MODULE-1

PHARMACY INDIA

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Contents

SECTION

1

Pharmaceutical Technology

- Tablet
- Capsule
- Parenterals
- Emulsion
- Suspension
- Pharmaceutical Aerosol
- Suppositories
- Novel Drug Delivery System
- Monophasic liquid dosage form
- Preformulation studies
- Sterlization

Chapter 1

TABLET

DEFINITION

- According to the Indian Pharmacopoeia: -Pharmaceutical tablets are solid, flat or biconvex dishes, unit dosage form, prepared by compressing a drug or a mixture of drugs, with or without diluents.

TYPES & CLASSES OF TABLET

Tablets ingested orally	Tablets used in the oral cavity	Tablets administered by other route	Tablets used to prepare solution
1. Compressed tablets or standard compressed tablets 2. Multiple compressed tablets ○ Layered tablets ○ Compression coated tablet 3. Chewable tablet 4. Sugar and chocolate coated tablet 5. Film coated tablet 6. Repeat action tablet 7. Delayed action tablet & enteric coated tablet 8. Controlled release tablets	1. Buccal & sublingual tablets 2. Troches & lozenges 3. Dental cones	1. Implantation tablet 2. Vaginal tablet	1. Effervescent tablet 2. Dispensing tablet 3. Hypodermic tablet 4. Tablet triturates

CHEWABLE TABLET

- Intended to be chewed in mouth.
- Negative heat of solution.
- Most commonly used chewable tablet in market for children. “Chewable Aspirin tablet” Antacid tablets, Anthelminthics
- Disintegrant not required

DELAYED ACTION TABLET & ENTERIC COATED TABLET

- Intended to release a drug after some time delay or after the tablet has passed through one part of the GI tract into another
- Not all delayed action tablets are enteric or intended to produce enteric effect
- Enteric coating polymer: Cellulose acetate phthalate, polyvinyl acetate phthalate, HPMC phthalate.

Emcopress	Calcium hydrogen phosphate
Amberlite	Ion exchange resins
Polyplasdone	Crosslinked PVP
Dipac	97% Sucrose +3% modified dextrin
Nu-Tab	95% Sucrose + 4% invert sugar
Sugartab	90-93 % Sucrose + 7-10 % invert sugar
Microcellac	75% lactose+ 25 % Microcrystalline cellulose
Cal-Tab	93% Calcium Sulphate + 7 % Vegetable gum

BINDERS AND ADHESIVES:

These materials are added either dry or in wet form to form granules or to form cohesive compacts for directly compressed tablet.

BINDER	PROPRIETERY NAME
Carboxymethylcellulose sodium	Nymcel
Cellulose, Microcrystalline	Avicel, Emcocel, Vivacel
Ethyl cellulose	Aqua coat
HPMC	Methocel, Pharma coat
Magnesium aluminium silicate	Pharmasorb, Veegum
Methylcellulose	Celacol, Methocel
Poly dextrose	Litesse

DISINTEGRANTS:

Added to a tablet formulation to facilitate its breaking or disintegration when it contacts in water in the GIT.

SUPERDISINTEGRANTS: Swells up to ten-fold within 30 seconds when contact water.

DISINTEGRANT	PROPRIETERY NAME
Cellulose, microcrystalline	Avicel, Emcocel, Vivacel
Magnesium aluminium silicate	Veegum
Methyl cellulose	Celacol, Methocel
Sodium lauryl sulfate	Empicol
Polacrilin potassium	Amberlite
Sodium starch glycolate	Explotab, Primojel
Crospovidone	Kollidon CL, Polyplasdone XL
Croscarmellose sodium	Ac-di-sol, Solutab

LUBRICANTS

Lubricants are intended to prevent adhesion of the tablet materials to the surface of dies and punches, reduce inter particle friction and may improve the rate of flow of the tablet granulation.

LUBRICANT	PROPRIETERY NAME
Glyceryl palmitostearate	Precirol
Hydrogenated vegetable oil	Lubritab, Sterotex
PEG 4000 OR 6000	Macrogols, Carbowax
Sodium lauryl sulfate	Empicol, Steroweet

Example: Lubricants- Stearic acid, Stearic acid salt – Stearic acid, Magnesium stearate, Talc, PEG (Polyethylene glycols), Surfactants

GLIDANTS:

Glidants are intended to promote flow of granules or powder material by reducing the friction between the particles.

GLIDANT	PROPRIETERY NAME
Cellulose	Elcema, Solka, Floc
Silicon dioxide, Colloidal	Aerosil, Cab-o-Sil, Syloid

- Corn Starch – 5-10% conc.
- Talc-5% conc.,
- Silica derivative - Colloidal silicas such as Cab-O-Sil, Syloid, Aerosil in 0.25-3% conc.

SWEETENING AGENTS:

SWEETENERS	PROPERTIES
Cyclamate	Carcinogenic, 70 times sweeter than sugar
Mannitol	72 times sweeter than sugar, used in chewable tablets
Saccharine	Carcinogenic, 500 times sweeter than sugar
Aspartame	Non-Carcinogenic, 200 times sweeter than sugar
Neotame	Also known by the trade name Newtame, is a non-caloric artificial sweetener
Sucralose	It is an artificial sweetener and sugar substitute. The majority of ingested sucralose is not broken down by the body, so it is noncaloric.
Acesulfame potassium	Also known as acesulfame K or Ace K, is a calorie-free sugar substitute often marketed under the trade names Sunett and Sweet One.

TABLET COATING

TYPES OF TABLET COATING

- SUGAR COATING
- FILM COATING
- ENTERIC COATING

EQUIPMENTS UESD IN COATING

- PERFORATED COATING PANS
- STANDARD COATING PANS
- FLUDIZED BED COATER

TABLET COATING

- As per I.P "Tablet coated with mixture of various substances such as resins, gums, inactive and insoluble fillers, sugars, waxes, etc."

TYPES OF COATING

- Sugar coating
- Film coating
- Enteric coating

Chapter 2

CAPSULES

INTRODUCTION

- Capsules are solid dosage forms in which the drug substance is enclosed within either a hard or soft soluble shell, usually formed from gelatin.

TYPES OF CAPSULES

Hard Gelatin Capsule	Soft Gelatin Capsule
○ Disintegration time is 30 minutes ○ Made up from **gelatin +sugar + water** ○ Dry filled capsules	○ Disintegration time is **60** minutes ○ Made up from **gelatin +plasticizer + water** ○ Soluble elastic and soft elastic caps ○ Liquid filling capsule

GELATIN

Gelatin derived from hydrolytic extraction of animal collagen. Common source of gelatin is skin, bones, white connective tissue frozen, pork skin.

TYPES OF GELATIN

TYPE A	TYPE B
Pharma gel A (cationic)	Pharmagel B (anionic)
By acid treatment	By alkali treatment
Isoelectric point (pH-9)	Isoelectric (pH-4.7)
Processing of an acid bone gelatin, isoelectric point pH – 5.5 -6	From green bones

BLOOM/GEL STRENGTH

- Measure cohesive strength of cross linking between gelatin molecules
- Bloom strength α molecular wt. of gelatin (directly proportional)
- Determined by weight in grams required to move a plastic plunger that is 0.5 inches in diameter ,4mm into 6% of gelatin gel that has been held at 10-degree Celsius for 17 hours
- Range is 150-250 gram
- Higher the bloom strength →higher the physical stability of capsule shell

VISCOSIY

- Determines on 6% concentration of gelatin at 60-degree Celsius →measure of molecular chain length and determine manufacturing characteristics
- Viscosity for gel range from **25-45 milli poise**
- Low viscosity **(25 to 32 milli pose) high bloom (180-250 g)** gelatins are used in the conjunction with the capsulation of hygroscopic vehicles of solids
- Gelatin used in the soft gelatin capsule should not contain **≥15ppm iron**

PLASTICIZER

- The ratio (w/w) of dry plasticizer to dry gelatin determines the hardness of gelatin shell assuming that there is no effect from the capsulated material.
- Some of the examples of glycerin /gelatin ratios are shown in table

HARDNESS	RATIO=DRY GLYCERINE: DRY GELATIN	USAGE
Hard	0.4/1	Oral, oil-based shell, softening product and those destined primarily for hot humid areas
Medium	0.6/1	Oral, oil-based shell, softening product and those destined primarily for hot humid areas
Soft	0.8/1	Tube, vaginal, water miscible based or shell hardening products and those destined primarily for cold, dry areas

ADDITIONAL COMPONENTS

INGREDIENT	CONCENTRATION	PURPOSE
Methylparaben (4 parts), propyl paraben (1 part)	0.2%	Preservative
Titanium dioxide	0.2 to 1.2%	Opacifier
Ethyl vanillin	0.1%	Flavoring for odour and taste
Essentials oils	Upto 2%	Flavoring for odor and taste
Sugar (sucrose)	Upto 5 %	To produce chewable shell and taste
Fumaric acid	Upto 1 %	Aids solubility: reduces aldehydic tanning of gelatin

POINTS TO BE REMEMBER

- Formalin treatment: - decrease solubility of gelatin and cross linking of gelatin molecules takes place
- 40% of formaldehyde →formalin
- Roto fill (Eli lily company) designed for filling of pellets
- Roto sort →for removing the loose powder
- Turett → to hold upper and lower punch
- Cam track →guide the movement f punches
- Fette machine →used to provide cool temperature
- Emptying capsule moisture content →12- 16%
- Humidity range → 30 - 40%

CLASSIFICATION:

PARAMETER	SMALL VOLUME PARENTERAL	LARGEB VOLUME PARENTERAL
Volume	100 ml or less	101-1000 ml
Routes	IV, IM & SC	IV
Dosage unit	Single or multiple S	Single
Preservative	Used	Not used
Buffers	Used	Not used
Formulation	Solution, emulsion, suspension	Solution & o/w nutrient emulsion
Isotonicity	Not essential	must
Pyrogenicity	Not essential	must
Use	Therapeutic & diagnostic	Nutrition, detoxification, And during surgery

FORMULATION OF PARENTERALS

- Active drug
- Antioxidants
- Vehicles
- Adjuvants

FORMULATION OF PARENTERAL PRODUCTS

VEHICLES

1. Aqueous vehicle

Type	Method of Preparation	Comment
Purified water	Distillation and Ion exchange	• Pharmaceutical solvent
Water for injection (WFI)	Distillation or reverse osmosis	• Not more than 10 parts per million of total solids. • Not sterile must be used within 24hrs or stored below 5ºC or at 80ºC.
Bacteriostatic WFI	Distillation or reverse osmosis	• Prepared under aseptic conditions and not terminally sterilized. • Contain an added bacteriostatic agent when in containers of 30 ml or less. • used for making parenteral solutions
Sterile WFI	Distillation or reverse osmosis	• Contain one or more suitable bacteriostatic agent. • Multiple – dose containers not exceeding 30 ml. • They are permitted to contain higher levels of solid than WFI because of possible leaching. • Used for washing wounds, surgical incisions, or body tissues.

2. **Water miscible vehicles -** Ethyl alcohol, Liquid propylene glycol, Glycerin, Ethyl alcohol used in the case of cardiac glycoside
3. **Non aqueous vehicle -** Fixed oils (vegetable origin, liquid, and rancid resistance, unsaturated, free fatty acid content).

Identification tests

TEST	O/W EMULSION	W/O EMULSION
Color	Usually, white	Takes the color of oil
Feel on skin	Non greasy	Greasy
Dye solubility test	Internal phase is stained by oil soluble dyes like scarlet red, Sudan iii which are visible as droplets under microscope.	Internal phase is stained by water soluble dye like Amarnath, Methylene blue.
Dilution test with water	Emulsion Becomes Turbid	Dosent get dilutes, intact as separate phase in clear water.
Conductivity test	Conducts current	Does not conduct current
Direction of creaming	Upward movement	Downward movement
Fluorescence test	Exhibits dot pattern fluorescence	Exhibits fluorescence throughout the emulsion
COCl2/ Filter paper test	Filter paper changes from blue to pink	No change
Bottling paper test	Wet the bottling paper	Does not wet the blotting paper

Proportion of oil, water and gum required for different oil

TYPE OF OIL	EXAMPLE	RATIO OF OIL: WATER: GUM
Fixed oil (for dry gm method and wet gum method)	Castor oil, Almond oil, Cod liver oil, Arachis oil	4:2:1
Mineral oil (bottle method)	Liquid paraffin, Linseed oil	3:2:1
Volatile oil (bottle method)	Turpentine oil, Peppermint oil, Cinnamon oil	2:2:1
Oleo-resin	Male fern extract	1:2:1

Thermodynamic causes for instability

- The state of instability is due to when **cohesive force > adhesive force.**
- A system is said to be thermodynamically stable, if it possesses low surface free energy. The higher the interfacial area, the greater is the interfacial free energy, and hence lower the stability.
- Interfacial free energy (ΔG) in emulsion

$$\Delta G = \gamma_{o/w} \Delta A$$

$\gamma_{o/w}$ is interfacial tension

ΔA is increase in surface area of the interface due to droplet formation.

- Approaches for stable emulsion - reduce $\gamma_{o/w}$ by adding surface active agent

Chapter 10 MONOPHASIC LIQUID DOSAGE FORM

Liquid Dosage forms	Description
Aromatic water	Solution of aromatic material in water.
Syrup	Aqueous solution containing sugar
Spirit	Solution of aromatic material in alcohol
Injection	Prepared to be sterile and pyrogen free and intended for parenteral administration.
Elixir	They are sweetened hydroalcoholic solution
Linctuses	They are generally prescribed for relief of cough
Liniment	They are alcoholic and oily liquid preparations, they are intended for external application by rubbing onto the affected area.
Lotions	They are aqueous, alcoholic or oily liquid preparation, they are intended for external application without rubbing onto the affected area.
Drops	Liquid preparation meant for oral, nasal or for eye administration.
Collodions	They are liquid preparation containing in a mixture of ethyl ether and ethanol.
Douches	They are aqueous solution which is directed against a part, or into a cavity, of the body
Enemas	These preparations are injected through the rectal route to evacuate the bowel.
Gargles	They are used for treating throat infection. Pharyngeal and oral pain. Potassium chloride is used for astringent effect.
Throat paint	They are viscous liquid preparation used for mouth and throat infection.
Mouth wash	They are mainly used to reduce plaque, gingivitis, dental caries and stomatitis.
Tinctures	Alcoholic preparation containing the active principles of vegetable drugs.

Topical semisolids

Semisolid Dosage Form	Description
Ointments	They usually contain a medicament or medicaments dissolves, suspended or emulsified in the base.
Creams	Creams are viscous emulsions of semisolid consistency intended for application to the skin or mucous membrane o/w type w/o type.
Pastes	Pastes are the preparations contain a large amount of finely powdered solids such as starch and zinc oxide. These are generally very thick and stiff.
Jellies	These are thin transparent or translucent, non-greasy preparations. They are similar to mucilages because they are prepared by using gums.
Gels	These are jelly-like semisolid dispersions of drug meant to be applied on the skin.

SECTION

Physical Pharmacy

- Micromeritics
- Rheology
- Surface tension & interfacial tension
- Colloidal dispersion
- Coarse dispersion
- Diffusion & dissolution
- Kinetics & Drug stability
- Solubility & Related Phenomena
- Complexation & Protein Binding
- Buffers & Buffering Agent

Chapter 1

MICROMERITICS

INTRODUCTION

- Micromeritics is thus the study of the fundamental and derived properties of individual as well as a collection of particles.
- Fundamental properties include - Particle size and distribution, Particles number, Particle volume, Particle shape, Surface area.
- Derived properties include - Porosity, Density, Bulkiness, Flow property.

PARTICLE SIZE AND PARTICLE SIZE DISTRIBUTION

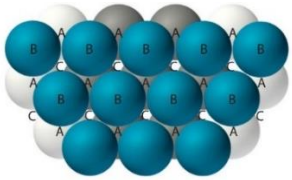
DIAMETER	DESCRIPTION
Surface diameter, ds	It is the diameter of a sphere having the same surface area as that of asymmetric particle
Volume diameter, dv	It is the diameter of a sphere having the same volume as that of asymmetric particle.
Projected diameter, dp	It is the diameter of a sphere having the same area of the asymmetric particle as observed under a microscope.
Stoke's diameter, dst	It is the diameter of an equivalent sphere undergoing sedimentation at the same rate as the asymmetric particle.

PARTICLE SIZE DETERMINATION

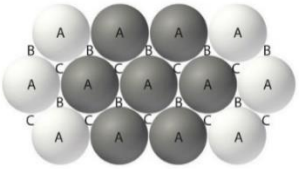
Method	Size range	Instrument	Comment
Microscopy	0.2-100 µm	Optical microscope	• Ferret, Martin and projected diameter measured. • It can detect presence of agglomerates & particles of more than one component • Diameter is 2D – length and breadth, thickness is not estimated
	0.001-0.1 µm	Transmission Electron Microscope (TEM)	
	0.01-1000 µm	Scanning Electron Microscope (SEM)	
	01-1000 µm	Light Microscope	
Sieving	50-1500 µm	Mechanical shaker	Standard sieves are used, Calibrated by National Bureau of Standards
Sedimentation	1-200 µm	Anderson Pipette (Gravity sedimentation based)	Stoke diameter measured

3. Packing Arrangements-

Powder beds of uniform-sized spheres can assume either of two ideal packing arrangements:



closest or rhombohedral packing (26% porosity)



most open, loosest, or cubic packing (48% porosity)

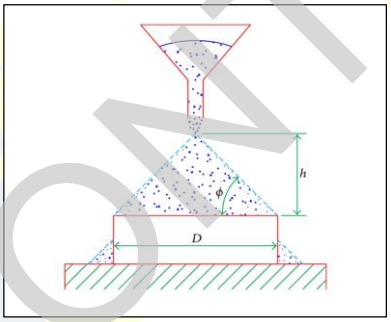
4. Flow properties

A. Angle of repose-

- It is the maximum angle possible between surface of the pile of the powder and horizontal plane.
- Methods used for determination-
  - **Fixed cone method**

    $\theta = \tan^{-1}\frac{h}{r}$

    Where, θ → angle of repose
    r = radius of the base of pile
    h = height of pile
  - **Rotating cylinder method**
  - **Tilted box method**



Angle of repose	Powder flow
<25	Excellent
25-30	Good
30-40	Passable
>40	Very poor

B. Carr's consolidation index (Compressibility)

$$\text{Carr's index} = \frac{Tapped\ density - bulk\ density}{Tapped\ density} \times 100$$

C. Dispersibility -

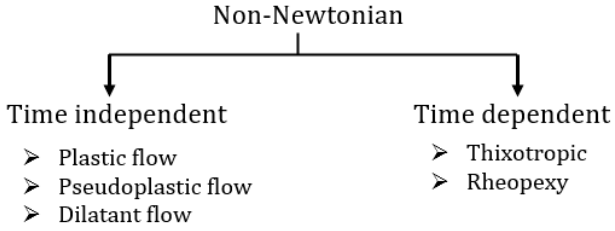
$$\text{Dispersibility (\%)} = \frac{Weight\ of\ powder\ in\ a\ watch\ glass}{Initial\ weight\ of\ sample} \times 100$$

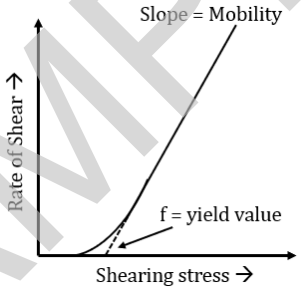
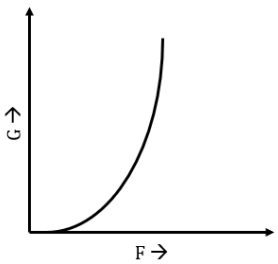
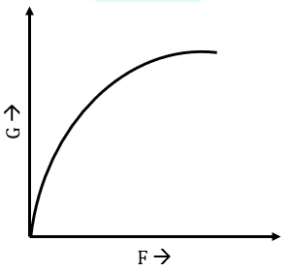
D. Hausner's ratio-

$$\text{Hausner's ratio} = \frac{Tapped\ density}{Bulk\ density}$$

Flow of powder	Carr's index	Hausner's ratio
Excellent	5-15	1-1.11
Good	12-16	1.12-1.18
Fair	18-21	1.19-1.25
Passable	23-28	1.26-1.34
Poor	28-35	1.35-1.45
Very poor	35-38	1.46-1.59
Extremely poor	>40	>1.6

Non-Newtonian flow



S. No.	PLASTIC FLOW	PSEUDOPLASTIC FLOW	DILATANT FLOW
1.	Plastic flow curves do not pass through the origin	Curve for a pseudoplastic material begins at the origin	It also originates from origin
2.	Lines extrapolates to axis, leads to formation of linear curve called yield value.	No part of curve is linear so, no yield value	No yield value
3.	Equation: $U = \frac{F-f}{G}$ U = plastic viscosity f = yield value (N/m^2) G = rate of shear (S) F = shear stress (N/m^2)	Equation: $F^N = \eta' G$ N = 1 (Newtonian flow) N >1 (Non-Newtonian flow)	Equation: $F^N = \eta' G$ N <1 (degree of dilatancy increases) N = 1 (Newtonian flow) N >1 (Non-Newtonian flow)
4.	Also known as **BINGHAM BODIES**	Also called **SHEAR THINNING SYSTEM**	Also called **SHEAR THICKENING SYSTEM**
5.	Flocculated suspension ↑ses yield value	Mainly natural & synthetic gum exhibit pseudoplastic flow	Curve exhibit dilatant flow
6.	Viscosity linearly ↑ses with ↑se rate of shear	Viscosity of pseudoplastic substance ↓ses with ↑se rate of shear	Viscosity of dilatant substance ↑ses with ↑se in stress
7.			
9.	**Examples →** Flocculated particles in concentrated suspension/ Suspension of ZnO in mineral oil, certain paints, ointments	**Examples →** Liquid dispersions of natural and synthetic gums (tragacanth, soidum alginate, methyl cellulose, and sodium carboxy methyl cellulose).	**Examples →** Suspension of corn starch in water; Suspension containing high concentration of solids; Inorganic pigments in water; kaolin in water; zinc oxide in water.

Chapter 4

COLLOIDAL

INTRODUCTION

- A dispersed system is defined as a system in which one phase the dispersed phase is distributed uniformly as particles throughout another phase called the dispersion medium or continuous phase.

Dispersed phase can be classified on the basis of the physical state of two phases-

Dispersion medium	Dispersed phase	Examples of colloidal dispersions	Examples of coarse dispersions
Gas	Liquid	Fog	Spray
Gas	Solid	Smoke	Dust
Liquid	Gas	Foam (Aerosol)	Foam
Liquid	Liquid (immiscible)	Oil globules	Emulsions
Liquid	Solid	Colloidal gold in water	Suspension of kaolin in water
Solid	Gas	Solid foam (Aerosol)	Solid foam
Solid	Liquid	Mineral oil in wax	Solid emulsion
Solid	Solid	Colloidal gold in glass	Solid suspension

CLASSIFICATION OF DISPERSED SYSTEM

Property	Molecular dispersion	Colloidal dispersion	Coarse dispersion
Particle size	Less than 1nm	1nm to 1µm	Greater than 0.5µm
Filter paper	Can pass	Can pass	Cannot pass
Semipermeable membrane	Can pass	Cannot pass	Cannot pass
Optical property	No tyndall effect	Tyndall effect is produced	Tyndall effect is observed
Visiblity under microscopy	Not visible	Visible under ultra microscope	Visible under normal ultra-microscope
Diffusion	Undergo rapid diffusion	Diffuse very slowly	Particles do not diffuse
Appearance	Clear	Clear or turbid	Turbid

Chapter 7

KINETICS AND DRUG STABILITY

INTRODUCTION

- Chemical kinetics is the study of the rate of chemical changes taking place during chemical reactions.

MOLECULARITY OF THE REACTION

- The molecularity of a reaction refers to the number of molecules, atoms or ions reacting in an elementary process to give the reactants.
- **Unimolecular reaction –** If only one type of molecule undergoes a change to yield the product.

$$Br_2 \rightarrow 2Br$$

- **Bimolecular reaction –** two types of molecules are stoichiometrically involved in reaction.

$$H_2 + I_2 \rightarrow 2HI$$

- **Half-life –** It is the time required for the concentration of the reactant to reduce to half of its initial concentration.
- **Shelf life (t_{90}) –** It is defined as the concentration of the reactant to reduce to 90% of its initial concentration.

ORDER OF REACTION

Zero order	First order	Second order
Rate of reaction is independent of the concentration of the reacting species.	Rate of the reaction is directly proportional to the first power of the concentration of a single reactant.	Rate of the reaction is directly proportional to the second power of the concentration of a single reactant.
Rate equation $K = \frac{Ao - At}{t}$ A_o → initial concentration A_t → concentration after t time	**Rate equation** $K = \frac{2.303}{t} \log \frac{a}{a-x}$ a → initial concentration x → decrease in concentration t → time	**Rate equation** $K = \frac{1}{at} \frac{x}{a-x}$ Initial concentration of a and b are not equal $a \neq b$ $K = \frac{2.303}{a-b} \log \frac{b(a-x)}{a(b-x)}$
Half life $t_{1/2} = \frac{Ao}{2K}$	**Half life** $t_{1/2} = \frac{0.693}{K}$	**Half life** $t_{1/2} = \frac{1}{ak}$
Shelf life $t_{90} = \frac{0.1\ Ao}{K}$	**Shelf life** $t_{90} = \frac{2.303}{K} \log \frac{Co}{0.9\ Co}$ **or**	

NAIL PREPARATION

Also called manicure preparation.
Nail bleaches: used to whiten the nails and removes stains from the nails.
Nail bleaches contain oxidizing agents like H2O2 or reducing agents like sulphites.
Nail enamel/Nail lacquer: intended to impart luster of color to the nails.

Formulation of nail enamel:

S.NO	NAME	DEFINITION	EXAMPLES
1.	Film former	Used for forming the filming	cellulose nitrate (most widely used), cellulose acetate, cellulose acetobutyrate, ethylcellulose, methacrylate and vinyl polymers.
2.	Solvents	mixture of solvent is so balanced that precipitation of cellulose nitrate is prevented	High boiling- butyl lactate, ethyloxalate, isoamylacetate etc. Medium boiling- Isopropylacetate, Toluene, IPA, Amylformate etc. Low boiling- ether, CS2, Acetone, Methyl acetate, Ethyl acetate etc.
3.	Plasticizer	imparts flexibility and gloss to the film and help in adhesion of film to the nails.	
4.	Color	insoluble pigment and lake color are used.	
5.	Pearlescent	impart pearly appearance to the film.	2-amino, 6-oxypurine (crystalline guanine), bismuth oxy chloride coated pigments.
6.	Enamel remover	intended to remove enamel from the nails and basically consider of solvents for	

HAIR COLOURANTS

S.NO	NAME	EXAMPLES
1.	Temporary colorant	Citric acid or tartaric acid
2.	Semi permanent colorant	Nitroamino dyes (Picramic acid)
3.	Permanent colorant	Either of vegetable origin or salts of heavy metals.
4.	Oxidation dye	p-phenylene diamine, p- toluenediamine. Phenol such as resorcinol, pyrogallol may be used to modify the shades.
5.	Vegetable dye	Henna, chamomile
6.	Metallic dye	lead, bismuth, silver dye.
7.	Lighteners and bleaches	Hydrogen peroxide, Permanganate solution

7.	β_1 globulin	Bind with carotinoids
8.	γ globulin	Bind with antigen
9.	Hemoglobin	Phenylbutazone, Pentobarbital, Phenothiazine
10.	Carbonic anhydrase	Acetazolamide & Chlorthalidone
11.	Cell membrane	Imipramine & chlorpromazine

EXTRA VASCULAR TISSUE DRUG BINDING

EXAMPLE OF EXTRA VASCULAR TISSUE DRUG BINDING ARE	
Liver	Epoxides of halgoenated hydrocarbon, paracetamol, and antihistamines
Skin	Chloroquine, phenothiazines interact with melanin
Eyes	Chloro quine, phenothiazines interact with melanin of eyes and lead to retinopathy
Hair	Arsenicals, chlorquine, phenothiazine
Bones	Tetracycline bind to bones and teeth leads to odontogensis brown yellow colouration of teeth
Fats	Thiopentla and pesticide DDT
Nucleic acids	chloroquine, quinacrine bind to DNA

STAGES DURING WHICH TERATOGENS SHOW FOETAL ABNORMALITIES

Period	Significance	Harmful effects
First 2 weeks	Fertilization and implantation stage	Miscarriage
2 – 8 weeks	Period of organogenesis	Cleft palate, optic atrophy, mental retardation, neural tube defects, etc.
8 weeks onwards	Growth and development	Development and functional Abnormalities

RELATIVE VOLUME OF DIFFERENT ORGANS, BLOOD FLOW AND PERFUSION RATE UNDER BASAL CONDITIONS ASSUMING THE TOTAL BODY VOLUME TO BE 70 LITRES

Organ/ Tissue	% of Body Volume	Blood flow (ml/ min)	% of Cardiac output	Perfusion rate (ml/min/ml)
A. Highly perfused				
1. Lungs	0.7	5000	100.0	10.2
2. Kidneys	0.4	1250	25.0	4.5
3. Adrenals	0.03	25	0.5	1.2
4. Liver	2.3	1350	27.0	0.8
5. Heart	0.5	200	4.0	0.6
6. Brain	2.0	700	14.0	0.5
B. Moderately perfused				
7. Muscles	42.0	1000	20.0	0.034
8. Skin	15.0	350	7.0	0.033
C. Poorly perfused				

PHARMACEUTICAL JURISPRUDENCE

HEALTH SURVEY AND DEVELOPMENT COMMITTEES

S. No.	Committees	Description
1.	**Bhore Committee**	Government of India set up Health Survey and Development Committee in October 1943 under the chairmanship of Sir Joseph Bhore.
2.	**Bhatia Committee**	Government of India in 1953 appointed the pharmaceutical enquiry committee under the Chairmanship of Major General S. L. Bhatia to make enquiry into the working of pharmaceutical industry.
3.	**Mudaliar Committee**	Government of India in June 1959 under the Chairmanship of Dr. A. Lakshmanswamy Mudaliar appointed a Health Survey and Planning Committee.
4.	**Hathi Committee**	Government of India under the Chairmanship of Jaisukhlal Hathi appointed a committee. The report of this committee covered all aspects ranging from licensing, price control, import, role of foreign sector, quality control etc.

IMPORTANT DATES OF ACT AND RULES

S. No.	Act	Date on which Act was enacted/ forced/ amended
1.	Opium Act	1857
2.	The Indian Contract Act	1 September, 1872
3.	The Design Act and Rule	1911 (Forced on 11th May 2001) and 1933
4.	The Poison Act	3 September, 1919
	Dangerous Act & Rule	1930 & 1957
5.	The Drugs and Cosmetic Act & Rule	10th April 1940 (Act) & 1945 (Rules)
6.	The AICTE Act	November 1945 (The act was enacted on 15th December, 1987)
7.	The Pharmacy Act	4th March, 1948
8.	The Shops & Establishments Act	1948
9.	Minimum Wages Act	15th March, 1948
10.	The Factory Act	1948 Forced on 1st April 1949
11	The Industries Act (Development & Regulation)	8th May, 1952
12.	The Drugs and Magic Remedies (Objectionable Advertisement) Act & Rule	1954 (Forced on 1st April, 1955)
13.	The Prevention of Food Adulteration Act & Rule	1954 Act & 1955 Rules
14.	The Medicinal and Toilet Preparation (Excise Duties) Act & Rule	1955 (Come in force on 1 April 1957) & 1956 (Rules)

VALVES USED IN MEASUREMENT OF FLUID FLOW

NAME	CHARACTERISTIC AND USES
Plug cocks valve	Used for handling compressed air
Globe valve	Contains seat ring and used in 50 mm pipes 50 mm
Gate valve	Contains inclined seat type of gate
Diaphragm valve	Rubber diaphragm coated with PTFE (Poly Tetra Fluro Ethylene) use for fluid contain suspended solids and in production of sterile product

TYPES OF RESIPROCATING PUMPS

NAME	CHARACTERISTIC AND USES
Piston pump	Use in peristaltic and HPLC pumps and for spray system in sugar coating and film coating operation
Plunger pump	Use for handling liquids at high pressure used for transport viscous liquid and liquid contain suspended solids
Diaphragm pump	Used in transporting liquid contain solids. Hazardous, toxic and liquids can also handle

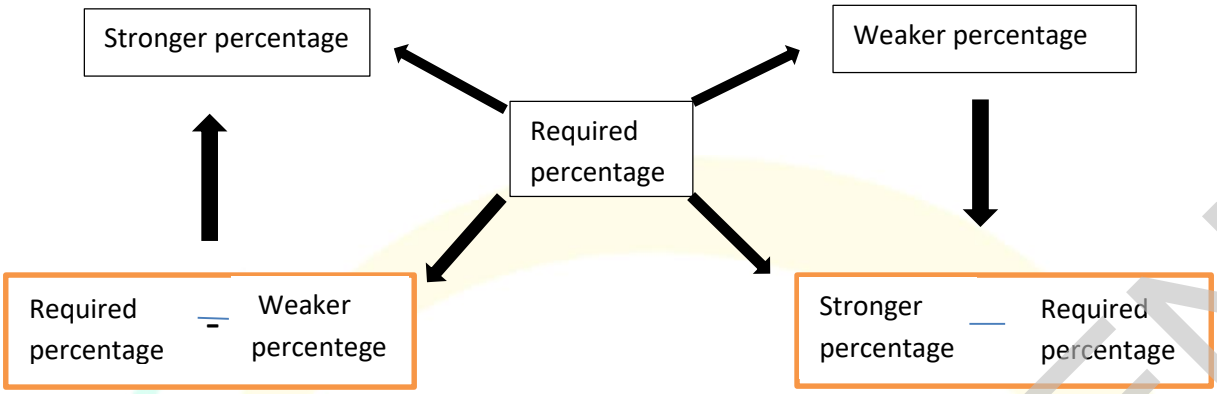
TYPES OF ROTARY PUMPS

NAME	CHARACTERISTIC AND USES
Gear pumps	Used for handling viscous or heavy liquid like vegetable oil, waxes. Used in aqueous film coating.
Centrifugal pumps (a) Volute pumps (b) Turbine pump	Used for viscous liquids Used for non-viscous and non-corrosive liquids. Used for handling organic solvents.

TYPES OF CONVECTION

FORCED CONVECTION	NATURAL CONVECTION
It is defined as heat transfer by actual mixing of fluid by the use of a stirrer or agitator or pumping the fluid for recirculation tube evaporators e.g.: - Forced circulation tube evaporators	It is defined as a heat transfer convection process in which mixing of fluid accomplished by the cuments set up, when body of fluid is heated e.g.: - Pan evaporator
The stagnant films are of great importance in determining the rate of heat transfer	In this convection fluid circulation causes changes in densities due to temperature difference

ALLIGATION METHOD



POSOLOGY

Young's formula	Child dose =[$\frac{\text{Age of child in years}}{\text{Age of the child in years} + 12}$]× Adult dose
Dilling's formula	Child dose =[$\frac{\text{Age of child in years}}{20}$]× Adult dose
Fried's formula	Child dose =[$\frac{\text{Age of child in month}}{150}$]× Adult dose
Cowling's formula	Child dose = (Age of child + 1 / 24) x Adult dose
Clarks's formula	Child dose =[$\frac{\text{surface area of child in m2}}{1.73}$]× Adult dose
Catzel's formula	Child dose = [$\frac{\text{Weight of Child in pound}}{150}$]× Adult dose

GPAT-2022 RESULT

Shining Stars of Pharmacy India

250+ SELECTION

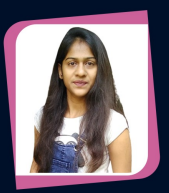

NIKHIL
AIR - 11


NIKHIL
AIR - 27


ABHISHEK
AIR - 122


SOUMYAJIT
AIR - 126


SUSHANT
AIR - 147


NAMRTA
AIR - 173


SURENDRA
AIR - 192


KRUSHNA
AIR - 204


ADITYA
AIR - 223


YASH
AIR - 223


MAYURI
AIR - 251


AMRENDRA
AIR - 424


AZAR RAZAK
AIR - 468


KHLANDAR
AIR - 497


PRIYANKA
AIR - 556


KAJOL
AIR - 604


SATA DEEP
AIR - 629


ASMA KHANAM
AIR - 651


SUBRAT
AIR - 695


TAVADE
AIR - 795


DIPIN
AIR - 911


ADRIJA
AIR - 958


JOREPALLI
AIR - 1022


NITIN
AIR - 1155


K. MARI
AIR - 1198


PRIYA
AIR - 1198


AMIT
AIR - 1321


RAKESH
AIR - 1361


SEKHAR
AIR - 1404


SUDAM
AIR - 1731


SHIVAM
AIR - 2020


RUDRAWAR
AIR - 2506


NILESH
AIR - 2506


NIRANJAN
AIR - 2613


SAPTAPADI
AIR - 2813

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