#### STUDYNAMA.COM



Studynama.com is India's MEGA Education Hub for Free Notes, Projects, Solved Papers and helps students score more marks with less effort!

Scroll below to access your study material ▼ ▼

# **Disclaimer** Please note none of the content or study material in this document or content in this file is prepared or owned by Studynama.com. This content is shared by our student partners and we do not hold any copyright on this content. Please let us know if the content in this file infringes any of your copyright by writing to us at: <a href="mailto:info@studynama.com">info@studynama.com</a> and we will take appropriate action.

#### Unit - I Callaidal dispersion

for with the wind in which in the property of the

Dispersion system \_;
A dispersion system is defined as a system in which dispersed phase is distributed uniformly through out dispersion

missingth terminar of monteritions

medium.

Classification of dispersion system

<u>S.N</u> .	Dispersion medium	Oispersed Phase	bioline called.
1-	Cras	liquid	· Fostles withourses .
2 –	Cras	salid	Smoke silledgest silledgest
3 -	Liquid	Gas and	Foam (aerosal)
4 -	birliquid prices	salid toulos	Callaidal gald in water
- 2	liquid oilli	liquid	Oil globelles ar water globelles
6 -	salid	Cras Rhudani	salid toam
7-	<i>salid</i>	Liquid	Mineral ail in war
8-	salid	salid	Callaidal gald in gloss

readon indude indude sillinger polar ship cit

#### Callaidal dispension

A dispersion system in which dispersed phase size wange I hm - III m, is distributed uniformly through out the dispersion medium are called as callaidal dispersion.

Classification of colloidal disposion Callaidal dispension au clossified into following types - Manera brungsia watziogrig Lyophillic callaid. 33249 orubon Lyophobic callaid. Association callaid. blugil CHOS Gophillic callaid \_1 Lyo means solvent. lyophillic callaids are salvent loving callaids. \* They are hydrophillic and lipophillic types\_ gelatin on biles Hydrophillic collaids include acacia which form callaidal dispersion in water.

lipophillic callaids include vubber at palystyrene which farms callaidal dispersion in any salvent.

Ex-i Benzene : 15 girs pribbo de de libraria de

\* They are thermody nemically stable.

\* Viscosity 1es with adding dispersed phase.

2 - Lyophobic callaid -:

\* They are klas salvent hating callaids.

\* when dispersion medium is water they are klass hydrophobic callaids.

Ex-; callaidal dispersion of sold or silver

\* They are shown dynemically unestable? which

\* Viscocity does not 1es an adding dispersed phase.

## 3 - Association collaids

\* They are also klos amphilic collaids.

\* Few malecules on ions have both polar and non-polar groups.

\* They exists separatly and associate at critical nicelle concontration to form micelle of callaidal size.

# STUDYNAMA.COM

#### India's Mega Online Education Hub.

Making Studies Easier - Authentic & Free!

Studynama.com is India's MEGA
Education Hub for Free Notes,
Projects, Solved
Papers, Entrance
Prep.

We help students score more marks with less effort!

- Classes 6-12 CBSE / State
- BTech/MTech
- BBA / MBA
- LLB / LLM Law
- MBBS / BDS / MD/BPharma
- B.Com. / M.Com.
- BCA/MCA

#### **Entrance Exam Prep:**

- IIT JEE, BITSAT, State
- CAT, XAT, MAT, SNAP etc.
- NEET, AIIMS
- GATE
- IELTS

Visit Website & Create Free Account

Viscosity res by adding amphiphiles ..... They are theresofy nemically stable. Properties of callaids grady a regular prisho the set phisosilv. 1- Optical properties -Optical properties of collaids are as fallows abiellos pritato terulas sold ano pull (a) Ultra microscopy. Electran microscopy. outliber microscopy. (b) light scattering. . Shipling sidedy orbyt 0 0 califordal dispension of sold on tilled @ Ultra microscopy -! When a cell containing colloidal dispersion is viewed through a ultramicro scope against dark background. sot ton cools phisossiv The particle appear as bright spat against dark background. Missing **(b)** Electron mic ro scopy -! Kind a berry \* The electron microscopy is weful in jetting picture of actual particle. \* It help so in bestudying size, shape and to structive may callaidal partidus. Drift lobinion

- @ light scattering -!
- \* When a beam of light is possed through a callaidal dispersion.

of the arrange and wild to pe

the stitute of both

- \* some light absorberd, some is scattleved and remainder is transmitted.
- \* Absorbed light is responsible for calamed
- \* Scattered light causes the callaidal dispersion to appear turb dity.
- @ Tyndall effect -:
- \* When a navious beam of light is passed

  through a callaidal dispussion.
- \* The path of light become illuminated.
  - \* This can be obserbed at right angel under ultra microscope.
  - \* This is klas syndall effect.
  - \* Lyophobic system show intence dyndall effect them Lyophillic system.

prison to bounton to turning

emand w

2 - kinetic properties -!

@ Brownian movement -:

The colloidal particle in disposition are always in a state of random motion.

1- print Etanon tolal

that to much be much

- \* This reandown mation can be observed under
- \* It was first observed by veobert brown.
- \* The velocity of the particles tes with the led in particle size.
- 6 Diffusion -1

Particles diffuse from a region of tigher concentration to lower concentration autill the system is uniform.

the system is unitarin.

\* The veste of diffusion is expressed by ficked's first law—

de - - DS dc Dinjolal mell bells

where > dq = Amount of material diffusing in time

S = Surface area. 0 = Diffusion coefficient. de = concentration gradient. the vicestly of duponion mather € Sedimentation -1 X In collaidal dispersion, the brownian movement tend to distarts sedimentation. \* Therefore stronger force must be applied for sedimentation. Ultra centrifuge is used four studying sediment - ation. (ability land by the stage of the s where bround more (mingles but 1) Viscosity - Viscosity is an expression of resistance to flow under bapplied stress (presur) \* The more viscous a liquid, the greater the applied færre to make it flow. 10 stow wir \* viscosity steedy provide shape of particles in Salmoitement is a function to star all is charge on the particle and related to

where - n = viscosity of dispersion

ho = viscosity of dispersion medium

of = volume fraction of collaidal

particles.

# 3 - Electrical proporties -:

When an electric is applied to a calloidal dispersion, the particle carriery charged moore toward opposite charge electrode.

- \* The negatively charged particles (such as knowing and sulphur) move toward anode.
- \* The trely charged particles (such as metal hydroxide and fervice hydroxide) move toward cathod.
- the mate of particle movement is observed by white microscope.
- X The veate of movement is a function of charge on the particle and vulated to

reta patential.

\* Zeta patential can be calculated by -

$$S = \frac{V}{E} \cdot \frac{4\pi\eta}{\epsilon} \times (9\times10^{9})$$

where -; S = Zeta patential in valt.

V = Velocity of movement of callaidal particles.

HON ANT

E = Applied patential.

n = Viscosity of the medium

€ = Dielectric constant.

#### Effect of electrolyte

- \* Consider a solid surface carriying a -ve charge and is in contact with aqueous solution containing both tree and -ve ion.
- \* The very charged solid surface will influence distribution of ions.
- The thound motion also influence distribution on of charges.
- electric double layer.

AgNO3 + NaI - AgI + NaNO3 tog EX-- pe halmbarter and not totaling above whileson ell. \* The swiface of AgI contains move I ions than Agt ion. the solution to the miles \* Aqueous soll contain large amount of Nat i'an and NO3- ion and traces of H+ +ve and -ve ion. and oH. \* Ag I swiface is wety charge due to \* It attract treno vons C Nat Jawards its ioh . · - an of charges. The shound motton causes the equal distribution ebestric double layen.

\* Not concentration is high over I ion sentace and form compact layer called as etern layer.

\* An other layer of NO3 tion forms, called as

\* Thus combination of 2 layer of opposite charges are called as electrical double layer.

particles, air conjutation.

Protective action -!

\* Large concentration of thydropholic callaids 1

the stability of hydropholic callaids towards

precipitation by electralytes.

\* The hydrophillic callaids adsorb an the surface and form a protective layer.

A This blay er a prevent them from precipitations on addition of electrolyte.

This phenomena is was protection on protection action.

000 **6** 6 6 6 Hydro O/ Hydro Phobic 0 0 0 0 Callaids 0 0 0 + vely charged large quanty of 000 Ly drophillic callaid going chapman Addition of eletrolyte Thus combination of sold of least the contract

Most stable ion can not veach the colloidal particles, No coagulation.

To rough again is month with 100-100

\* When bismath sub nitrate is suspended in traggeouth dispension. 37 day ochyp 13 Hillidaks

\* These phenomena invalve coagulation of gum by bismath ion tomber shirtles sittling orbits et

\* The flocculated gum aggrégates with the bismut ion to form gel ar hard cake.

\* It phosphate, citrate an dontenate added electionly de. They protect from coagulating influence of no resit strong to fet the memorially sufficient

bismuth ian.

- \* It is a process of converting ppt of large particle size to colloided size by means of electrolyte is Was peptization.
- \* Same ionic materials get advanted on the surface of finally divided solid and convent it into callaidal dispersion.

# Coacervation (Phase separation)

- \* When oppositly harged hydrophilic calloids are mixed, a calloid with layer separates out.

  This process is klos coaccivation.
- \* The phenomena in which a micro-malecular dispersion on mixing, separated into two layer is called as concernation.
- Ex-1 Gulatine is positively charged below pH 4.7.
- Acacia is -vely charged at this pH.
- when they 2 are mixed together., 2 layors

esite silged . are found. The upper layer of low viscosity have poor concentration of callaidal material. - The lawer layer have high viscoulty contain high concentration of calloidal material. former bus burns this will plant to some push

the state of the state of the

# Unificant Samuelog organ williams

# Rheology\_

- madda in mod

The tour inheology has been derived from the greek word inheo means "To flow" and logos means "Science".

Rheology may be defined as the science concerned with the flow of liquid and deformation of matter under the influence of stress.

applied perpendicularly to the surface or at any angle to the surface of body.

### New Jorian System

liquids which exhibit newton's law of flow one Klas newtonian liquid.

of them states that neate of shear is

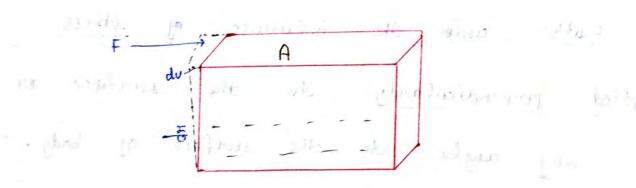
directly proportional to the shearing stress.

Rate of shear = 
$$\frac{dv}{dsr}$$

appropriate the state of the failer

where -: dv = Velosity difference b/w two planes of Liquid separated by distance dot.

Shearing etress = 
$$\frac{F}{A}$$
 (Force per area).



According to newton's law \_\_\_

$$\frac{dv}{du} = \eta \frac{F}{A}$$

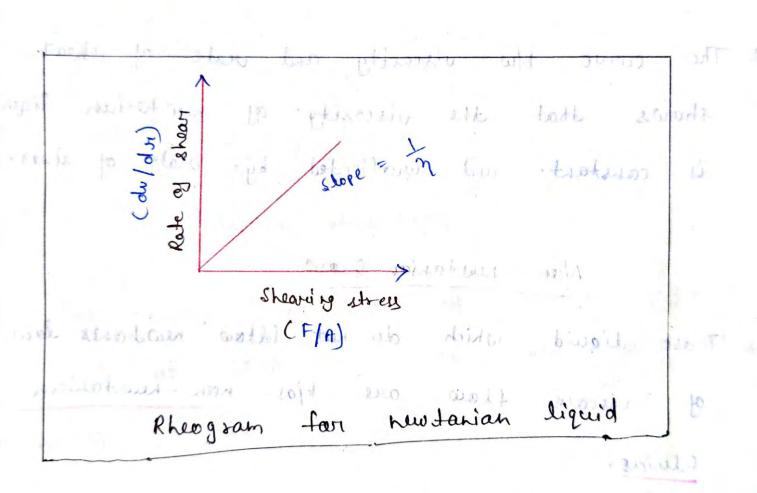
where - h = coefficient of viscosity.

1100

\* The veheological property of liquids are expressed in the form of those diagram or wheograms.

\* The plot of newtonian liquid is a strate line.

\* The slope of this veheogram is equal to veciprocal of viscosity.



The linear conve indicate withat a mild fonce can induce inflow in this system.

Ex 3 Benzene, water, eu a primerane

rays are linear to burgary the dynamic att The groups A is warperly world is winning all in starts to be bright accordance to daily att Viscosity with to make the Rate of shear

\* The curve blw viscosity and vide of shear shows that the viscosity of newtonian liquid is constant. and unaffected by orate of shear.

to bornerious.

#### Non- newtonian flow

- which do not follow new tonis law \* Those liquid flow are klas non-new tanian of viscous fluids.
- \* Viscosity of Non- hur tonian fluids changes with change in applied stear etress.
- \* Ex-! Emulsian, ointment, gel, callaider dispensions are non-newtonian fluids.

\* There are following types of hour new to you thereds from condican 1- Plastic flow -: \* The characteristics of material which exhibit plastic flow are klas bingham bodies. made princets I a mital heart in tollay block noally to state 1) Shearing stress (F/A) \* The curve does not pass through arigin, but at some paint an shear stress axis interest klas bigham, yield (FD). Example of \* For is high yield value beyond which flow curve became linear. Fi is lower yield value, where actual flow begins

\* The plastic viscosity (U) can be calculated from equation -- ruply sikely t and the standy Where -> F = shearing stress. Fo = Yield value in dynes / cm2. Cr = Rate of shear. my for not runs Rate of shoot was to had \* Example of plastic flow are time oxidetiments mineral all are paints dir done curve became linear. mechanium-! whole advant yield value

\* Plastic flow is due to contact of flocculated particles.

Friction b/w the moving particles and force of floraulation contributes yield value.

\* The shearing stress in dynes/cm² require to over come these force.

X' when the yield value exceed and flow begins,

The water of shear (on) becomes directly proportion

to the force (etress).

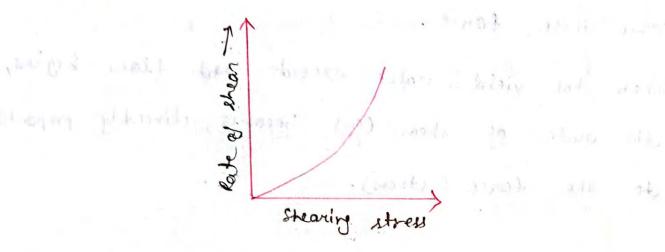
(9-1 > The yield value of a plostic material was determined experimentally to be 6000 dynes/as and shearing etress above the yield value, F was found to 1 dinearly with G.

If the veste of shear was 120 5°, when F was 25000 dynes/cm² calculate the plastic viscosity of sample.

 $U = F - F_B = 8500 - 6000 = 20.8$ Cr Paise

# 2- Pseudo plantic flow

Pseudoplastic materials are characterised by vheological curve which pass through the origin.

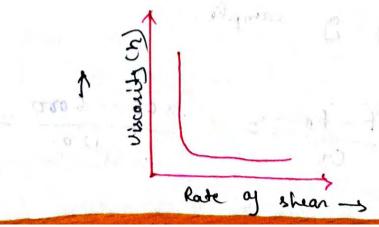


X brendo plastic flavo curve is hat linear.

\* The chear etress F does not 1 linearly with
the veate of shear.

\* Viscosity does not vernains constant.

\* Viscority les with mate of shear.



Ext salt of tragacanth, gelatine, cms pinestonand in jums - a commented of mechanism remote them Brungin is made et Poly mer at lalymen under flow ruting stage \* These materials are long hair malecules which are disorrange at low shear restes \* At thigh mate of shear they became alighed \* Thus material becomes less viscous as the shear reate is Ned.

3- Dilatant flaw \* Dilatancy is a phenomena in which material show on 1 in versistance to flow with ting veate of shear. \* The material rections to a state of fluidity when the shear is vermoved. to rempt it gente to have rall relay Karylar These materials extension and steaming stress \* This phenomena is klas shear thickening

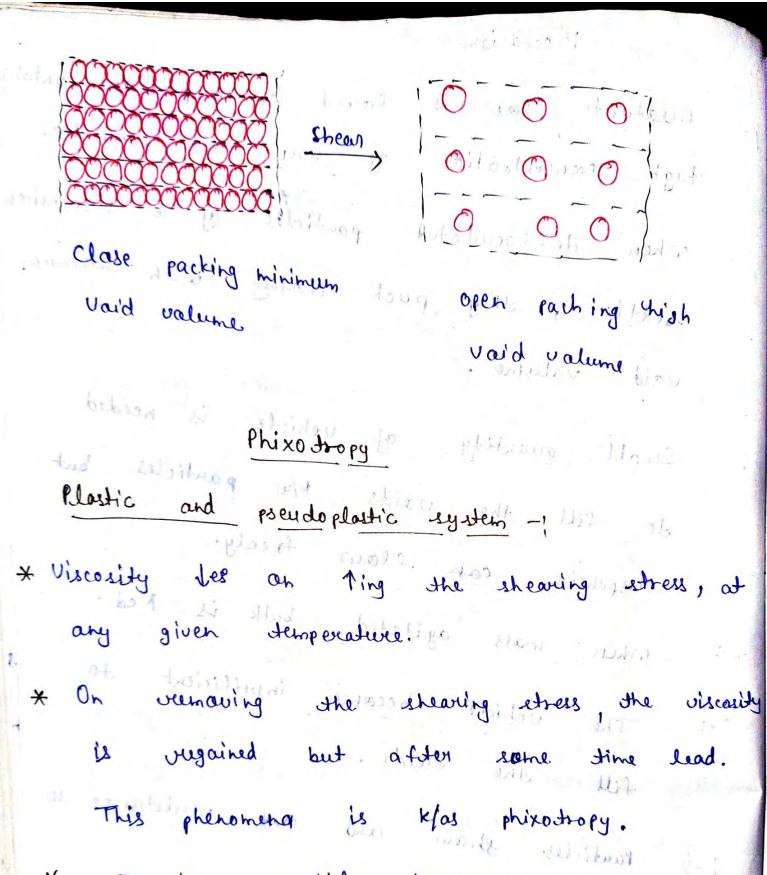
\* Uiscosity Tes with Ting rate of thear. They realisted becomes · hit is store route etc

#### Mechanism

- 1 > Dilatant flow is found in unspension containing tigh concentration of very fine particles.
- 2-3 when deflocculated particles of a suspension settle, they pack closely with minimum vaid valuese.
- 3 -> Small quantity of vehicle is needed to fill the vaids b/w particles but
- suspension can flow freely.
- 4-> When mass agitated, bulk is 1 ed.
- S> The vehicle become insufficient to
  - 6 -> Particles show and red revuridance to

     200 000 Lamburtones eldissection et to

In the south of the standard of the south marks



X It is reversible is othermal process.

Gred Application of Sal Remaral of Screl shear stress Grel

\* Rheogram is obtained by platting the veste of shear at various shearing stress. evoleting a Tolock and lseudo clastic \$ Polastic Shearing stress Rheagran stress is tes and bepaume is \* As shearing . las of providuos and obtained. \* On vieducing the shearing stress a down curve is obtained. shear stress \* The down curve sifted to the left side means the viscosity of down curve is lower than the upwwe. Ex-! O Example of plastic system showing phixotropy on bentonite gel. 1 Pseudo plantic system showing phisostopy on

dispensions of synthetic suspending agents. The primarile indicate the reals Thixo tropy in dilatent system -! \* In dilatant system, an 1 in shearing stress causes an apparent 1 in viscosity. \* On vumaval og stress viscosity les but after a lag of time. transformation X It is viewersible isathernal HUNDELL SA from salution to gel. - ballot do Sail Application of Scal Remard of Sail shear stress \* Rheogram fon dilabant system are as follows-Trous plans 10 Price 18 10 210 2100ml . Purmye att. nort. & the sile P. elymort () 1-x3 no protoring no graduated the shearing stress of

\* Viscosity of application of with stress. Egs Sand suspension Kinematic viscosity - Arustangust office got are a by phisosoft Viscosity-s Viscoulty is an expression of the resistance of a fluid to flow under applied stress, higher the viscosity, greater the rusistan Consently speed of maky with Coefficient of viscosity. The survey of the state of the survey of the demperature is F= Force per unit area. Cr: Rate of shear. The unit of viscosity is paide on sentipoise. while the contraction is building 1 Cp = 0.01 paise. · bingil 19 petender 10 10 Kinematic viscosity from The kinematic viscosity of a liquid is its absolute viscosity divided density at a definite temperature. byol to the

kinematic viscosity =  $\frac{2}{p}$ 

Effect of temperature -

Viscosity of a gas 1es with temperature.

In case of liquid the viscosity les with

1 in temperature.

Cremerally speed of many vish can be ted

2-3 Himes with 1 of of 10°C temp.

The dependence of viscosity of a liquid

an temperature is given by Arthenius

equation - para there my some?

7 = Ae-EV/RT

T = Temperature in kalvin.

n= viscosity of liquid.

R = Cros constant

habituile the A = Frequency of chalipen challision

energy of activation required for blu was mulmagnet stiller 2

Determination of visconity 1. Copillary viscometer (ostwald viscometer) 1-1 parature is evolve as east stome states to the distribution all minustrice of capillary Jube who in his of trait one is transcours will Ostevald viscomiter elle ittin has it bingib out interested with all x \* Capillary viscometer is accurate for measurement of viscosity of newtonian liquids (filuids) having dow viscostly. - so nottoliolos pot \* Liquid is introduced into the ostward viscometer through left our upto mark A. viscometer is fixed vertically an q water bath.

- \* The liquid is sucked through vight arm will the mark (B. and observed welligh)
  - \* The pressure is vuleased and time taken from the miniscus to fall from B to C is noted.
  - \* To determine the vulative viscosity of a liquid with verspect to water,
- \* The experiment is done first with water and then with the liquid whose viscosity is to be determined.
- \* The time taken for the liquid To and for water T2 are determined.
- \* The vulative viscority is determined by calculation os pil adiv out

$$\frac{2y}{2} = \frac{\int_1 d_1}{\int_2 d_2}$$

$$\frac{1}{\int_2 d_2} = \frac{\int_1 d_1}{\int_2 d_2}$$

0-1-3 The time veguired for water and liew'd B to flow through a ostwald viscometer to bosed or was found to be 48 sec. and 20 sec. ouspectively. at 25°C. It the density of wester and the liquid at 25°C are without atte exerges delait 1 and 0.85 gm/cm2 respectively, calculate the viscosity of liquid B at 25°C. Caiven viscosity of water at 25°C is 10.89 Em. paise).

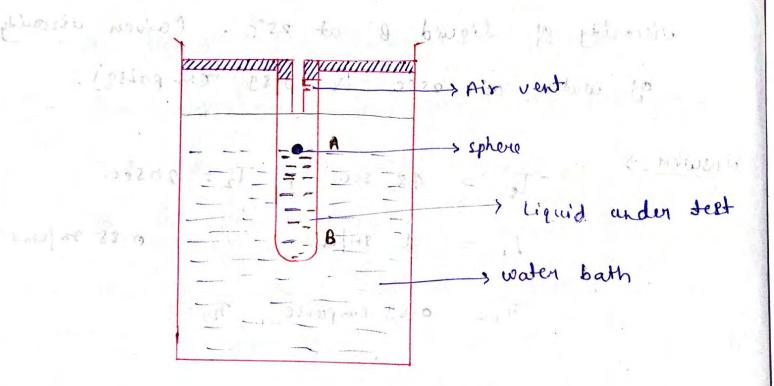
Answer 
$$\Rightarrow$$
  $T_1 = 48$  sec.  $T_2 = 20$  sec.

$$\frac{R_1}{R_2} = \frac{P_1 J_1}{P_2 J_2} \quad \text{adul } L_1 \quad \text{po triangs} \quad L_2$$

22= 0.31 cm palse of the planting

The Holes is closinged beautiful topicals a

This instrument is bosed on stok's law which states that when a body falls through a viscous medium, it experiences a runistance which opposes the motion of the body. the stableton phralipriese surplies 28.0 hours



\* It consist of a tube having two mark A and 8 on the outer swrface.

\* The tube is filled with the liquid whose viscosity is to be determined.

\* The tube is clamped ventically inside a

\* A ball of suitable material such as steel on glass is allowed to fall through the guide Libe inside the falling tube. \* The time taken for the sphere to fell from the point A to B is roted. \* The Iterinal velocity is obtained by dividing the distance to the 2 marks and the \* By substituting the values in the equation, the viscosity of the liquid is determined. 7 = do (Ps - Po) W V 81 FOR knowlish of evaluation or to existing the auton white into is on it to provide the state winder haply is besident at algebra ext

Cup and Bob visco-meter

; \* It consists of 2 cylindous of different diameters.

\* The autor cyclinder forms the cup into which the inner cyclinder or bob is fixed.

\* The sample to be analysed is placed

in the space b/w the auter wall of the bob and inner wall of the cup. The dougue set up tin when bob wisto measured by angular difficient (a) of a pointer that moures on à scale: (1) ctant donner to server ( teat). to there and non must being x del silo ( relling) fonces, compressive (public) fonces, bending on divising. Temperature and mental in structural but wit consist ting to better. endething district in both conjustations and new-congratalline. earlids. lastrotri, ercoro violitamo dels sA intermolecular torces arise that appoint the applied force.

\* Deformation ductors to any change in the thape for evice (sq. an object due to applied force (energy through work) or change in temperature (heat).

\* Applied force can be rusult of tensile (ruling) forces, compressive (pushing) forces, bending on twisting.

\* Temperature can rusult in structural defect, paint vacancies, line and screw dislocation in bath crystalline and non-conjectalline salids.

\* As deformations occurs, internal internal cular forces wise that appose the applied force.

\* If the applied fonce is not too great, I these forces may be sufficient to visit allo di sitta le the applied fonce. 227. L. Dit wages bugget The object retween to its original testate, when the load is removed. \* A larger applied fonce may lead to a permanent defarmation of the strobject. il applies bromatibus all ne president Types of deformation 1 Elastic de formation (age 1 Plastic deformation. - 10 bo -@ Fracture deformation. (i) True stress and strain deformation. in able of material such of concrete and steet.

D'élastic defarmation -! \* This is also k/as Jemporary deformation X It depend upon the stress level in \* The temperary deformation is recoverable as it disprears after the runawal of applied farce. Upan remaval et load, a complète recovery to the undeformed configuration should takes place. \* There we 2 types of elastic deform · Noithon deformation. - ation small elastic deformation subort (a) residonantes vientes bio mosts de formation in case of material such as concrete and steel.

plange l'elastic deformation proposition de Case of elastomor and polymen. 1) Plastic deformation -: printerment broth le \* This types of detarmation is irreversible. \* An object in the plastic determation vange will first undurgo elastic deformation and then plastic deformation which is irriversible. Intubor situal? \* It depends on both whe stress level and strain history ring the material. \* Plastic deformation in metals occurs after a metal reached its yield point is so pen substant into & It vusults due 100 dislocation of micro structural sources which are of load.

deformation such as copper, silver and gold. \* Hard thermosetting plastic have small plastice deformation kuch as mubber, crystalls and ceramics. dusido 1/1 vilsola agraban texa Hice grave mortomodel Elastic modulus \* Elastic modulus is the ratio of below to the proportional limit lo joben that strain modern single bus \* It is elette gration of stress to strain when better desformation is totally electic. \* This modulus may be thought as a materials ovusitance to elastic exo didos sometes sometes original de formation. t A origid material has a higher -book p

modulus. \* élastic modules às also klos y aung s. modules. Ex-1 Magnisium has magnitude of modulus 6/10 45 gigapascale and tungstan has 407 gigapascale. There is the man work makens \* The parameteris used to describe the 100,0011 stress - strain curve is tensile strength. rield strength and "10 lelongation; yield \* There are 3 types of moduli—the 1 - Elastic modulus (Yaung's modulus). The 2- Bulk modulus \_\_\_\_ The viatio of estress to the tractional decrease of in 6the valuence of the body. . with him bord. 3- Shear modulus -> The viatio of Hangening whomy set farce per unit area to the angular

detarmation.

presentant. Copera an inceres tion

Stress > ... It is indefined as force per unit grea : militagen por representation of the militagen to the Strain ->
It is defined as elongation or contraction per unit length. dos 1908 8 Heckel equation \* The heckel analysis is a most papular 10.1014 method of deformation reduction under compression pressure.

\*\* Pawder packing with Ting compression

do ad affect particle rearrangement, elastic

and plastic deformation and particle fragmentation. ubod att 10 energy Mix and Ity follow first order with where's vieadant. Coppend an concentration.

· do i to must ab

Log 1/E = Ky.P + Kn

Ky = material constant. where -> kn = Initial oupacking stage (E.) E = Porosity 0. P = Applied pressure A- 1901 \* For cylindrical Jablet's — (Common P = 12 4 F / T. 02) Course or and Earles 100 = Tablet diameter 111 F = compression fonce.

\* Porosity can be calculated by equation.

E = 100 CI- 4 W/H. 7 D2H)

where I weight of tablet.

Where I weight of tablet.

H = Thickens of tablet.

10 N 1 1 1 1 1 2 = 11 10 Heckel's plots -1, · burbano lomotoro = 1+4 (23) sinks pridroper toward - not white around 3 rulling hall Log E أعوما Type - A Type - B Parisbriens of Compression Fonce Compression Fance (saft material) (Hard material) Type - A -> Higher slope and lawer yield streis. maisseygnes Type-B- Lawer slope and high yield stress (Hard material). でも、14人のも、10円 tallow first order kinetics. 10 things parasity les compression fonce Ass X also testate to mediate

materials which are soft under go plostic deformation.

It depend upon shape and size distribution of particles.

Ex + Nacl, Na Br (Type A)

X Harder material with higher yield pressure under 90 compression by fragmentation.

Ex+ Lactore and sacrose (Type B)

situals to Burkers that no titles heterogeneous dispersed system Coarise disjursions are in which the dispersed phase particles are larger with the dispersed phase particles are larger to the dispersed the second that the second second the second second the second second the second seco than 1000 nm. Nace, Na Br (Type A)

## Unich — Thomas and that was

4386 Lines

de la Coarse dispersion de la la indepensation

\* Suspension and emulsion are 21 types of

Coarse dispersion.

\* The size of coarse dispersion vanges from

1 un do 100 um.

Suspension nay be defined

as a heterogenous (biphasic system) comprising

ey a solid phase (dispersed phase)

white tarmally of a dispersed in a liquid phase

(continuous, phase).

\* A suspension is a coarse dispersion which

supply insoluble typand distostefull substance

in the farm of pleasant starte.

Ex-100 chearan phenical is very bitter and

can hat be given in liquid form to children. 1 chlaramphenical patrilate, an insoluble salt can be farmulated in suspension for paediatric USP . course disposes. Interfecial properties of suspended particles and of year there save a factors in suspended in prinipanticles of teph sixohid I sugare entert o 1 Swiface free chorge - 21019 bilos o \* In formulation of a suspensioning work is done to vieduce the particle size ( A the surface wea). Moissognie ! \* This makes the begeterhalo therm a dynamically which the speed of most ett. \* but In which derden to so I so the relability , part des

forculate by vander wall is forces. of The 1 in free energy due to ouduration of particle size is given by the equation x Force policy on the souther of the  $\Delta G_{i} = \sqrt{g_{i}} \Delta A$ Where & DG = Surface free energy change VsL = Interfecial tension b/w solid and liquid !! DA = Change in surface area of salid . Proget. \* The system try to stable by oudnoing free energy to zero \* The interfecial tension can be oreduced by wetting agent. which adsorb an the surface of particle. wetting agent can host verduce the interfected tension to zoco, hence

Suspension particle stend to thorculate. the A in the press of the sale of Delectrical properties -! \* Fance acting on the surface of the suspended particles affect floceculation in a suspension. \* Farce of attraction arise from vander wall s forces \* Fonce of vientision visulty from electrical double layer. bille \* when the oupulsive cherry is high, notype it prevent collarion of particles and they remains deflocculated. Lois of meat when defloccoulated particles settles, they form closed, eaching. when the country that make the

induction de moisson de mons, hense

man and pullation to make the diameter of particle. 920 44 122 19 26 C in plient Repulsive curve Whose Hor relieved. Energy curve for floculated suspension phinospie : 18 grange e. 1709 8,42043 Attractive converting ochloweled to Distance b/w - 100 state is notakianibes to store 97 Mar 2 1 1. 1 Settling in suspensions The sedimentation velocity of suspended particle is given by stockis law. According to to this to oit ogoes the red Lli V = d2 ( Ps + P) 1

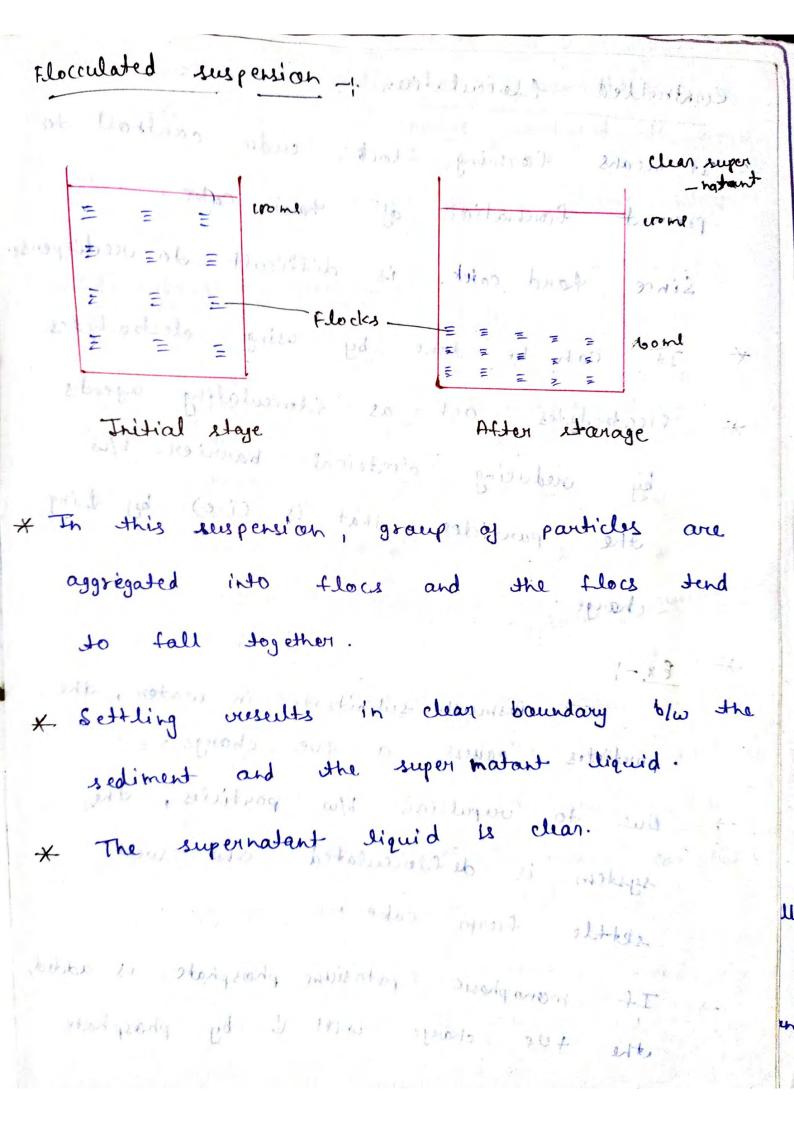
v= Rate of settling in em/s. d = diameter of particles. Ps = Density of dispersed phase. Po = Density of dispersion medium. Acceleration due to gravity. n = viscosity of dispersion medicum. Stock's law is applicable to dilute X suspension containing 0.5-29m. salid per 100 ml. From stock's law, it is clear that X vate of sedimentation is— Directly propartional to difference he by the densities of both phase. noitoturides et work of vola ( 13-16) would be dikney Directly proportional without square of diameter of particles. [ v & d2

@ Inversaly proportional to the viscosity of the dispersion medium. 10 nothernage of Va Librarys out in north + 1011199111 of 126. Approaches to viduce settling of particles -! 1- It may be viduced by I the particle size. 2- It can be vieduced by 1 ing to other viscosity up to l'optimum plates dido 3- It can be vieduced by lings the difference in the density of the dispersed phase and dispersion medium (By adding PECT, Chycerine, sugar rete) (Poly ethylene glycol) 03 - wholeon glog so thus steeps gatterw. and sois set low trater gration of glade solid and vehicles.

- \* There are two approaches for preparation of stable suspension.
- \* There are printer growing to some of
- O use of structured vehicle to maintain deflocated.
- (1) Application of flocculation to produce flocs which settle veapidly and easy to vedispose

Wettingt agent particles -; beneben and so

- \* This is the first step in formulation of suspension.
- is defficult due to adsorbed air and grease.
- \* wetting agents such as paly scorbate -80 help to viduce interfecial tension blw solid and vehicles.



## Controlled floculation - designed belowed

\* It means farming flocks under controll to prevent formation of hour cake.

Since hard cake is difficult to redispense.

\* It can be done by using electrolytes

\* Electrolytes act as flocculating agents by reducing electrical barrier. b/w the particles that is (i.e.) by ding chaye. We ber words other bategarige

\* Ex-1

Bismuth subhitsate in water, the

- particles passes a tre charge.

  Due to repulsion b/w particles, the system is deflocculated and well x settle forth cake.
  - -> If manophasic patasium phosphate is added, the tre charge will I by phasphate ions.

3 On continuous, additions of mano phasic podasium phosphate, the tre charge reduced to zero.

-> This visualt in formation of loose flows.

and have your and now already bountary Deflocculated suspension -!

to senial in

oth work

the charge

brigate , rankarhat , contagnal , oliginal Supernatant claudy 60 . . . . snite to constant of the story the property with with Defloculated suspension allent shains without that and blunches

\* In deflocculated suspension, the larger particles settles faster vate than the smaller particles.

\* As: a visual a clear boundary blw the sediment and the dispersion medium can not be easily distinguished.

\* The supernatant liquid ocemains dainly for a definite period of time.

avisuse of extructured vehicle by anous has

\* structured vehicle are those vehicle which are used to reduce the degree of sedimentation

\* Structured vehicle can be prepared by using thickening agents such as tragakanthy beegun, carbachal, carbory methyl cellulare etc.

These structured vehicles slow down the vate of sedimentation.

\* To prepare structured which, the charge on flocculating and suspending agent should be kept in mind.

Ex. 1 + vely charged particle flocculate in - vely charge (anianic) electrolyte (gum)

The tuely changed particle will be destablised by tuely changed gelatine.

With trely charged electrolyte.

An emeileion is a biphasic liquid preparation containing two immiscible liquids, one of which is dispersed uniformally as minute shoulds into the ather continuous phase.

X The liquid which is converted into minute globules are called the dispersed phase and the liquid in which it is dispensed are called continuous phase.

\* The size range of globules may be
0.1-100 Mm in diameter.

Types of emulsion.

1 > Oil in water emulsion (o/w) -i

A system in which ail is dispersed phase war water ignicantinuous phase are klas

oil in water emilsion.

Ex-1 Lotion, liniments, creams etc.

2- water in ail emelsion (w/o) -13 The system in which water is dispersed phase and ail is the continuous phase are klas prostorinin ail (w/o), emulsion. Ex-: Maistwing cream; cleansing cream? 3- multiple emulsion (w/o/w, o/w/o)-; \* Multiples remedian, are those emulsion in which the cells in water or water in cell emulsion are dispersed in another liquid medium such as all ar water. Finally system forms 0/w/o or w/o/w
emulsion. Eg > Sustained vieleased dosage forms seeing hornogeih zi lio dila di ditepe. A 4 - Micro-emulsion -! 25/1 200 10019 Euperthon Micro - emphians of are emulsians that contain globule diameter less than 0.1 um, and are invisible to

neckedh eye. \* micro emulsions are transparant solutions. Es Bath external as well as internal preparent. branch turns Eproop sally give half. Love Theorise of emulsian \* If one liquid is broken into small particles as globules, the surface area of liquid 1es. \* Thus surface free energy also les due to words forth securface, and area. \* Hence the system becames thereno dynamically 10 unstable 1 11 Live Lawillitio 14 \* Emulsifying agents are added to stablized the system. · structe wil Emulsifying agent reduces interfectal tension \* There are following theories of emulsions A set of Freeze 1- Mono malecular adsorption theory-\* surfactant form a single layer at the

inter phase.

\* Surfectant have both hydrophillic and lipophillic regions.

\* Surfectants adsorbe at the all-water interposed such that dipophillic groups orient towards oil and hydrophillic groups arrient towards water.

\* This film also act as mechanical barrier to cardescence of globules.

\* Emulsifying agent vuduces interfecial tension,
Surface free energy also.

\* An additional effect is presence of remface charge which cause viepulsion b/w glabules.

Swelactant

Oil

Swater

Swater

Mano malecular

\* Hydrophillic callaids act by farming multimode
- cular layer at the interphase.

\* The layer are strong and overist coalescence.

\* Hydrophillic callaids cause I in viscosity of the medium which also les coalescence.

X Sènce they are thydrophillic, they form anly 0/w emulsion.

Hydrophillic callaids

Water

multimalecular adsarption

3- Salid particles adsorption theory -!

\* Some fine solids have balanced hydrophillic

and dipophillic properties. N' la curs

\* They occumulate at the w/o interphase and

prevent coalescence.

\* If the solid particles are initially wetted by ail, a weter/aid (w/o) enulsjon væsults. - such state to meet have A The Boyen has strong and writed contention The following the state of the . 22 mollogo - oli jo - ele , dille mulban elle west part william better 22 mil 2 \* If the solid particle are initially wetted by water, a 0/w emulsions ousults. abielles sillingorball 40) il a Do our Do gravilla - mant porte de siste Exited Abstraction of collaidal plays and several in organic substances are used so sealgnoths emploifying agent. 27/12 Cooled Contra

vice - veusa.

- 1 Physical and chemical charges -1 \* Natural gums used as emulsifying agent may Cartain bacterial growth. in tolono this \* This may cause thange in pH and breaking di smos saludali down not emulsion. Factors which improve stability of in a condition—! O Particle size ... It is necessary to choose the optiment size of globeles. (de) lin di natori di (1) Particle size distribution uniform size impart maximum stability. blobules are Wiscoulty - 1 min and
  - As wiscoulty 1 es flocculation of globules humbervieduce : 101 nos 13 610 An optimenta viscosity is desirable for good stability. est

Phose valume viation il dispersed phase is called critical paint beyond which phase inversion dakes place. 50:50 phase valume ratio give most stable emulsian. Present the Land writing Charge of globules (i) PH of emetrican Prevervation of emulsion 1- Preservation from micro-organism , Micro-arganism cause change in calour, taste, odown of the chydrolyris and even cause breaking of emulsion. character of ideal preservative.

- Tt should be hon-toxic, hon-initant.

Joste to the emulsion.

bacteriostatic activity.

-> It should be highly water soluble.