EXPERIMENT – 1

AIM - Identification of two cations and two anions in a given sample of ore / powder/ mixture.

APPRATUS:-

Conical flask, test Tube, Reagent, spirit lamp, chemicals required.

OBSERVATION TABLE:-

(A) Table for Acid

Experiment	Observation	Inference

(B) Table for Basic Radical

Experiment	Observation	Inference

RESULT:-

The given mixture contains :-

Acid Radical		
Basic Radical		

PR ECAUTION:-

1. Take care by using conc. acid group.
2. Mixture should be taken less or sufficient quantity.
3. Take care by using conc. acid group.
4. Mixture should be taken less or sufficient quantity.
5. Take care by using conc. acid group.

EXPERIMENT – 2

AIM:- To determine percentage of iron in given salt of iron. (Ferrous ammonium sulphate)

THEORY : Ferrous ammonium sulphate is a stable salt and can be oxidized easily with acidified $KMnO_4$ to the ferric salt as given by the equation.

$2MnO4^{-}$ $+16H^{+}$ $+ 10Fe^{2+}$ → $2Mn^{2+}$ $+ 10Fe^{3+}$ +8H2O and

2KMnO4 +8H2SO4 + 10FeSO4 → $2MnSO_4$+ $5Fe_2(SO_4)_3$+K_2SO_4+$8H_2O$

PROCEDURE:-

(A) Standardisation of $KMnO_4$ solution.

$KMnO_4$ solution is standardized by titrating it with standard Ferrous Ammonium Sulphate (FAS) solution. Standard solution of FAS (say N/30) in 100 ml is prepared by weighing out the requisite amount of the salt (1.307g) and dissolving in water acidified with dil H_2SO_4 to check hydrolysis. Now 10ml of this solution is taken in a conical flask and 5ml dil H_2SO_4 is added and titrated with $KnSO_4$ solution till a permanent light pink colour is obtained. The titration is repeated until three concordant readings are obtained from the normality a standard FAS solution, its volume and the volume of $KMnO_4$ used. The normality of $KMnO_4$ solution in calculated let it be N

(B) Determination of strength of unknown given Fe-salt (FAS) solution.

W g of the given FAS salt is dissolved in 100ml of water, acidified with dil H_2SO_4. 10 ml of the solution is now titrated with the same

$KMnO_4$ solution as above until permanent light pink colour in obtained. Titration is repeated to get concordant reading. Let the volume $KMnO_4$ solution used be V_1 ml.

$$= \frac{N_1 V_1}{V2} \times 392 = p \text{ g/l (say)}$$

i.e. 1000 ml FAS solution contains Pg of FAS

$$\therefore \text{ 100 ml FAS } = \frac{P \times 100}{1000} = \frac{P}{10} \text{ g}$$

Again 392 g FAS salt contains 55.85 g Fe

$$\therefore \frac{P}{10} \text{ g FAS salt contains Fe } \frac{55.85 \times P}{392 \times 10} \text{ g} = Q.\text{g (say)}$$

i.e. Amount of Fe is the given FAS salt of Q.g.

Since W g of the given FAS salt contains Qg Fe

$$\therefore \text{ 100 g } \frac{Q \times 100}{w} \text{ g}$$

$$\text{\% of iron} = \frac{\text{wt of iron in sample}}{\text{wt of sample}} \times 100$$

i.e. percentage of Fe in the given FAS salt

$$= \frac{Q \times 100}{w}$$

$$55.85 \times P \times 100$$

$$= \frac{\qquad}{392 \times 10 \times w}$$

$$= \frac{55.85 \times N_1 \times V_1 \times 392 \times 100}{392 \times 10 \times w \times V2}$$

$$\frac{N_1 \times V_1 \times 55.85 \times 10}{V2 \times w}$$

OBSERVATION :-

Standardization of $KMnO_4$ Soln. by N/30 FAS

S.No.	Reading of Burette		Vol. of FAS
	Initial	Final	
1. 2.			

CALCULATION:-

(A) Standardization of $KMnO_4$ Solution

Volume of FAS solution taken = V

Normality of FAS solution = N

Volume of $KMnO_4$ used = V_1

So, Normality of $KMnO_4$ Solution , $N_1 = \frac{NV}{V_1}$

Observation Table

Standardization of Fe in the given unknown FAS salt

S.No.	Reading of Burette		Vol. of FAS
	Initial	Final	
1. 2.			

Concordant Vol. = …….. ml

(B) Determination of Fe in the given unknown FAS Salt :

Normality of $KMnO_4$ Solution = N_1
Volume of $KMnO_4$ used = V_1
Volume of FAS solution taken = V2
Normality of FAS = N2

Using, $N_1 V_1 = N2V2$, the normality of FAS solution,

$$N2 = \frac{N_1 V_1}{V2}$$

Strength of FAS in g/l = Normality x Eq. wt.

RESULT:- The given salt contains …….% iron

PRECAUTIONS:-

1. The reading should be taken carefully.
2. all apparatus should be dry & clean

EXPERIMENT – 3

OBJECT:- To measure the pH of different solution.

REQUIRMENTS:-

Digital pH meter, beaker, different solutions, buffer solution.

PRINCIPLE:-

Hydrogen ion concentration of a solution is a very important quantity in analytical chemistry.

As a matter of fact it is difficult to express pH value in words and Sorensen"s method is a mathematical one.

This is represented as:-

$$pH = \log_{10} [1/H^+]$$

Or

$$pH = \log_{10} 1 - \log_{10} [H^+]$$

$$pH = -\log_{10} [H^+]$$

When the pH value of a solution is from Zero to less than seven then the solution will be acidic and when it is from above 7 to 14, then it is alkaline. At pH =7 the solution will be neutral.

METHOD:-

1) Connecting the electrode:
   a) Set up the electrode stand and fit the pH electrode into it.
   b) Carefully remove the procreative rubber cap from the filling hole of electrode . The level of KCl solution should be a few mm below the hole. Top up if necessary with saturated KCl solution. Now put the rubber cap back.
2) Preparation of buffer solutions: Dissolve one buffer tablet or powder pack of 7 pH in 100 ml distilled water. The pH of this solution is 7.
3) Calibration of Electrode:- The electrode should be calibrated before beginning measurements.

   Following procedure is adopted for calibration of electrode.

a) Connect the combination pH electrode to the input socket, wash it with water and switch on the instrument.

b) Dip the electrode in 7 pH buffer solution.

c) Set the "TEMPERATURE °C" control to the buffer solution temperature.

d) Set the function selector switch to „pH" position and adjust with „CALIBRATE" control till the digital and display shows the precise pH value of the buffer solution.

e) Now move the function selector switch to „STAND BY".

f) Remove the electrode from the buffer solution and wash it with distilled on de-iodised water.

g) Dip the combination electrode into another buffer solution (4pH).

h) Set the "TEMPERATURE °C" control to the temperature of the selected buffer solution.

i) Set the function selector switch to pH position adjust the „SLOPE" correction control, at the front panel until the display shows the pH value of the selected buffer solution. Check that the correct readings are obtained with both the buffer solutions without further adjustment.

Observation Table:-

S. No.	Solutions	pH value
1.	Solution No. 1	4.5 pH
2.	Solution No. 2	5 pH
3.	Solution No. 3	6 pH
4.	un known	-----

Result:-

1) pH of Solution No. 1 =

2) pH of Solution No. 2 =

3) pH of Solution No.3 =

4) pH of unknown water sample -------

PRECAUTIONS:-

1) The electrode should be calibrated before beginning measurements.
2) Buffer solution should be stored in a cool place.

EXPERIMENT – 5

AIM - Proximate analysis of a sample of Coal.

PRINCIPLE - The proximal analysis, which includes the determination of moisture, volatile matter, ash and fixed carbon this give quick and valuable information regarding for commercial and industrial use.

PROCEDURE -

1. Moisture – It is determined by heating a known quantity of air dried coal from 105^{0}C-110^{0}C for one hour and calculating the loss in weight as percentage. Heat a silica crucible with lid, cool it in a desiccator and weigh. Take 1 gram of coal sample in it and again weigh, heat the crucible without lid in an air oven at 105^{0}C-110^{0}C for 1 hour, cool the crucible in a desiccator and weigh it again.

   The loss of weight corresponds to the moisture.

2. Volatile Matter:- It is determined by heating 1 gram of air dried coal for 1 minute in a translucent silica crucible at a steady temperature of 925^{0}C in a muffle furnace.
3. Ash :- Take one gram of powdered air dried sample in previously weighed crucible having 5 cm diameter and 1 cm depth. Place a crucible on a claypipe triangle and heat over a Bunsen burner with a wavy flame. Place the crucible without lid in muffle furnace at 750^{0}C and heat for 1 hour cool it in a desiccators to room temperature and weigh with lid.
4. Fixed carbon :- The sum of total of percentages of volatile matter, moisture and ash subtracted from 100 gives the percentage of fixed carbon.

CALCULATION:-

1. Moister –

Weight of empty crucible = W_1 gm

Weight of crucible + sample = W_2 gm

Weight of crucible + sample after heating = W_3 gm

$$\% \text{ moisture} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

2. Volatile matter –

Weight of empty crucible = W_4 gm

Weight of crucible + sample = W_5 gm

Weight of crucible + sample after heating = W_6 gm

$$\% (\text{moisture} + \text{Volatile matter}) = \frac{W_5 - W_6}{W_5 - W_4} \times 100$$

$$\% \text{ of Volatile matter} = \left(\frac{W_5 - W_6}{W_5 - W_4} \times 100 \right) - (\% \text{ moisture})$$

3. Ash –

Weight of empty crucible = W_7 gm

Weight of crucible + sample = W_8 gm

Weight of crucible + ash = W_9 gm

$$\% \text{ Ash} = \frac{W_9 - W_8}{W_8 - W_7} \times 100$$

4. Fixed carbon :-

$$\% \text{ Fc} = 100 - (\% \text{ Moisture} + \% \text{ Volatile matter} + \% \text{ Ash})$$

RESULT:- The given sample of contain

1. Moisture- ....%
2. Volatile material- ....%
3. Ash- ....%
4 Fixed carbon- ....%

EXPERIMENT – 6

AIM - To determine the flash and fire point of a given oil by Penskey Martens flash point apparatus.

APPRATUS - Flash point apparatus.

THEORY - Flash Point :- "The lowest temp. at which the oil lubricants give enough vapours that ignite for a moment when a small flame is brought near it."

Fire point:- "The lowest temp. at which the vapours of the oil burn continuous for at last five second when a small flame is brought near it."

In most cases, the fire point are 5 – 40^{0}C higher than the flash point. A good lubricant has high flash and fire point and thus high working temperature.

DISCRIPTION OF THE APPRATUS-

Penskey Martens apparatus consists of a brass cup which is 5cm in diameter and 5.5 cm in depth. The level upto which oil fitted in cup is marked at about 3 cm below the top of the cup. The shutter provided at the top of the cup has a level mechanism when the shutter is turned. Opening for test flame and air are opened and the flame exposure device dips into the opening over the surface of the oil.

PROCEDURE:-

1. Thoroughly clean and dry all parts of the cup and its accessories before starting the test being sure to remove any solvent which had been used to clear the apparatus.

2. Support the tester on a level steady table.
3. Fill the cup with the sample to be tested to the level indicated by the filling mark.
4. Insert the thermometer, light the test flame and adjust to 4 mm in diameter.
5. The apparatus is heated, so that the oil temperature at use increase by about 5-6% per minute while the stirrer is rotated at approx 60 rotation/minute.
6. Record the flash point it is the temperature (µ) at the time when the test flame applied causes a distinct flash in the indicator of the cup.

RESULT:-

1. The flash point of given oil sample = t_1°C
2. The fire point of given oil sample = t_2°C

PRECAUTIONS:-

1. The oil cup should be dried.
2. The bulbs of thermometer should be inside the oil sample.
3. Breathing over the surface of the oil should be avoided.

EXPERIMENT – 7

AIM - To determine the calorific value of a solid fuel, using Bomb Calorimeter.

THEORY:-

The calorific value is the most important property of a fuel. The calorific value may be defined as the total quantity at heat, liberated by the complete combustion of a unit mass of the fuel. The calorific value determines the quantity of a fuel, and also helps in calculating thermal fuel, and a thermal efficiency and heat balance in the process where coal is used as a fuel.

HIGH OR GROSS CALORIFIC VALUE:-

The higher or GCV is defined as the total amount of heat liberated when one unit mass of the fuel has been completely burnt & the products of combustion have been cooled to room temperature. In such case water vapour produced by combustion of hydrogen and evaporisation of moisture coil get condensed and the heat is evolved. It is also taken into consideration. However, the heat evolved due to formation of H_2SO_4 and HNO_3 during combustion are subtracted from the heat evolved. The calorific value, as determined in the lab by bomb calorimeter represent the GCV.

LOWER OR NET CALORIFIC VALUE:-

In actual practice, the water vapour produced from hydrogen and moisture of the fuel during combustion is not condensed and escapes as such along with the hot combustic gases and hence a lesser amount of heat is available, hence, LCV or net calorific value may be defined as the net heat produced when unit mass of the fuel is burnt completely and products are allowed to escape.

LCV = GCV - [Latent heat of water vapour formed

DISCRIPTION :-

The calorific value of a solid or non-volatile liquid fuel is usually determined with the help of an oxygen bomb calorimeter.

The calorific value determination is carried out in a bomb calorimeter which consists of following parts as shown in figure

(i) The combustion bomb

(ii) The calorific vessel

(iii) The water jacket

(iv) Stirrer

(v) Thermometer

(vi) Crucible

(vii) Oxygen

(viii) Firing wire

WORKING:-

A known amount of sample (1gm) is burnt in a sealed chamber called bomb. The air replaced by pure O_2. Heat produced by burning the fuel must be equal to the amount of heat absorbed by the calorimeter before calculating the calorific value of a fuel with the help of bomb calorimeter. The water equivalent of the apparatus must be first determine.

CALCULATION:-

X = mass of fuel sample

W = Mass of water

w = Mass of water equivalent

t_1 = initial temperature of water

t_2 = Final temperature of water

L = HCV in cal./gm

Heat liberated by fuel – Heat absorbed by water

$$XL = (W+w)\,(t_2-t_1)$$

$$\text{or } L = \frac{(W+w)\,(t_2-t_1)}{X} \text{ cal/gm}$$

MATERIAL:-

Bomb calorimeter, given fuel sample, benzoic acid, burette, pipette, measuring, flask, N/10 NaOH, Analytical balance.

PROCEDURE:-

A known mass (about 0.5 to 1.0 gm) of given fuel is taken in clean & dry crucible. The crucible is then supported over the ring. A fine pt. wire, touching the fuel sample is then stretched across electrodes and cotton piece or thread of known wt. is tied to the pt. wire inserted in the sample inside. The core should be taken so that the lower end of the cotton thread touches the sample. Place 10 ml of distilled water inside the bomb with the help of pipette & place the cover in position and disconnect the O_2 supply. The bomb is then placed inside the vessel.

PRECAUTIONS:-

1. Do not use too much of the sample in any case. (Not more than 1 gm) Since bomb may not withstay for long-long time it effects for combustible change which liberate near than 10,000 calorie.
2. Do not change with more O_2 than necessary O_2 to obtain complete combustion and don"t fire the bomb if an average of O_2 is advice.

EXPERIMENT-8

AIM: To estimate the amount of Copper present in the brass solution.

CHEMICALS REQUIRED

1. Sodium thiosulphate 0.1N
2. Sulphuric acid 4N
3. Potassium dichromate 0.1N
4. Starch solution 1N.
5. Brass solution
6. Potassium Iodide 10N.
7. Acetic acid
8. Brass solution
9. Ammonium hydroxide

PRINCIPLE

Alloys are the mixture of two or more elements. Brass in an alloy of Copper, iron, Zinc and Tin. It has the percentage of copper 55%.1g of brass is dissolved in minimum nitric acid by careful heating to remove nitrogen oxides. The residual oxides of nitrogen are removed by adding 10ml of con. H_2SO_4 and heating the contents for evaporation. It is then cooled and 20ml of distilled water is added. Boil the solution for few more minutes and cool it.Liquid ammonia is added with a constant stirring and deep blue precipitate is obtained. It is then neutralized by adding 6N H_2SO_4. Then add about 5ml of orthophosphoric acid which complexes the ion. Finally the solution is transferred into 100ml SMF. This a brass solution. It is titrated against $Na_2 S_2O_3$ using KI and starch as indicator. The reaction

$$2Cu^{2+} + 4I^- \longrightarrow Cu_2I_2 + I_2$$

$$I_2 + 2S_2O_2^{2-} \longrightarrow S_2O_4^{2-} + 2I^-$$

Initially sodium thiosulphate is standardized using std. $K_2Cr_2O_7$ is acid medium and by adding KI solution. Here Iodine gas is liberalized by dichromate. This liberated iodine is titrated against $Na\ _2S_2O_3$ using starch as an indicator.

$$Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 7H_2O + 3I_2.$$

(Chromous ion-Orange) (Chromic ion-green)

TITRATION –I: STANDARDISATION OF SODIUM THIOSULPHATE (Sodium thiosulphate Vs Std.$K_2Cr_2O_7$)

PROCEDURE

Burette is filled with thiosulphate solution. Pipette out 20ml of std. pot.dichromate into a clean concial flask. To this 10ml of dil. H_2SO_4 and 15ml of 10% KI are added. the liberated iodine is titrated against sodium thiosulphate when the colour becomes straw yellow, 1ml of freshly prepared starch is added as indicator. Continue the titration, the endpoint is the appearance of green colour. Repeat the titrations to get the concordant value.

Sl.No	Volume of $K_2Cr_2O_7$ (ml)	Burette readings		Volume of Sodium thiosulphate (ml)	Indicator
		Initial (ml)	Final (ml)		
					Starch

Concordant Value = ____________ ml

CALCULATION:

Volume of $K_2Cr_2O_7$ Solution $V_1 = 20$ ml

Strength of $K_2Cr_2O_7$ Solution $N_1 =$ ____________ N (given)

Volume of Sodium thiosulphate Solution $V_2 =$ ________ ml

(ConcordantValue)

Strength of Sodium thiosulphate Solution $N_2 = \dfrac{V_1 N_1}{V_2}$

So Strength of Sodium thiosulphate Solution = ____________ N

TITRATION –II

ESTIMATION OF COPPER IN BRASS
(Sodium thiosulphate Vs Brass Solution)

PROCEDURE

Burette is filled with sodium thiosulphate solution. Pipette out 20ml of made up brass solution into a clean conical flask. Few drops of NH_4OH solution is added drop by drop till faint precipitate is obtained. It is then neutralized by adding 2ml of dil. CH_3COOH to get a clear solution then 10ml 10% KI is added. Titrate the solution with sodium thiosulphate till straw yellow colour appears. Now 1ml of starch is added as indicator. Continue the titration till ivory colour (or) pale white colour is obtained. Repeat the titrations to get the concordant value.

Eq.wt. of Copper = 63.54

Sl.No	Volume of Brass Solution (ml)	Burette readings		Volume of Sodium thiosulphate (ml)	Indicator
		Initial (ml)	Final (ml)		
					Starch

Concordant Value = ____________ ml

CALCULATION

Volume of Sodium thiosulphate Solution V_1 = 20 ml

Strength of Sodium thiosulphate Solution N_1 = ------------ N (given)

Volume of Brass Solution V_2 = ____________ ml (ConcordantValue)

Strength of Brass Solution $N_2 = \frac{V_1 N_1}{V_2}$

Strength of Brass Solution = ------------- N

Amount of Copper present in given Brass Solution

= Eq.Wt x strength of Brass Solution

= 63.54 x ----------

= _______________ g

TITRATION – I

Burette Solution - Sodium thiosulphate

Pipette Solution - Std. Potassium dichromate

Additional Solution - 10ml of dil.H_2SO_4+15ml of 10%KI.

Indicator - Starch

End point - Appearance of green colour.

TITRATION – II

Burette Solution - Sodium thiosulphate

Pipette Solution - Brass solution

Additional Solution - Few drops NH_4OH+2ml of dil.CH_3CooH+10ml 10%KI

Indicator - 1ml Starch

End point - Appearance of pale white colour.

PRECAUTIONS:-

1. Reading should be taken carefully.
2. The end point should be checked.
3. Note that there should be no air bubble in nozzle of burette

EXPERIMENT – 09

AIM: - Determination of viscosity by Red Wood Viscometer.

CHEMICALS REQUIRED : - Given sample of lubricant, suitable organic solvent like CCl_4, ether, petroleum spirit or benzene.

APPARATUS REQUIRED: - Red Wood viscometer no. 1 & no. 2, stop watch, Kohlrausch flask, thermometer, filter paper

PRINCIPLE: -

Viscosity is the property of a fluid that determines its resistance to flow. It is an indicator of flow ability of a lubricating oil; the lowest the viscosity, greater the flow ability. It is mainly due to the forces of cohesion between the molecules of lubricating oil.

Absolute Viscosity may be defined as "the tangential force per unit area which is required to maintain a unit velocity gradient between two parallel layers. It is denoted by (eta). Its Unit in CGS system is poise and its dimensions are $ML^{-1}T^{-1}$.

Viscosity Index: Viscosity generally decreases with increase in temperature. The maintenance of viscosity over the range of temperature is called the viscosity Index (V.I)

A relatively small change/no change in viscosity with temperature is indicated by high viscosity index whereas low viscosity index shows relatively large change in viscosity with temperature

Effect of temperature on viscosity

Viscosity of lubricating oil is inversely proportional to the temperature i.e. with increase of temperature, viscosity decreases. This is due to the decrease in intermolecular attraction

At higher temperature, oil must have sufficient viscosity to carry loads. Hence heavier oils are used at higher temperature. Similarly, light oils are used at low ambient temperature

Effect of pressure on viscosity

Lubricating oils are subjected to extreme pressure at the interphase between gears and rolling element. At such higher pressure, viscosity of lubricating oil increases considerably.

Vicosity helps in selecting good lubricating oil

Significance of viscosity measurement

Viscosity is the property of lubricating oil that determines it ability to lubricate and through its film strength, viscosity values are used

In evaluating load carrying capacity

In denoting the effect of temperature changes and for determining the presence of contaminants in used oil during service.

Absolute viscosity values are required for use in all bearing design calculations and other lubrication engineering technical design problems.

Redwood Viscometer

It is of two types

4) Redwood viscometer No.1- Universal
5) Redwood viscometer No.2- Abmiralty

Both the above viscometers are identical in principle, shape and mode of testing. The essential differences between the two are

	Redwood viscometer No.1- Universal	Redwood viscometer No.2- Abmiralty
Dimensions of orifice	Length-10mm, Dia-1,62mm	Length-50mm, Dia-3.8mm
Kohlrausch flask	Smaller mouth	Wider mouth
Useful for	Low viscous oil having flow time between 30s-2000s e.g. Kerosine oil and mustard oil	Higher viscous oils having flow time greater than 2000s e.g. Fuel oil, mobile oil

Description of the Redwood viscometer

It is divided in to three parts

1. **Oil Cup;**

   Material- Silver plated brass
   Height-90mm
   Diamtere- 46.5mm

   It holds the test sample of lubricating oil. The bottom of the cup is fitted with polished-agate discharge tube containing an orifice of specified dimension

2. **Water Bath**

   Oil cup is surrounded by water bath for adjusting the temperature

3. **Kohlrausch Flask**

   It receives the oil from polished-agate discharge tube

PROCEDURE: -

1. Select the appropriate viscometer, either Redwood viscometer No.1 or 2 depending up on the nature of lubricating oil
2. Clean the viscometer cup properly with the help of suitable solvent e.g. CCl_4, ether, petroleum spirit or benzene and dry it to remove any traces of solvent.
3. Level the viscometer with the help of leveling screws.
4. Fill the outer bath with water for determining the viscosity at 80 ° c and below.
5. Place the ball valve on the jet to close it and pour the test oil into the cup up to the tip of indicator.
6. Place a clean dry Kohlrausch flask immediately below and directly in line with

discharging jet.

7. Insert a clean thermometer and a stirrer in the cup and cover it with a lid.
8. Heat the water filled in the bath slowly with constant stirring. When the oil in the cup attains a desired temperature, stop the heating.
9. Lift the ball valve and start the stop watch. Oil from the jet flows into the flask.
10. Stop the stop watch when lower meniscus of the oil reaches the 50 ml mark on the neck of receiving flask

OBSERVATION TABLE

S.NO.	Temperature	Viscosity, t (seconds, Redwood No. 1)
1 2 3		Mean value:

RESULT: - The viscosity of given oil sample using Redwood viscometer no. -------- at___ °C is _____ Red Wood seconds.

PRECAUTIONS: -1.The oil should be filtered thoroughly a muslin cloth to remove solid particles that may clog the jet.

2. The receiving flask should be placed in such a manner that the oil stream from jet strikes the neck of receiving flask and do not cause any foaming.
3. After each reading the oil should be completely drained out of receiving flask.