Three Component Systems
Lab. 3

Done By:

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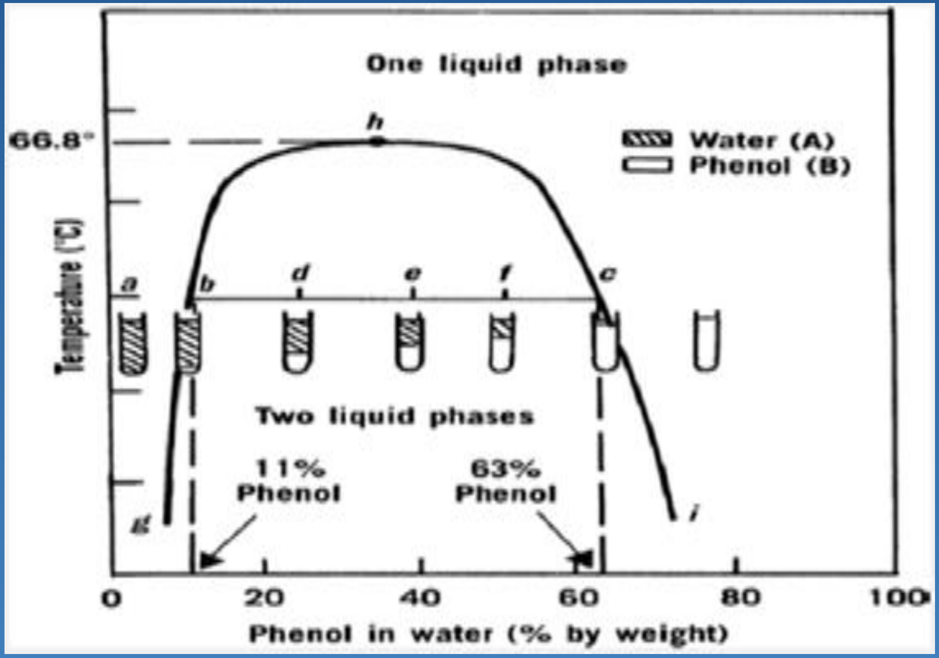
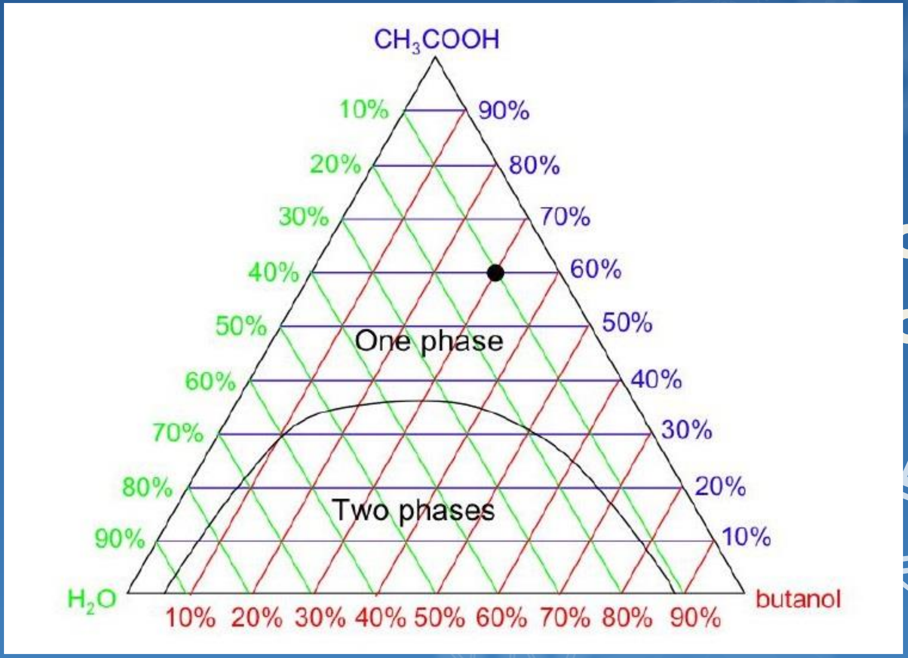
The comparison between two component and three component system

2 component system	3 component system
2 materials	3 materials
Drawn on ordinary graph paper	Drawn on triangular graph paper
Factors affecting are temp. and concentration	The exp. is done under constant pressure and temperature
The tie line is always parallel to base line	The tie line may be parallel or not
Example phenol/water system	Example HAC,CHCl3,H2O system

Two component system

Three component system

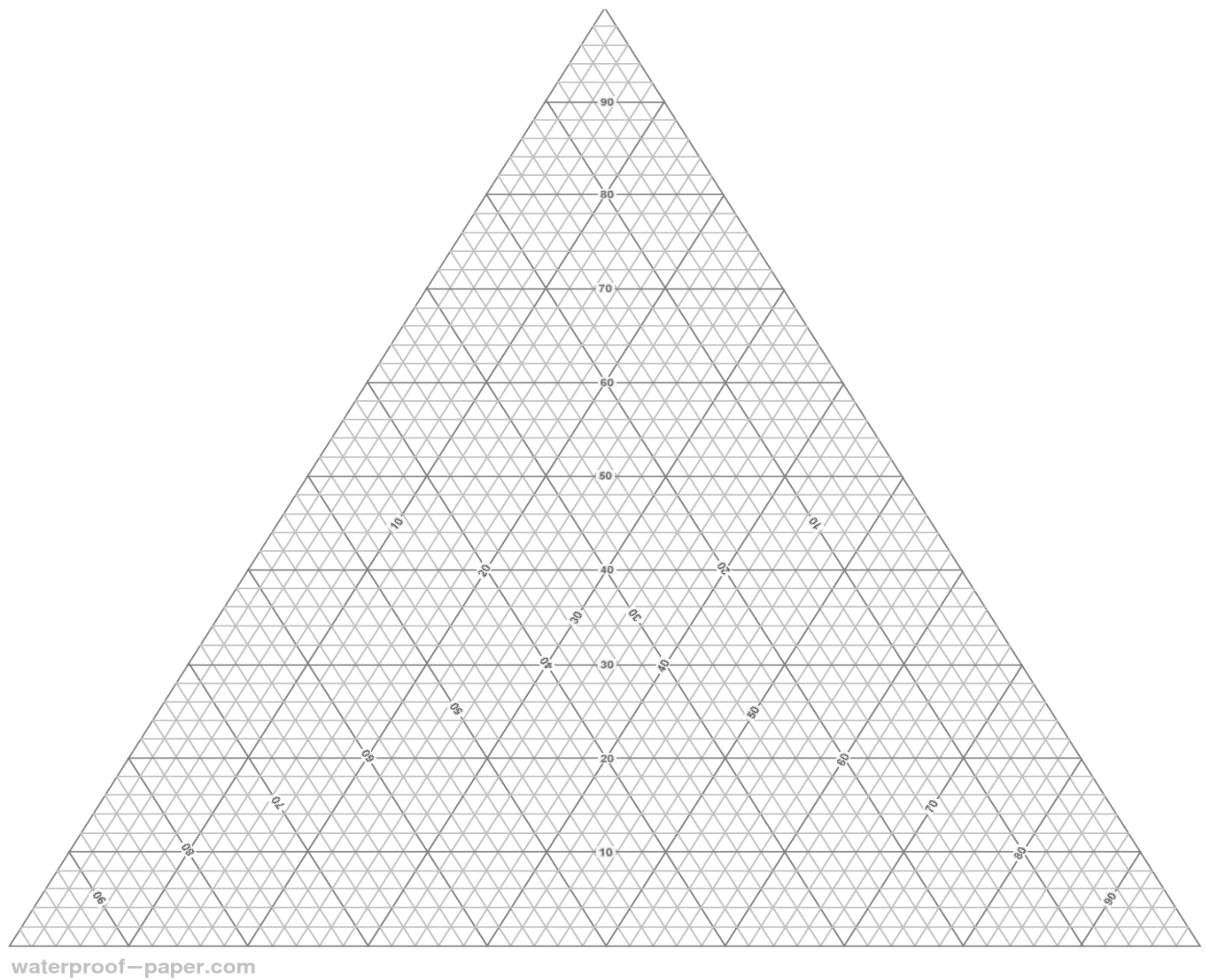




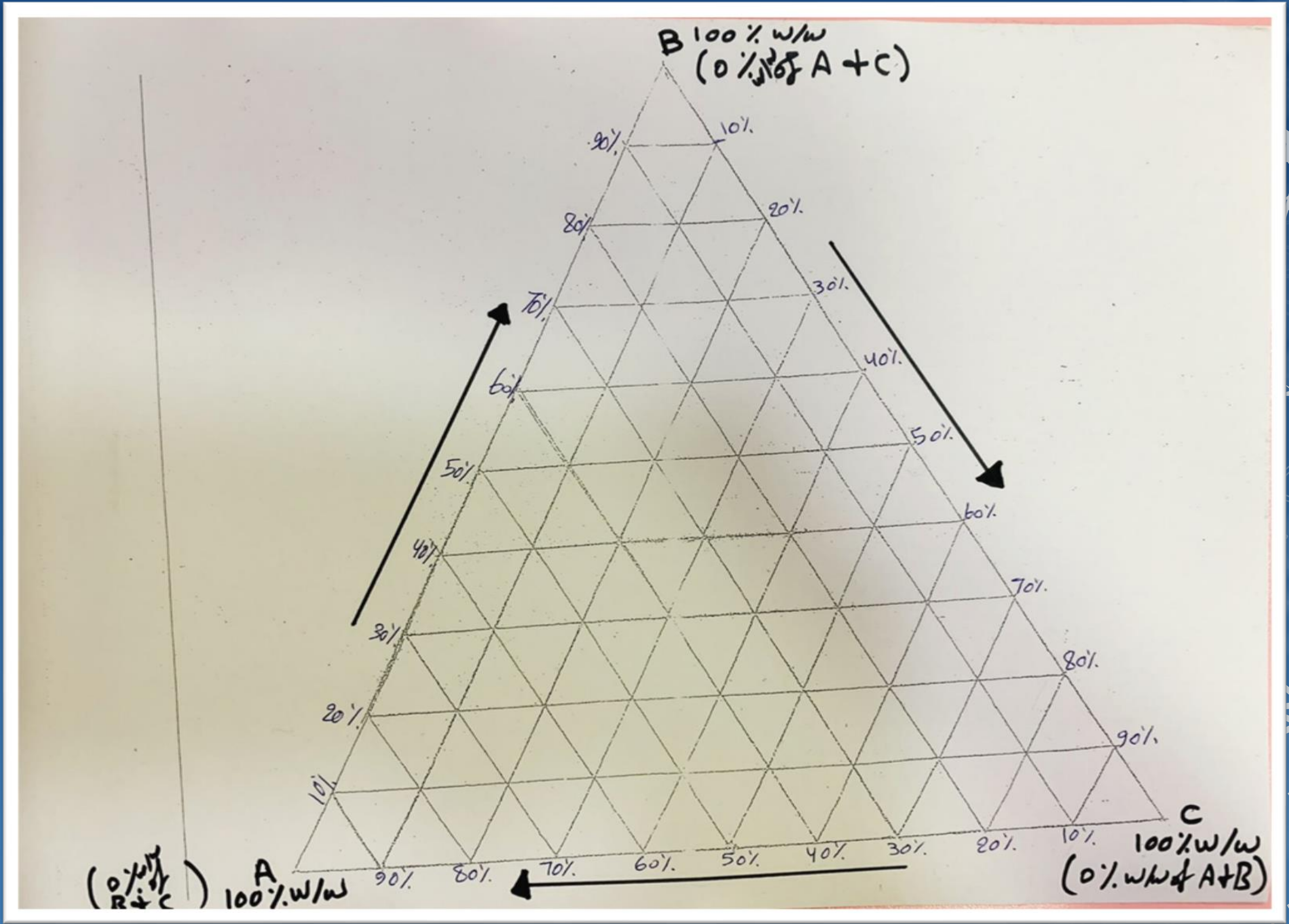
Rules relating to triangular diagram:-

1)Each of the corners or apexes of triangle represent 100% by wt. of one component (A,B & C) as a result , the same apex will represents 0% of the other two components.

Triangular graph paper

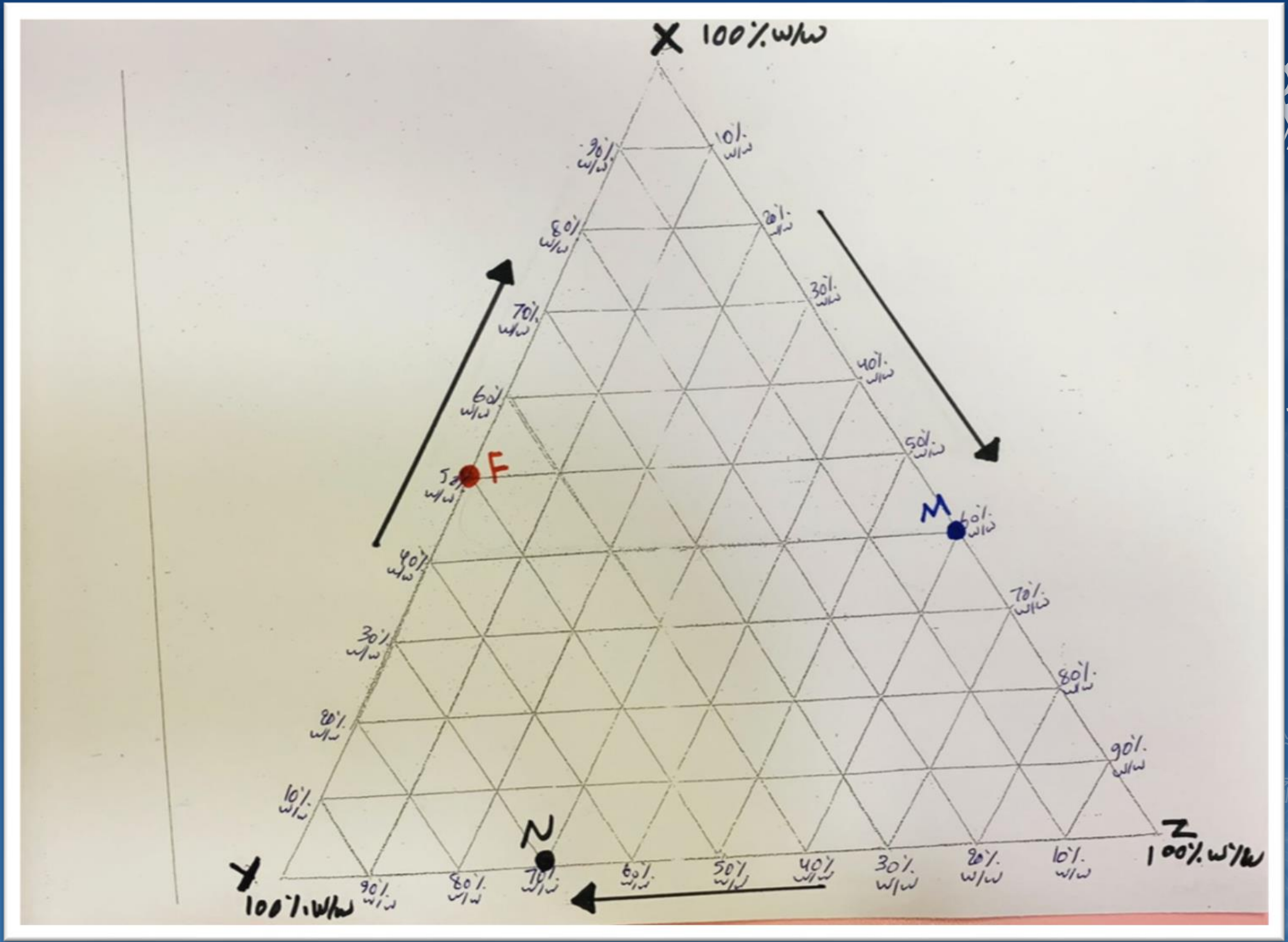


Triangular graph paper



Rules relating to triangular diagram:-

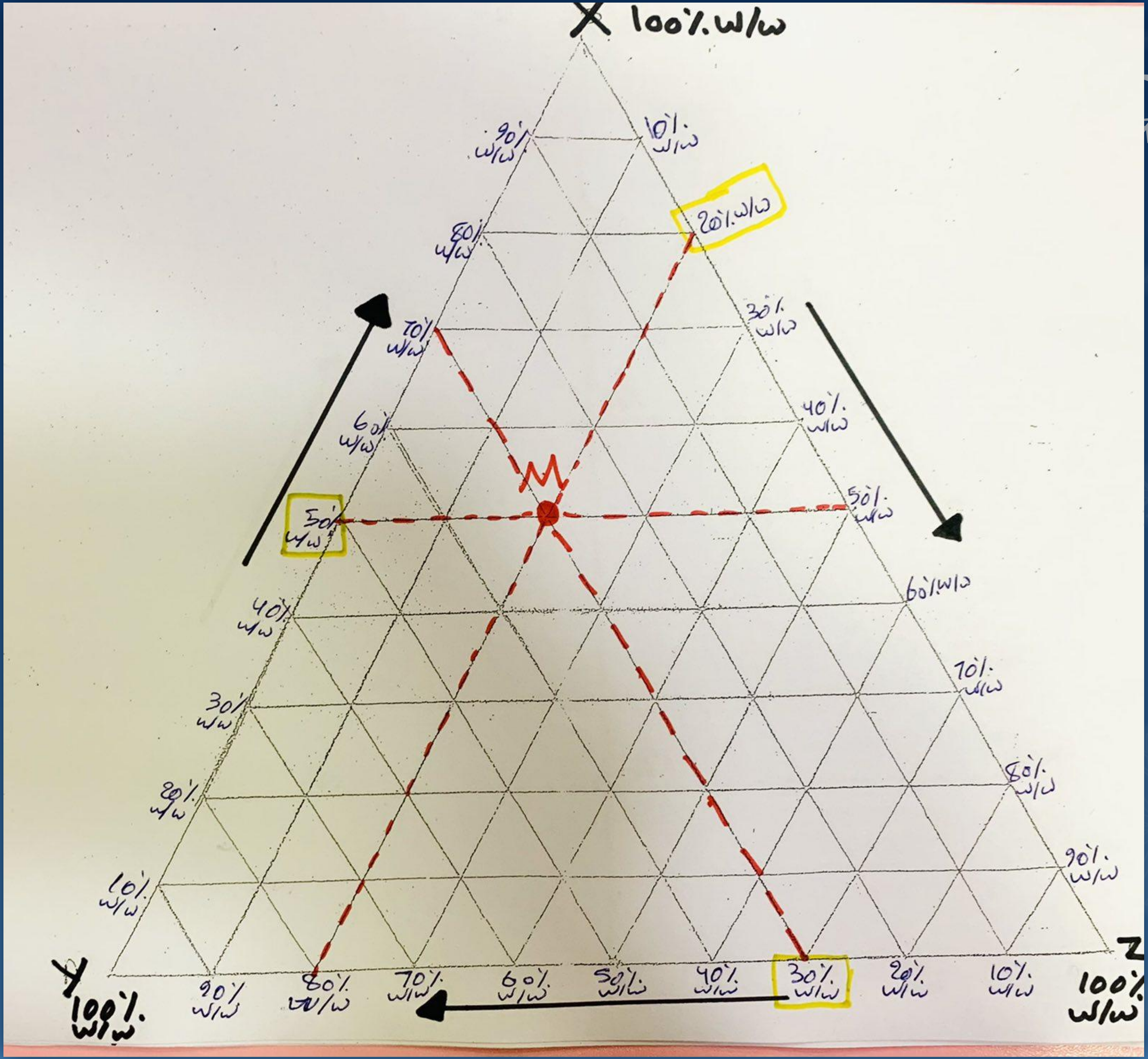
2) The three lines joining the corner points represent two component mixture of the three possible combination of A, B & C .



Three component phase diagram (above):
Blue point M : X = 40%w/w , Z = 60%w/w
Red point F : X = 50%w/w , Y = 50%w/w
Black point N : Y = 70%w/w , Z = 30%w/w

Rules relating to triangular diagram:-

3-The area within the triangle represents all possible combinations of A,B&C to give three component system.

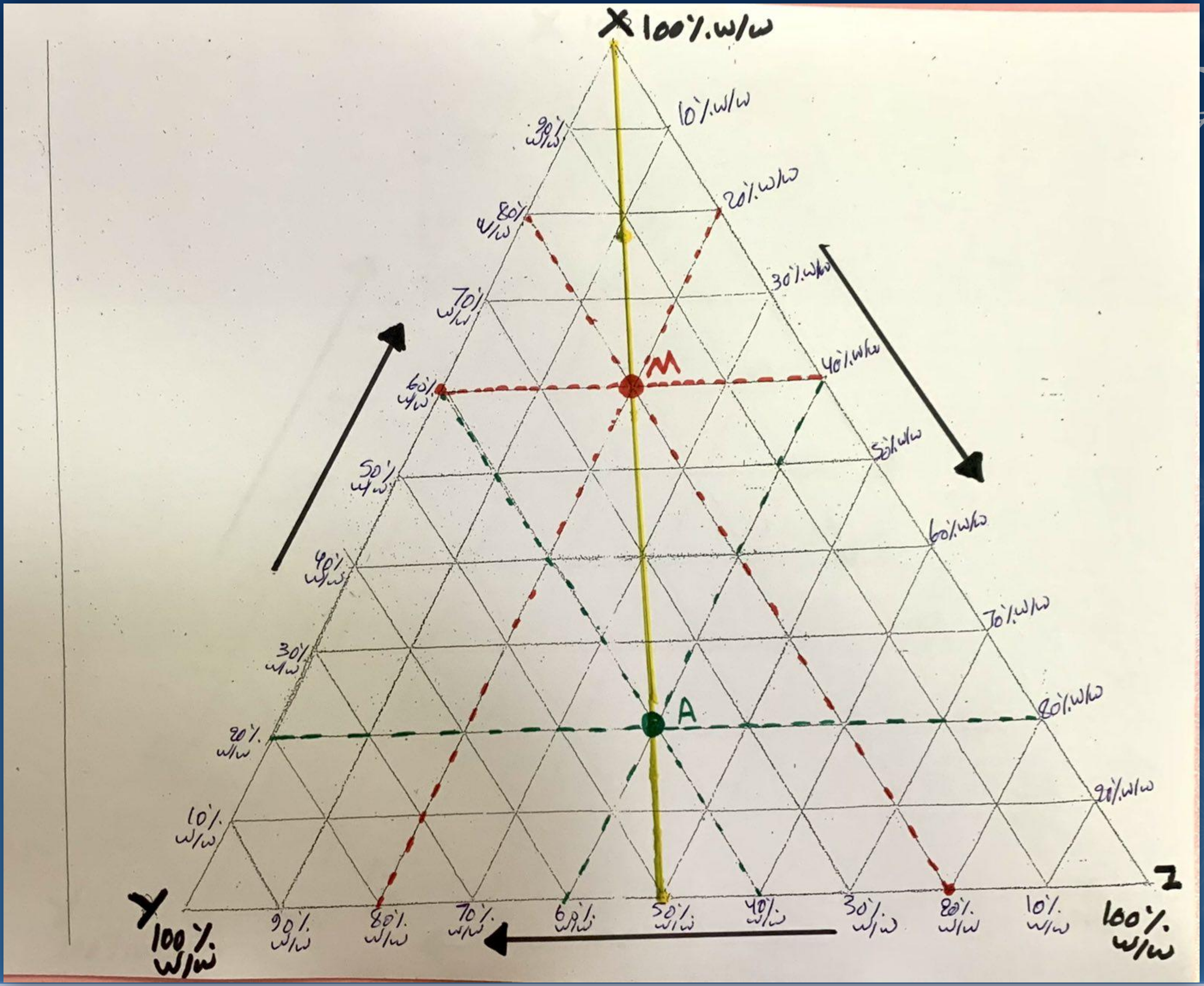


Three component phase diagram (above):

Red point M : X = 50%w/w , Z = 20%w/w and Y=100-(50+20)=30 %w/w

Rules relating to triangular diagram:-

4) If a line is drawn through any apex to a point on the opposite side ,then all systems represented by points on such line have constant ratio of two components.



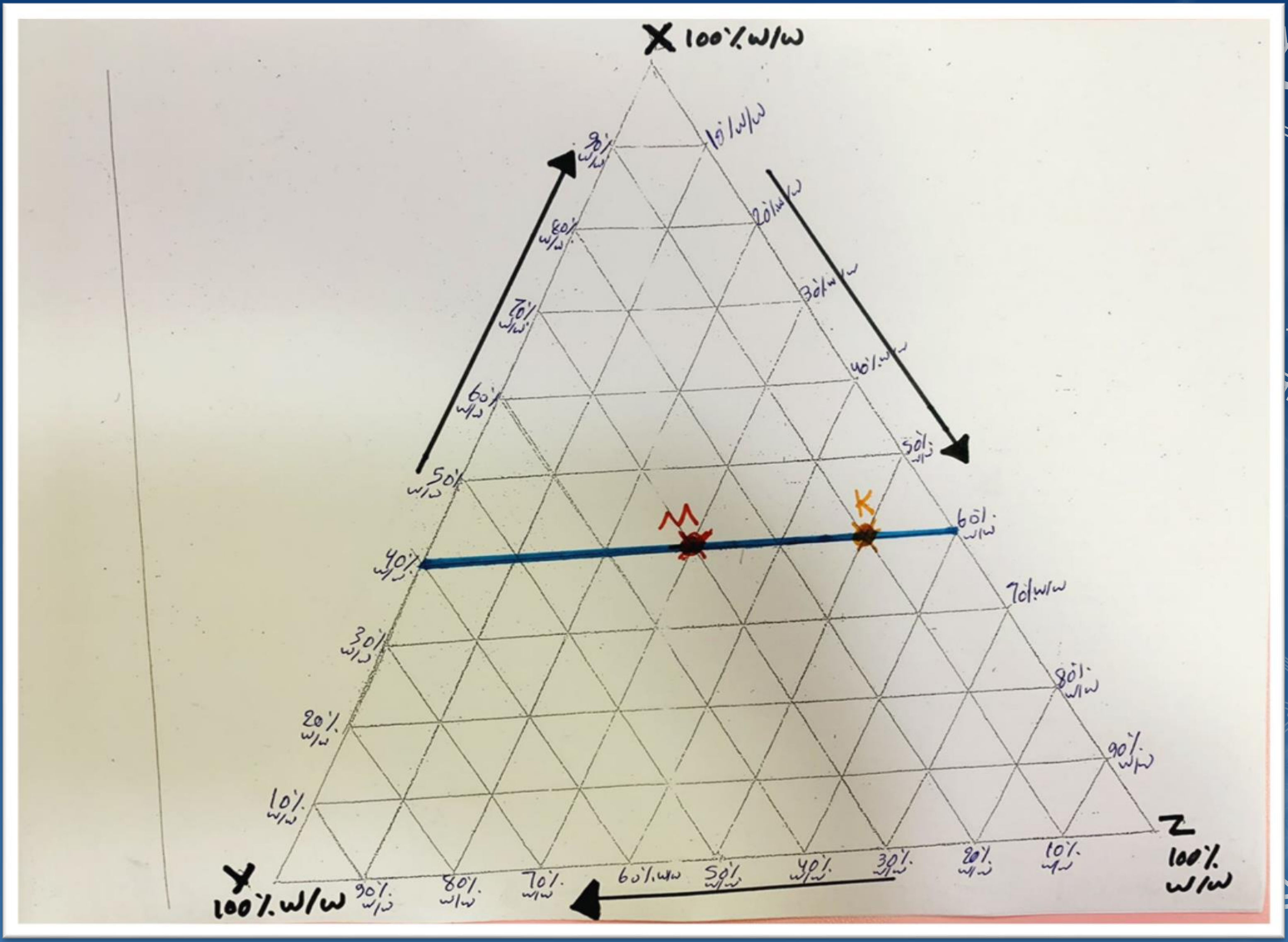
Three component phase diagram (above):

Red point M : X = 60%w/w , Z = 20%w/w and Y=100-(60+20)=20 %w/w ,ratio y/z=20/20=1

Green point A : X = 20%w/w , Z = 40%w/w and Y=100-(20+40)=40 %w/w, ratio y/z=40/40=1

Rules relating to triangular diagram:-

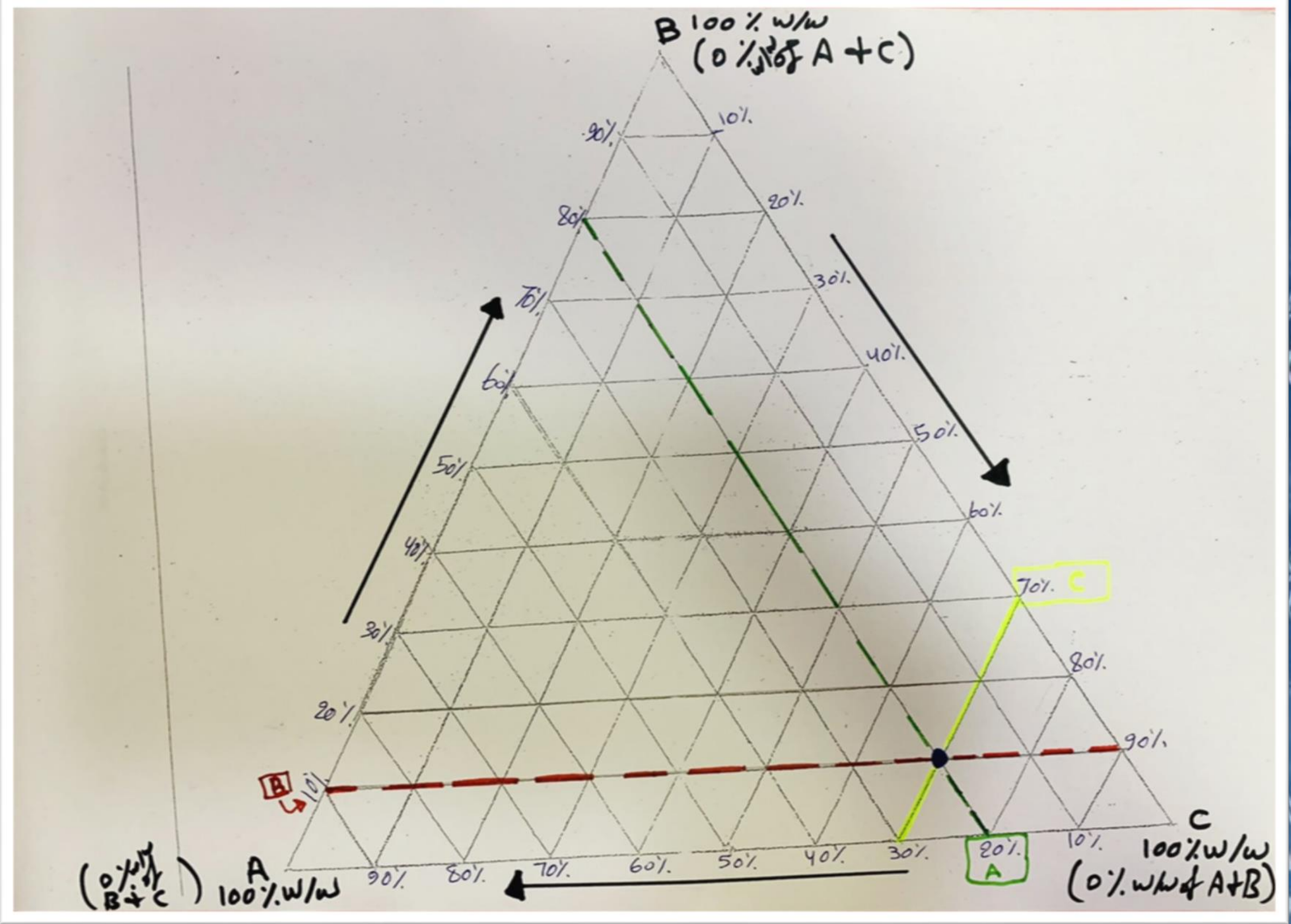
5) Any line drawn parallel to one side of the triangle represents ternary systems in which the proportion (or % by wt)of one component is constant.



Three component phase diagram (above):

Point M : **X = 40%w/w** , Z = 30%w/w and Y=100-(40+30)=30 %w/w

Point K : **X = 40%w/w** , Z = 50%w/w and Y=100-(40+50)=10 %w/w



Three component phase diagram (above):
Blue point : A = 20%w/w , B = 10%w/w and C = 70%w/w

Procedure:

1-Prepare 10 gm of the following combination of HAC & $CHCl_3$:5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, and 90% w/w HAC:$CHCl_3$ in a small clean &dry flask which form one single phase.

2-To these mixtures slowly add water from a burette until a turbidity just appears. Check the weight of water (which is equal to its volume).

Note:- **To prepare samples in step no.1, the required amount of HAC&CHCl3 from burettes by converting the weight in to volume according to the law:**

Specific gravity (sp.gr) = weight/volume

Sp.gr of HAC =1.009 and for CHCl3 =1.4

Group NO.	HAC/ $CHCl_3$	HAC ml HAC gm	$CHCl_3$ gm	$CHCl_3$ ml	H2Ogm ml
1	5%	0.5	9.5	6.79	
2	20%	2	8	5.7	
3	40%	4	6	4.3	
4	70%	7	3	2.14	
5	80%	8	2	1.42	
6	90%	9	1	0.71	

3-Obtain a miscibility curve by calculating the percent w/w of each component in the turbid mixture and plot this triangular diagram.

For example Group no. 1 if the amount of water consumed for turbidity just appears =0.5ml

Total weight of the system= wt of HAC+ wt of CHCL3 +wt of H20

=0.5gm +9.5gm+0.5gm

=10.5gm

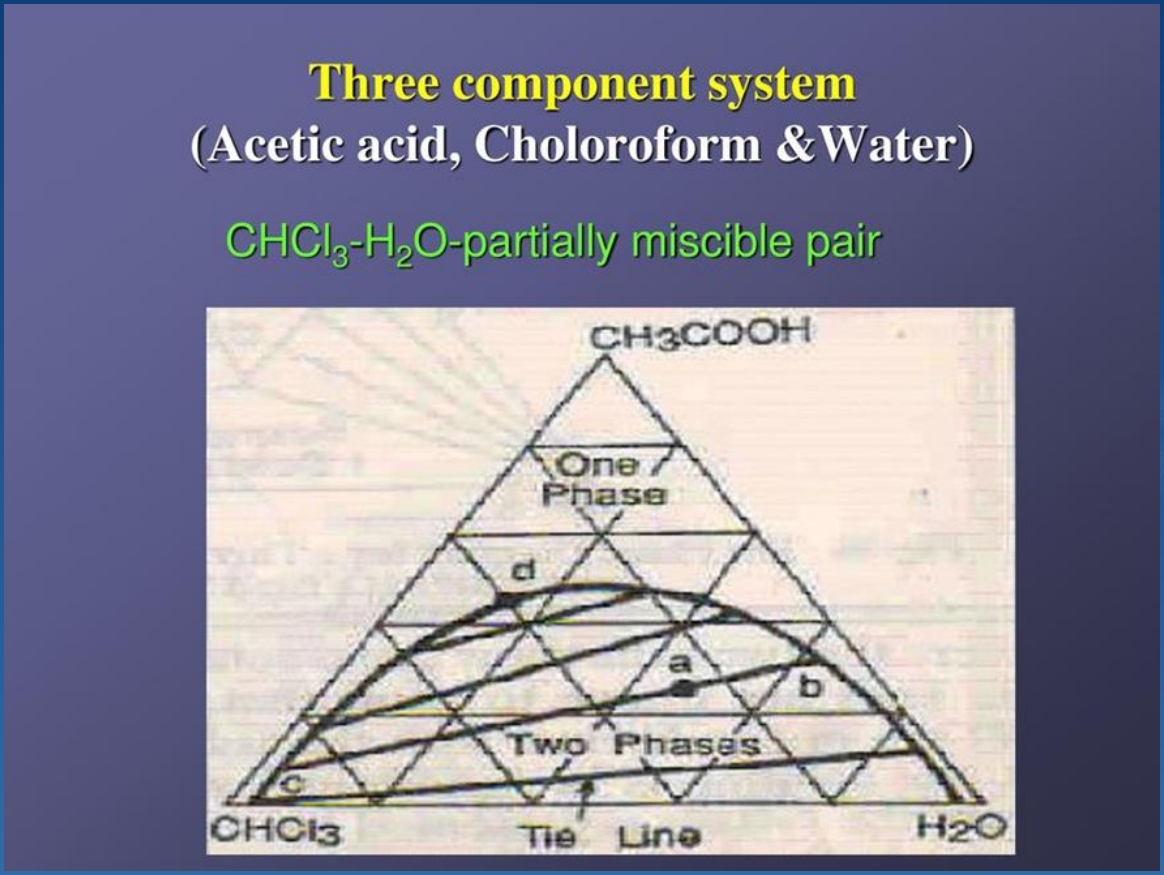
FOR HAC: 0.5/10.5*100=4.76%w/w

FOR CHCl3: 9.5/10.5*100=90.5%w/w

FOR H2O: 0.5/10.5*100=4.76%w/w

*Tabulated the amount of HAC ,CHCl3 and H2O
*Calculate the % of each point, then drown the binodal curve which separate one phase from two phases area

Group NO.	HAC/ $CHCl_3$	HAC%	$CHCl_3$%	H2O%
1	5%	4.76%	90.5%	4.76%
2	20%			
3	40%			
4	70%			
5	80%			
6	90%			



* When the amount of HAC is low, the amount of water will be very low and when increase the mixture will separate into 2 phases.


THANK YOU
FOR LISTENING