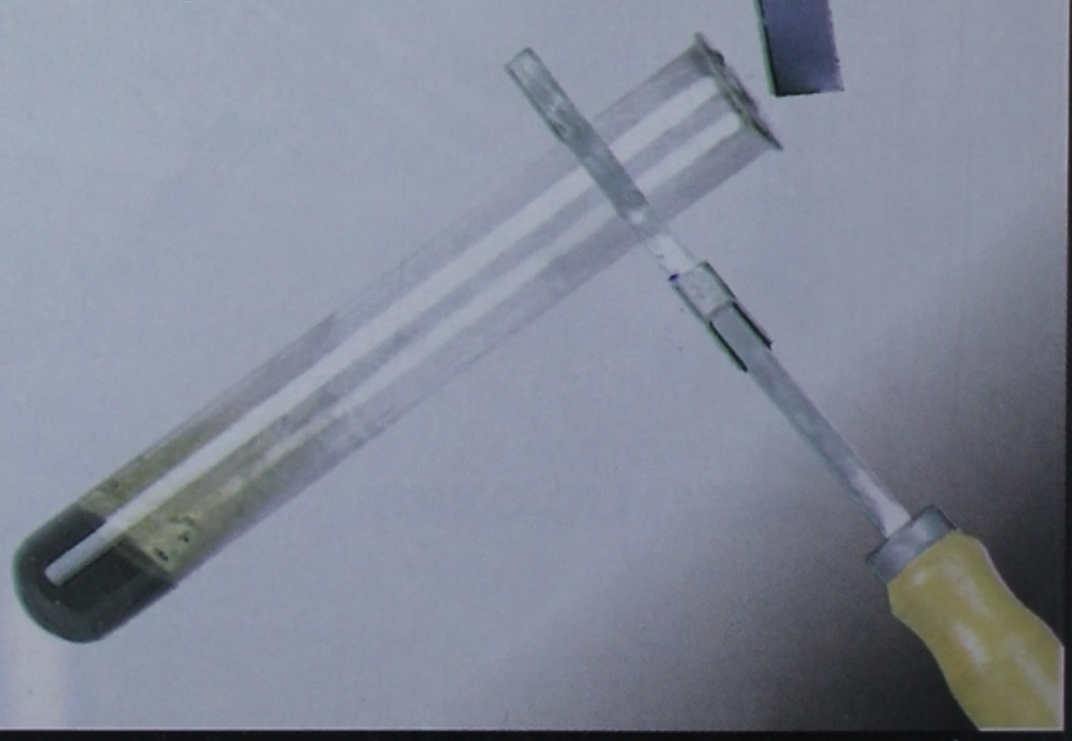
GAS TURNS
LIME WATER MILKY

6. CHLORINE

TURNS
MOIST BLUE LITMUS PAPER
RED & THEN BLEACHES IT

TURNS
MOIST STARCH IODIDE PAPER
BLUE BLACK

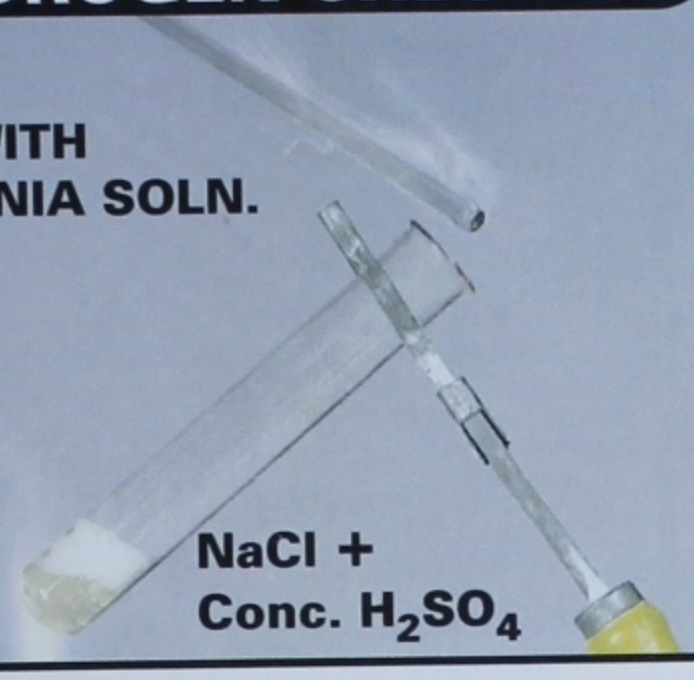




Identification of Gases

7. HYDROGEN CHLORIDE

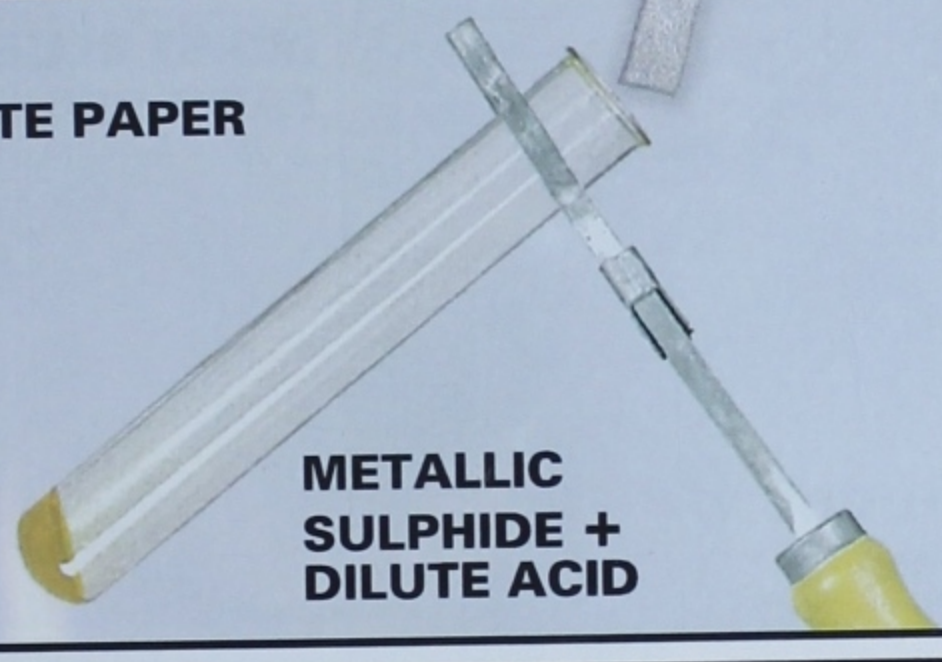
GIVES DENSE WHITE FUMES WITH GLASS ROD DIPPED IN AMMONIA SOLN.



$NaCl$ +
Conc. H_2SO_4

8. HYDROGEN SULPHIDE

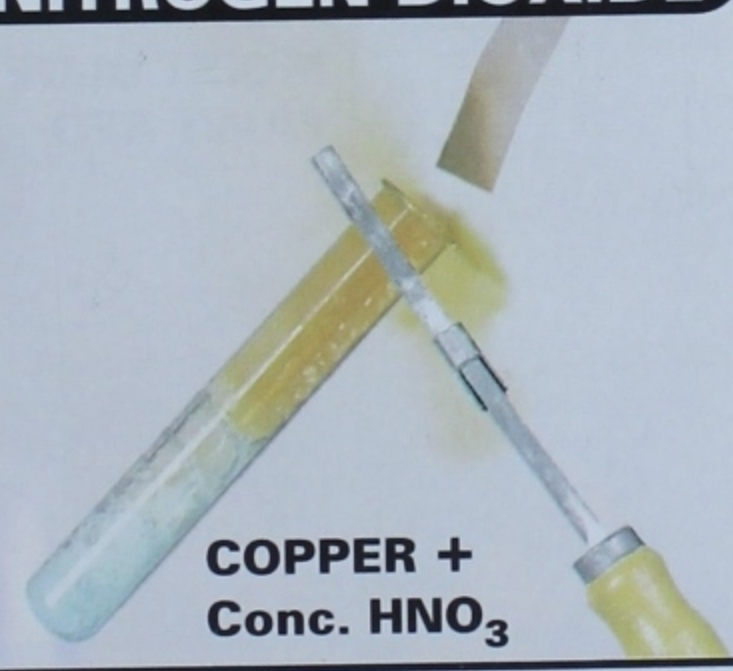
TURNS MOIST LEAD ACETATE PAPER SILVERY BLACK



METALLIC SULPHIDE +
DILUTE ACID

9. NITROGEN DIOXIDE

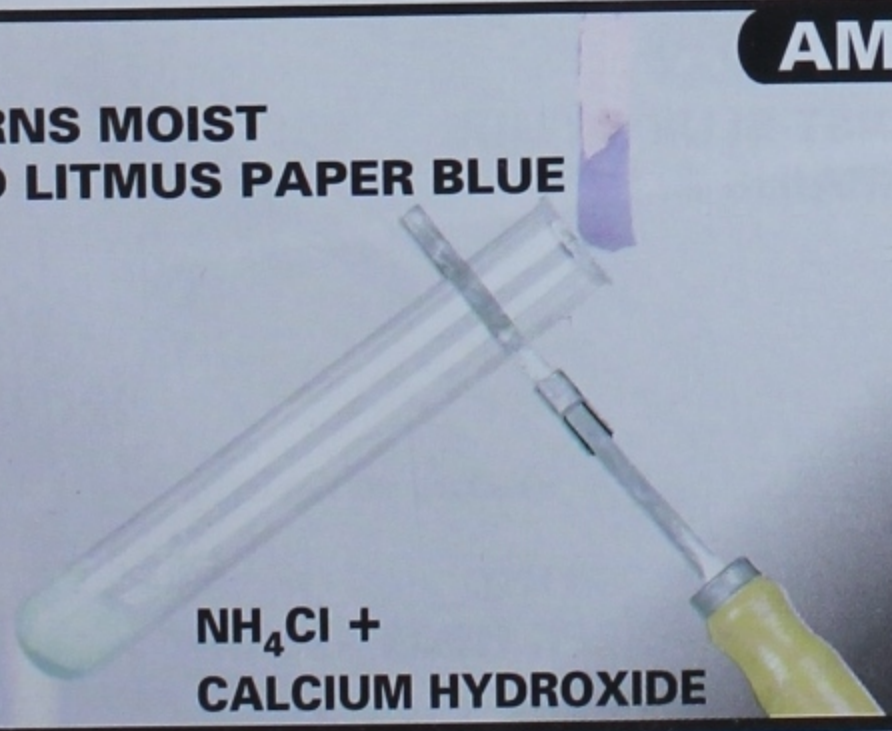
REDDISH BROWN FUMES EVOLVED
TURNS KI PAPER BROWN



COPPER +
Conc. HNO_3

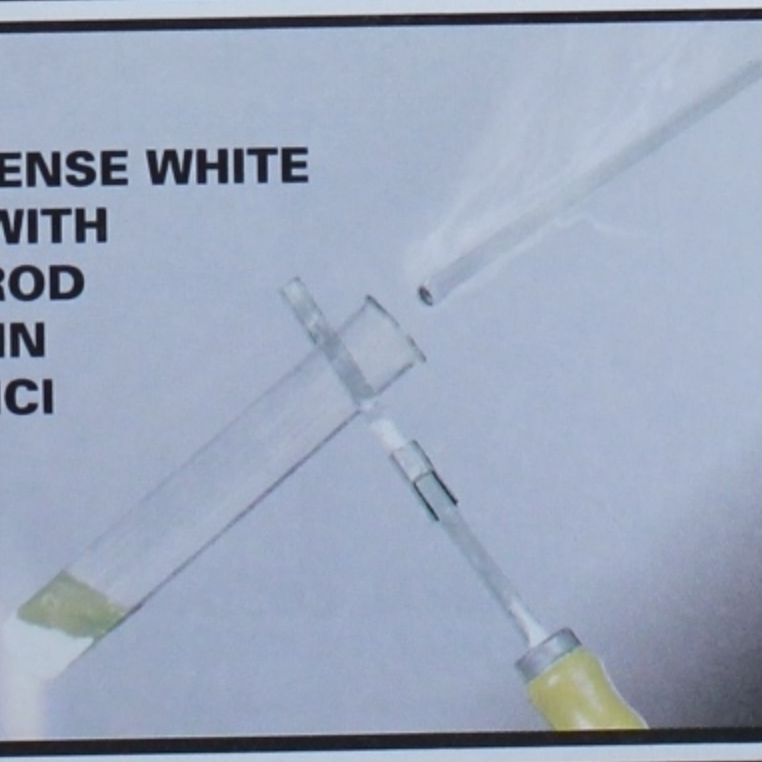
10. AMMONIA

TURNS MOIST RED LITMUS PAPER BLUE



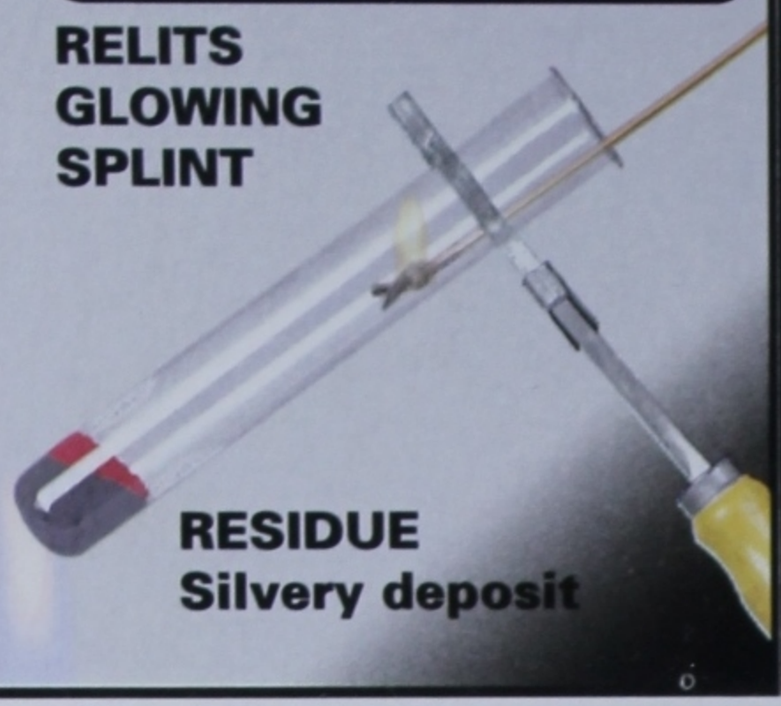
NH_4Cl +
CALCIUM HYDROXIDE

GIVES DENSE WHITE FUMES WITH GLASS ROD DIPPED IN CONC. HCl



II. Action of heat on the given substance

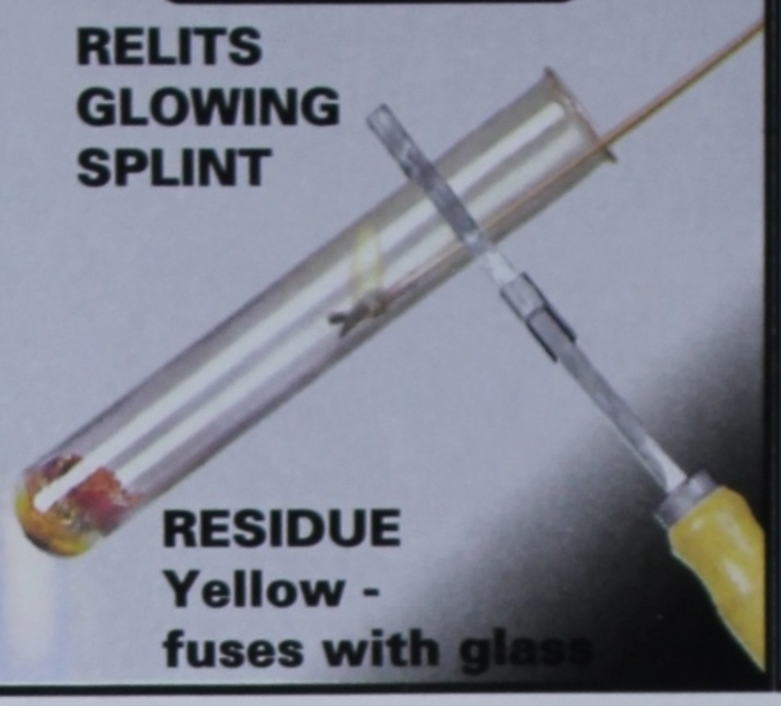
1. MERCURY [II] OXIDE



RELITS GLOWING SPLINT

RESIDUE
Silvery deposit

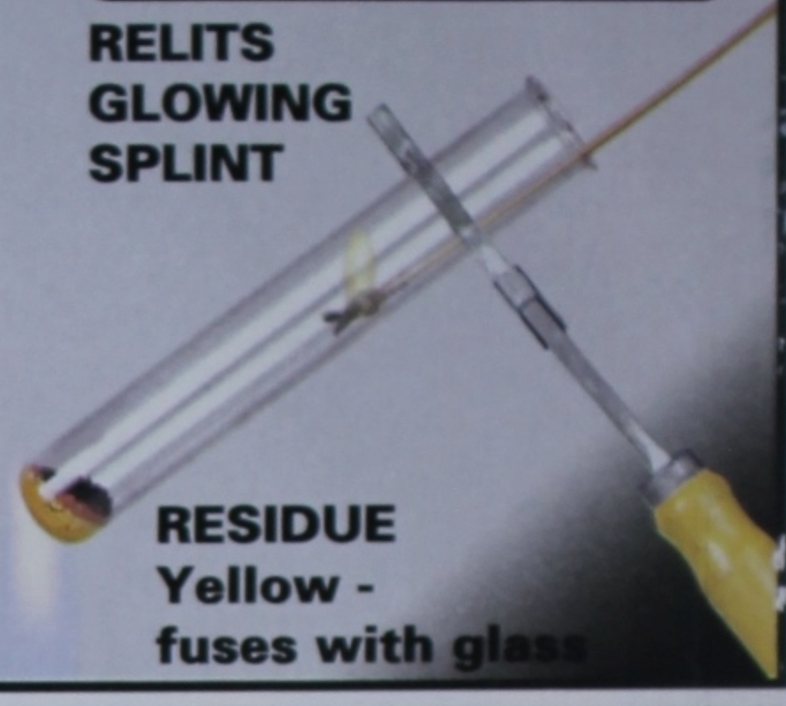
2. RED LEAD



RELITS GLOWING SPLINT

RESIDUE
Yellow - fuses with glass

3. LEAD [IV] OXIDE



RELITS GLOWING SPLINT

RESIDUE
Yellow - fuses with glass

4. COPPER CARBONATE

ORIGINAL COLOUR
Light Green

MOIST BLUE LITMUS TURNS FAINT RED

RESIDUE
AFTER HEAT - Black

5. ZINC CARBONATE

ORIGINAL COLOUR
White

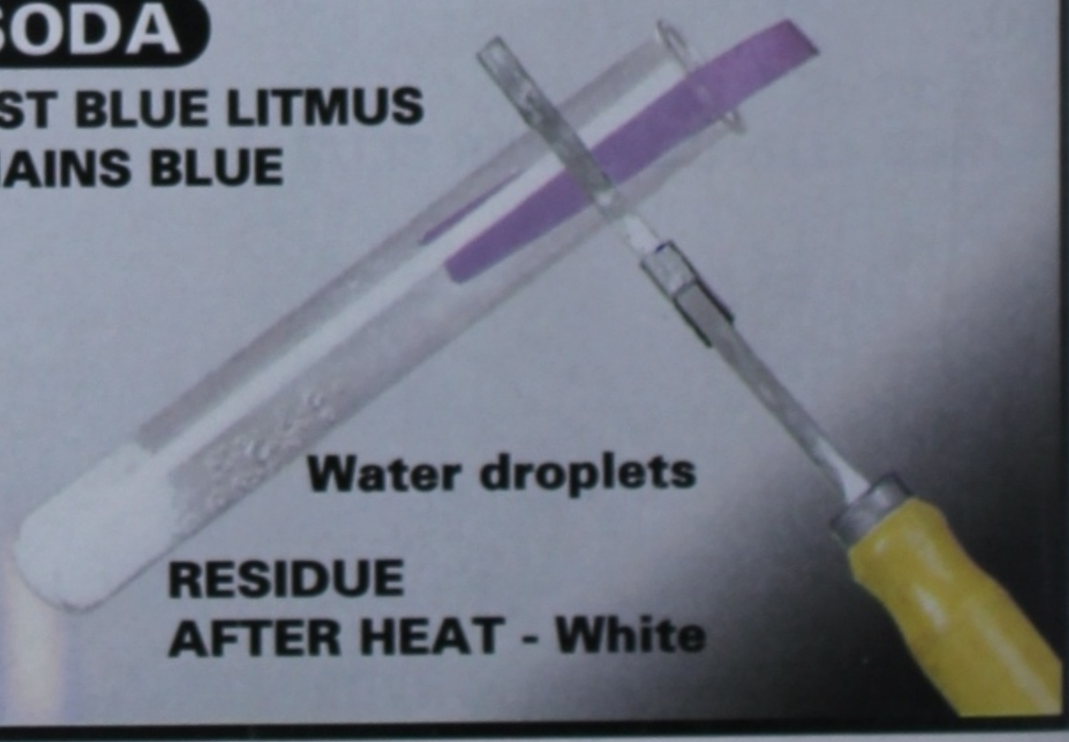
MOIST BLUE LITMUS TURNS FAINT RED

RESIDUE
WHEN HOT - Yellow

6. WASHING SODA

ORIGINAL COLOUR
White

MOIST BLUE LITMUS REMAINS BLUE



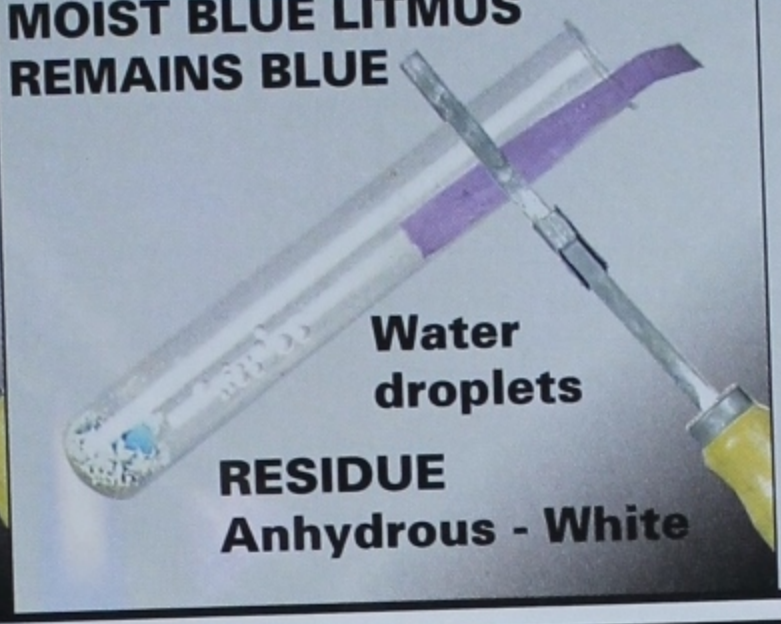
Water droplets

RESIDUE
AFTER HEAT - White

Action of heat on the given substance

7. COPPER SULPHATE

ORIGINAL COLOUR
Hydrous - Blue



MOIST BLUE LITMUS
REMAINS BLUE

Water
droplets

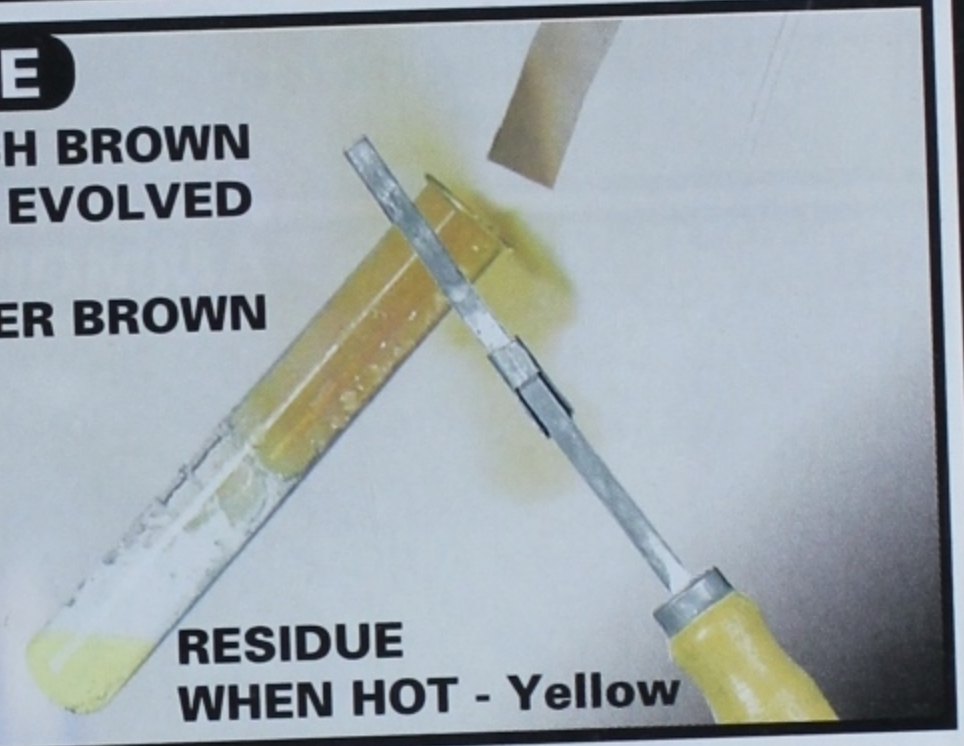
RESIDUE
Anhydrous - White

RESIDUE -
On strong heating -
Black

8. ZINC NITRATE

ORIGINAL COLOUR
White

REDDISH BROWN
FUMES EVOLVED
TURNS
KI PAPER BROWN

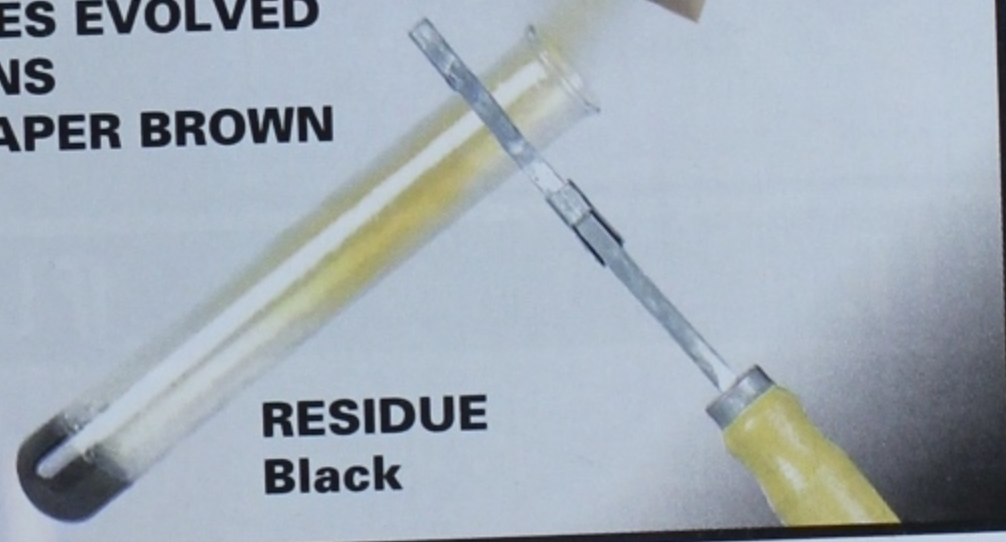


RESIDUE
WHEN HOT - Yellow

9. COPPER NITRATE

ORIGINAL COLOUR
Blue

REDDISH BROWN
FUMES EVOLVED
TURNS
KI PAPER BROWN



RESIDUE
Black

10. LEAD NITRATE

ORIGINAL COLOUR
White

REDDISH BROWN
FUMES EVOLVED
TURNS
KI PAPER BROWN

RESIDUE
Yellow

Action of heat on the given substance

11. AMMONIUM CHLORIDE

ON HEATING
White sublimate formed

12. IODINE

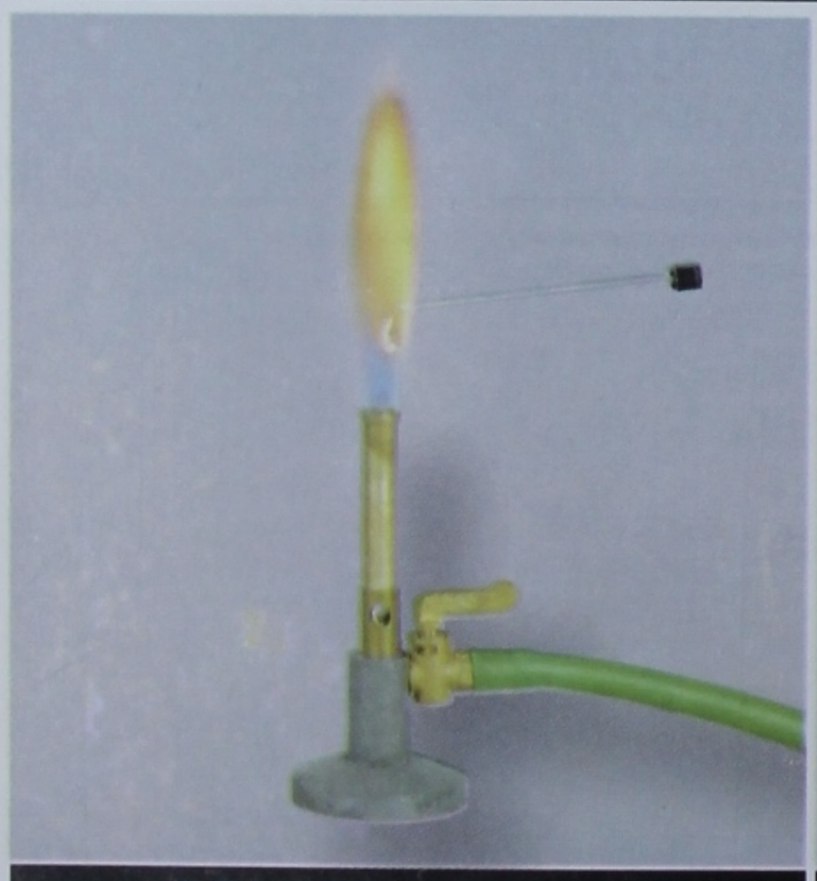
ON HEATING
Violet vapours evolved

13. AMMONIUM DICHROMATE

ORIGINAL COLOUR
Orange

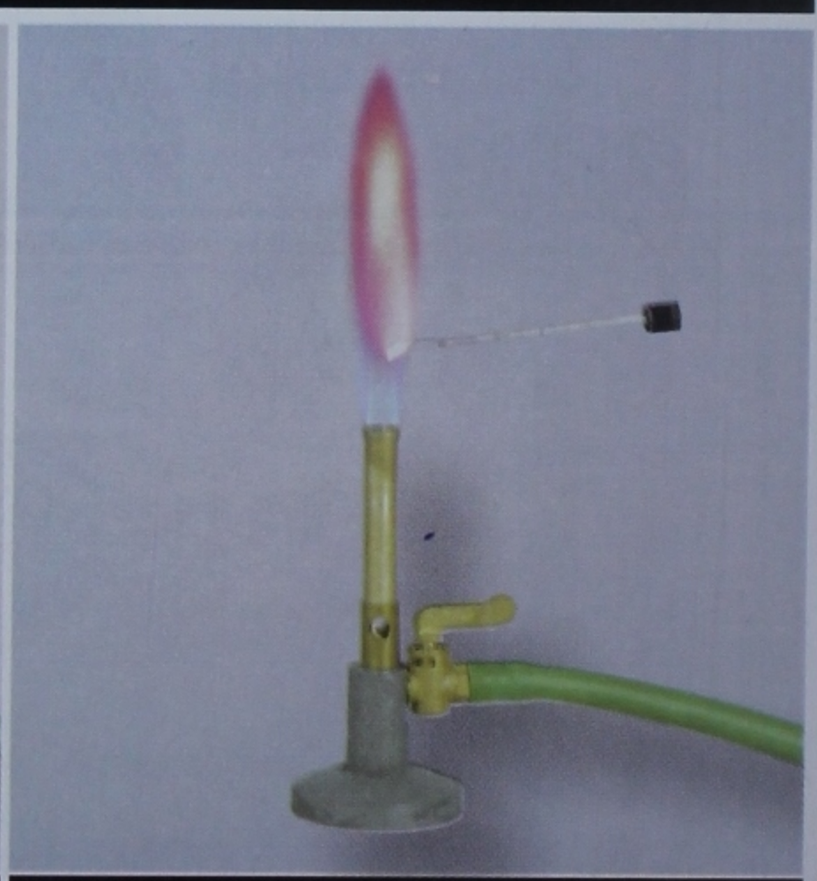
RESIDUE
Green

III. Flame Test



GOLDEN YELLOW
Sodium - Na^{1+}

LILAC
Potassium - K^{1+}



BRICK RED
Calcium - Ca^{2+}

VII DETERMINATION OF – The Quality of Water

Experiment - Find the *sources of pollution of water bodies* in the locality & *determine the quality of water*

- ***Sources of polluted water may include*** - run off water from streets, garden lawns, septic tank discharges or waste water from sewage waste & other samples of *fresh water* & *marine water*.

- **The Water Quality Indicators include -**

Water quality indicators	Test performed for – determining quality of water
• *Physical*	Turbidity, temperature, specific conductance, dissolved solids - clarity, colour, odour, salinity etc.
• *Chemical*	pH of water, dissolved oxygen in water, dissolved nutrients in water.
• *Biological*	Presence of algae, bacteria, viruses etc.

- **Simple Tests – for determining the quality of a sample of water**

• ***Turbidity***	***Turbidity*** – refers to the particulate matter suspended in water bodies. ***Measurement*** – By use of a handheld - *turbidity meter* which measures - the *scattering of light* by matter, when a beam of light is passed into water. ***Conclusion*** – Measurement helps to calculate inputs from *nutrients* & *soil erosion*.
• ***Temperature***	***Measurement*** – By use of an accurate *thermometer*. ***Conclusion*** – Hot water from industrial plants, affects the - temperature of water bodies it enters. Warm water holds less oxygen and hence affects survival of living species.
• ***Specific conductance***	***Measurement*** – Simple *electrolytic cell* – to determine the degree to which water can conduct electricity. ***Conclusion*** – Low specific conductance indicates – less polluted water.
• ***Dissolved solids***	***Measurement*** – The sample of water is *filtered* & then *evaporated*. The solids left behind are then – *chemically tested*. ***Conclusion*** – Dissolved inorganic matter such as – bicarbonate, chlorides may cause *hardness in water*. Dissolved solids make water look & taste unpleasant.
• ***pH of water***	***Measurement*** – By use of *pH paper* or *electronic pH-meter*. ***Conclusion*** – Changes in pH of water affects dissolution of chemicals in water and survival of certain organisms which cannot exist in highly acidic water. [unpolluted water generally has a pH range around 6.5 to 8]
• ***Dissolved oxygen***	***Measurement*** – The sample of water is tested by using special field kits. ***Conclusion*** – Unpolluted water have high amount of dissolved oxygen [DO] whose presence & amount is responsible for survival of aquatic organisms. [Temperature & speed of water affect the amount of dissolved oxygen]
• ***Dissolved nutrients***	***Measurement*** – Residual water after evaporation is subjected to - chemical tests. ***Conclusion*** – Increase in nutrients affects - pH value, clarity & temperature of water. Increase in 'nitrogen & phosphorous' will result in *eutrophication*.
• ***Bacteria***	***Measurement*** – Test for coliform bacteria in the water sample using various methods including a medium called m-endroth. ***Conclusion*** – Presence of bacteria along with viruses are detrimental to human health.

Additional Questions

1. Give a *chemical test* to distinguish between the following gases :
   a] Hydrogen and oxygen
   b] Carbon dioxide and sulphur dioxide
   c] Hydrogen chloride and hydrogen sulphide
   d] Chlorine and nitrogen dioxide
   e] Ammonia and hydrogen chloride
   f] Sulphur dioxide and chlorine.
2. *On heating* which of the following substances i.e. copper carbonate, zinc carbonate, washing soda, copper sulphate, zinc nitrate, copper nitrate, lead nitrate, ammonium chloride and ammonium dichromate - relate to the reactions given below.
   a] A white substance which leaves an amphoteric oxide as a residue [whose colour varies in the heated and in the cold state] and evolves a gas which turns lime water milky.
   b] An efflorescent substance which leaves a residue having the same colour as the substance and evolves a gas which changes the colour of cobalt chloride paper.
   c] A white solid which evolves two colourless gases which on cooling combine and condense on the cooler parts of the test tube.
   d] A coloured substance which decomposes violently leaving a coloured residue and evolving two neutral gases one of which is unreactive or inert in nature.
   e] A coloured substance which leaves a black residue and evolves two gases one of which is acidic and coloured and the other neutral and colourless.
   f] A coloured substance which leaves on strong heating a black residue and evolves two colourless gases one of which is acidic and the other neutral.
   g] A white crystalline solid which decrepitates on heating leaving a residue which fuses with the glass and evolves two gases one of which is coloured and acidic.
   h] An amorphous substance which turns from pale green to black on strong heating evolving a colourless, acidic gas as the only gaseous product.
3. Give balanced equations for the following conversions *affected by heat alone* on the substances :
   a] Copper carbonate to copper oxide;
   b] Hydrated copper sulphate to sulphur dioxide;
   c] Copper nitrate to nitrogen dioxide;
   d] Ammonium dichromate to nitrogen;
   e] Zinc carbonate to zinc oxide;
   f] Zinc nitrate to nitrogen dioxide
4. Using dilute sulphuric acid how would you differentiate between :
   a] Sodium sulphide and sodium carbonate.
   b] Copper and magnesium.
   How would you identify the gaseous products evolved.
5. Using a platinum wire, conc. hydrochloric acid and a bunsen burner how would you distinguish between the three salts ie. sodium chloride, potassium chloride and calcium chloride. Explain in brief the method used for the same.
6. A mixture consists of 20% sodium chloride and 80% sand. Explain practically in brief a simple method involved to ascertain the correct percentages in the mixture.
7. Using given samples of temporary and permanent hard water, soft water, ordinary soap, detergent and washing soda how would you- a] distinguish between hard and soft water b] distinguish between temporary hard water and permanent hard water c] remove temporary hardness from water without using a chemical compound d] remove temporary hardness and permanent hardness from water using a chemical compound e] prove the advantage of detergent over soap.
8. To determine the quality of water in different water samples collected from water sources, specific tests are performed. State four physical tests & three chemical tests performed to determine the quality of water. For each test explain how the test is conducted & the conclusion drawn about the quality of water.

Unit Test Paper — Practical Chemistry

30 marks

Q.1 Select the correct gas from A to F which matches with the descriptions 1 to 5. [5]

A: CO_2 B: SO_2 C: NH_3 D: Water vapour E: Cl_2 F: H_2S

1. Turns moist blue litmus red and then bleaches it.
2. Turns moist red litmus paper blue.
3. Turns lime water milky and blue litmus paper slightly pink.
4. Turns cobalt chloride paper from blue to pink.
5. Turns lead acetate paper from white to silvery black.

Q.2 Select the correct salt from list II which on thermal decomposition exhibits the change in colour from list I – 1 to 5. [5]

List-I

1. Light green to black
2. White to yellow [heated state]
3. Blue to black
4. Orange to green
5. Blue to white

List-II

A: Copper carbonate

B: Hydrated Copper sulphate

C: Copper nitrate

D: Ammonium dichromate

E: Zinc nitrate

Q.3 State which of the substances given below evolves oxygen gas on thermal decomposition. [5]

1. Zinc carbonate
2. Washing soda
3. Lead nitrate
4. Ammonium dichromate
5. Trilead tetroxide
6. Zinc nitrate
7. Mercury [II] oxide
8. Anhydrous copper sulphate

Q.4 Complete the table given below. [10]

1.	Heat on copper nitrate	• Colour of acidic gas evolved	_____
2.	Heat on iodine crystals	• Colour of vapours evolved	_____
3.	Heat on ammonium dichromate	• Name of neutral gas evolved	_____
4.	Heat on copper carbonate	• Test for gas evolved	_____
5.	Heat on zinc nitrate	• Colour of residue	_____
6.	Addition of dil. H_2SO_4 to FeS	• Odour of gas evolved	_____
7.	Addition of dil. H_2SO_4 to $KHCO_3$	• Name of residue obtained	_____
8.	Addition of dil. H_2SO_4 to zinc	• Test for gas evolved	_____
9.	Heat on sodium chloride	• Colour imparted to flame during flame test	_____
10.	Flame test for calcium chloride	• Acid used for flame test	_____

Q.5 Select the correct answer from the words in bracket. [5]

1. Hard and soft water can be distinguished using _____ [dil. acid / ordinary soap / detergent].
2. Low specific conductance of water indicates _____ [less / more] pollution in water.
3. The type of water softened by addition of washing soda is ____ [permanent / temporary / both types].
4. Unpolluted water has _____ [high / low] amount of dissolved oxygen.
5. The sample of hard water which lathers with soap after boiling & filtration contains _____ [calcium chloride / calcium bicarbonate].