PHARMACY INDIA

PHARMACEUTICS

PHYSICAL PHARMACY | BIOPHARMACEUTICS | PHARMACEUTICAL JURISPRUDENCE | MICROBIOLOGY | HOSPITAL & CLINICAL PHARMACY | PHARMACEUTICAL ENGINEERING | BIOTECHNOLOGY

A COMPETITIVE EXAMINATION BOOK

SAMPLE PDF

COMPETITIVE EXAMINATION BOOK FOR

GPAT | NIPER | PHARMACIST | DRUG INSPECTOR

FOR FREE ONLINE SUPPORT

www.pharmacyindia.org

PHARMACY INDIA

PHARMACEUTICS

PHYSICAL PHARMACY | BIOPHARMACEUTICS | PHARMACEUTICAL JURISPRUDENCE | MICROBIOLOGY | HOSPITAL & CLINICAL PHARMACY | PHARMACEUTICAL ENGINEERING | BIOTECHNOLOGY

A Competitive Examination Book

Theory Book

GPAT| NIPER | DRUG INSPECTOR | PHARMACIST

PHARMACY INDIA

DOWNLOAD OUR APP

Download PHARMACY INDIA App from Google Play Store

FOR FREE ONLINE SUPPORT

www.pharmacyindia.org

SAMPLE PDF

Contents

SAMPLE PDF

BIOPHARMACEUTICS

SAMPLE PDF

SAMPLE PDF

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

Types of Tablets

Oral Tablets for ingestion	Tablets used in the oral cavity	Tablets administered by other route	Tablets used to prepare solution
❑ Compressed tablets	❑ Buccal & sublingual tablets	❑ Implantable tablet	❑ Effervescent tablet
❑ Multiple compressed tablets	❑ Troches & lozenges	❑ Vaginal tablet	❑ Dispensing tablet
❑ Chewable tablets	❑ Dental cones		❑ Hypodermic tablet
❑ Sugar/chocolate-coated tablets			❑ Tablet triturates
❑ Film-coated tablets			
❑ Repeat action tablet			
❑ Delayed action tablet & enteric coated tablet			
❑ Controlled-release tablet			

ORAL TABLETS FOR INGESTION

COMPRESSED TABLET

- Uncoated tablet intended to provide rapid disintegration & drug release.

MULTIPLE COMPRESSED TABLET (Layered tablets & Compression coated tablet)

Two components or three-layer tablets

- Tablets with in a tablet
- To produce repeat action & Prolonged action products
- Complete physical separation is required for stability purpose in case of three-layer tablets

CHEWABLE TABLET

- Intended to be chewed in mouth.
- Most commonly used chewable tablet in market for children.
- Example - "Chewable Aspirin tablet" Antacid tablets, Anthelminthics
- Disintegrant not required

SUGAR & CHOCLATE COATED

SAMPLE PDF
PHARMACY INDIA

- May be used in chewable tablets in place of mannitol.

DEXTROSE (Cerelose)

- For hydrous and anhydrous.

MANNITOL: widely used in chewable tablet:	**SORBITOL: optical isomer of mannitol**
• Negligible heat of solution • Slow solubility • Pleasant feeling in mouth • Can also be used in vitamin formulation.	• Hygroscopic at humidifies above 65% • Low cationic content • They are non-carcinogenic

SUGAR BASED DILUENTS / Sucrose

- Trade name: - Sugar tab, Nutab, Dipac.
- SUGAR Tab: 90-93% sucrose + 7-10% invert sugar
- DIPAC: 97% sucrose + 3% dextrose modified
- NU-Tab: 95% sucrose + 4% invert sugar with Small amount of corn starch, Magnesium Stearate.

MICROCRYSTALLINE CELLULOSE

- Available under the trade name of (Avicel, Aricel, Emocel)
- Also act as disintegrant agent
- Two tablet grades exist

  (I) PH-101 (Powder)

  (II) PH-102 (Granule)

Diluents and their Brand Names

Diluents	Brand Names
Microcrystalline cellulose	Avicel, Aricel, Emcocel
Starch	Sta-Rx-1500
Sucrose (sucrose dextran ppt)	Di-Pac, Sugar tab. Nu- tab.
Anhyd. Lactose	DCL-30
Spray dried lactose	Fast flow Zeparox TM
Hydrolysed starch Dextrates	Celutab, Emdex
Calcium hydrogen phosphate	Encompasses
Microfine cellulose	Elcema

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	Brand 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.

SAMPLE PDF

Film coated tablet	Water or 0.1N HCl	30 minutes
Dispersible and effervescent tablets	Water (19-21°C)	3 minutes
Enteric coated tablet	0.1N HCl with Phosphate buffer	3 hours (2hrs in GI fluid & 1hr in intestinal fluid)
Hard gelatin capsule	Water	30 minutes
Soft gelatin capsule	Wayer	60 minutes

DISSOLUTION

- Dissolution is the process by which a solid solute enters a solution.
- In the pharmaceutical industry, it may be defined as the amount of drug substance that goes into solution per unit time under standardized conditions of liquid/solid interface, temperature and solvent composition.

Types of Dissolution Apparatus According to USP

USP Apparatus	Description	Rotating Speed	Dosage Form
Type 1	Rotating basket apparatus	50-120rpm	Conventional tablet, chewable tablet, controlled release
Type 2	Paddle apparatus	25-50rpm	Orally disintegrating tablet, chewable tablet, controlled release, suspension
Type 3	Reciprocating cylinder	6-35 rpm	Controlled release, chewable tablet
Type 4	Flow through cell	N/A	ER, poorly soluble API, Powder, granules, microparticles, implants
Type 5	Paddle over disk	25-50 rpm	Transdermal
Type 6	Rotating cylinder	NA	Transdermal
Type 7	Reciprocating disc	30rpm	CR

Types of Dissolution Apparatus According to IP & BP

Apparatus	BP	IP
Type 1	Rotating basket apparatus	Paddle apparatus
Type 2	Paddle apparatus	Rotating basket apparatus
Type 3	Flow through cell	

Comparison between Disintegration & Dissolution Test

Variables	Disintegration	Dissolution
Mesh screen of the bottom end of the basket	10	40
Temperature	37±2°C	37±0.5°C
Speed	28-32 CPS	50-100
Tablet remain below the surface of the liquid and decend not closer than	2.5cm (25 mm)	2.3-2.7 cm (23-27 mm)
Medium (PBS pH 7.4)	900 ml	900 ml

SAMPLE PDF
PHARMACY INDIA

MULTIPLE CHOICE QUESTIONS

1. In the process of sugar coating, to prevent moisture penetration into the tablet core, which one of the following step is performed (GPAT 2022)
(a) Seal Coating (b) Subcoating
(c) Syrup Coating (d) Polishing

2. Select the equation that gives the rate of drug dissolution from a tablet (GPAT 2021)
(a) Fick's Law
(b) Henderson Hasselbalch equation
(c) Noyes Whitney Equation
(d) Michaelis Menten equation:

3. For solid oral drug products, a change in the concentration of which of the following excipients is more likely to influence the bioavailability of a drug (GPAT 2021)
(a) Starch
(b) Magnesium stearate
(c) Microcrystalline cellulose
(d) Lactose

4. In tablet, hydroxy propyl methyl cellulose is used as (GPAT 2019)
(a) Diluent (b) Film former
(c) Disintegrant (d) Binder

5. Microcrystalline cellulose is also called as (GPAT 2019)
(a) Sugar tab (b) Nutab
(c) Emdex (d) Avicel

6. Substance used to reduce friction during tablet compression and facilitate ejection of tablets from the die cavity is called as (GPAT 2018)
(a) Lubricant (b) Glidant
(c) Anti-adherent (d) Humectant

7. A material which is insoluble and inert and used in matrix tablet formulation is (GPAT 2018)
(a) Polyethylene (b) Stearyl alcohol
(c) Polyethylene glycol (d) Triglycerides

8. Which one of the following is a solid dosage form excipient which can play the role of diluent, a disintegrant, a glidant, a lubricant and a pore/ channel former? (GPAT 2017)
(a) Lactose
(b) Microcrystalline cellulos
(c) Ethyl cellulos
(d) Eudragit RL 100

9. Which is an example of non-enteric film former polymer? (GPAT 2016)
(a) Ethyl cellulose (b) CAP
(c) PVAP (d) Both (a) & (c)

10. Cam tracks are used guiding the movement of (GPAT 2014)
(a) Hopper (b) Dies
(c) Punches (d) None of these

11. Eudragit S is chemically (GPAT 2014)
(a) Poly (methacrylic acid methylmethacrylate) 1.1
(b) Methacrylic acid copolymer
(c) Poly (methacrylic acid methylmethacrylate) 1:2
(d) Poly (ethyl acetate, methylmethacrylate) 2:1

12. Study the following two statement (GPAT 2012)
[R] When used as gramlating agent PEG 4000 improves dissolation rate of the dosage form as it form as complex with a better solubility
[Q] Sodium CMC when used as a binder affects dissolution rate of the dosage form as it is converted to less soluble acid form at low pH of the gastric fluid
Choose the correct answer
(a) Both [P] and [Q) are currect
(b) [P] is incorrect and [Q] is correct
(c) [P] is correct and [Q] is incorrect
(d) Both [P] and [Q] are incorrect

13. Which filler can NOT be used for the preparation of tablets for amine containing drugs to avoid discoloration of the tablets
(a) Dicalcium phosphate
(b) Microcrystalline cellulose

SAMPLE PDF
PHARMACY INDIA

Chapter 3

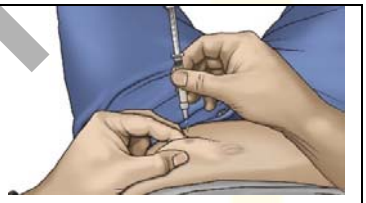
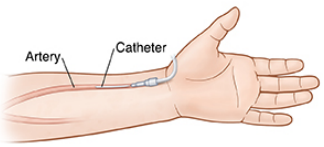
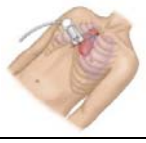
PARENTERALS

INTRODUCTION

- The term derived from Greek word 'Para' outside & 'Enterone' intestine.
- Parenterals are sterile solutions or suspension of drug in aqueous or oily vehicle.
- Parenteral drugs are administered directly in to the veins, muscles or under the skin, or more specialized tissues such as spinal cord.
- B.P.: "Parenteral preparations are sterile preparations intended for administration by injection, infusion or implantation into human or animal bodies"

PARENTERAL ROUTES

- The term parenteral literally means to avoid the gut (gastrointestinal tract) and refers to any route of administration outside of or beside the alimentary tract.

Subcutaneous injections	• Administer medications below the skin into the subcutaneous fat outside of the upper arm • Given at a 45-degree angle, 2 5 - or 26-gauge needle, 3/8 to5/8-inch length.	
Intramuscular injections	• Care must be taken with deep IM injections to avoid hitting a vein, artery, or nerve. • Typical needle is 22- 25-gauge ½- to 1-inch needle. • IM injections are administered at a 90-angle volume limited to less than 3 ml.	
Intravenous injections or Infusions	• Fast-acting route because the drug goes directly into the bloodstream, often used in the emergency department and in critical care areas. • Intravenous (IV) injections are administered at a 15- to 25-degree angle.	
Intra-arterial injection	• The injection is given directly in to the artery.	
Intracardiac injection	• These are given into the heart muscle or ventricle at the time of emergency only.	

SAMPLE PDF
PHARMACY INDIA

- Uses monocyte obtained from Human volunteer or blood bank.
- Detects pro-inflammatory and pyrogenic contaminants.
- Used or Qualitative and Quantitative detection.

Production facilities of Parenterals

The production area where the parenteral preparation are manufactured can be divided into five sections:

1. Clean-up area
2. Preparation area
3. Aseptic area
4. Quarantine area
5. Finishing & packaging area

CONTAINERS

1. Glass

- Glass has been widely used as a drug packaging material.
- Glass is composed of sand, soda ash, limestone, & cullet.
- Si, Al, Na, K, Ca, Mg, Zn & Ba are generally used into preparation of glass.

Types of Glass:

TYPE	DESCRIPTION	CHARACTERISTICS	GENERAL USE
Type I	**Borosilicate glass**	Highly resistant and chemically inert glass. Alkalis and earth cations of glass are replaced by boron and/or aluminium and zinc. These are used to contain strong acids and alkalis.	Buffered and unbuffered aqueous solution
Type II	**Treated soda lime glass**	These are more chemically inert than Type I glass. The glass surface is de-alkalized by "Sulphur treatment" which prevents blooming/weathering from bottles.	It is suitable for most acidic and neutral aqueous preparations. (Solution containing pH below or equal to 7)
Type III	**Regular soda lime glass**	Untreated soda lime glass with average chemical resistance	Dry powder and Oleaginous solution
Type IV	**General Purpose soda lime glass**	Not used for parenteral, used only for products intended to be used orally or topically.	Not for parenteral, used for tablet, capsule, oral solution or suspensions

CONTAINER TYPE	EP TESTS	USP TESTS CURRENT	USP TESTS PROPOSED
Type I	• Glass grains • Surface glass • Surface etching	Powdered glass	• Glass grains • Surface glass • Surface etching
Type II	• Glass grains • Surface glass • Surface etching	Water attack test at 121ºC	• Glass grains • Surface glass • Surface etching
Type III	• Glass grains • Surface glass	Powdered glass	• Glass grains • Surface glass
Type IV	-	Powdered glass	-

2. Plastic

Type of materials	Uses
Polypropylene	Most widely used because of high melting point.

SAMPLE PDF
PHARMACY INDIA

CHARACTERISTICS OF AN IDEAL SUSPENSION

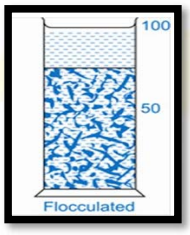
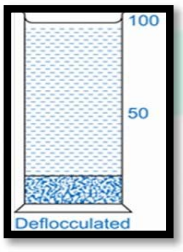
- Solid particles should be of such size that they do settle rapidly.
- If sediment is formed, it should not form a hard cake at the bottom of container.
- If sedimentation occurs it should be easily redispersable on shaking.
- Viscosity of the suspension should be such that the product can be easily poured from the bottle.
- Suspension for topical use should spread when applied and leave a film of medicament at the site of application.
- Suspension for oral use should have an acceptable taste.

CLASSIFICATION OF SUSPENSION

SUSPENSION

Based on Physical State	Based on Proportion of Solid Particles	Based on electro kinetic nature of solid particle	Based on Size of Dispersed Particles	General classification of Suspension
a. Suspension b. Aerosols c. Foams	a. **Dilute suspension** (2 to10% w/v solid). **For example: -** cortisone acetate, prednisolone acetate. b. **Conc. suspension** (50%w/v solid). **For example: -** zinc oxide suspension.	a. **Flocculated Suspension** (Dispersed phase maybe a network of particle) b. **Deflocculated Suspension** (Dispersed phase may consist of discrete particles)	a. **Molecular Dispersion** (Particle size is less than 1 nm) b. **Colloidal Dispersion** (Particle size between 0.1-0.2 µm) c. **Coarse Dispersion** (Particle size is greater than 0.2 µm)	a. **Oral suspension e.g.,** Paracetamol suspension. b. **Topical suspension** e.g., is Calamine Lotion. c. **Parenteral suspension e.g.,** Procaine penicillin G suspension.

DIFFERENCE BETWEEN FLOCCULATED AND DEFLOCCULATED SUSPENSION

Flocculated Suspension	Deflocculated Suspension
Slightly sediment and clear supernatant layer.	Pleasant appearance, because of uniform dispersion of particles.
Supernatant is clear.	Supernatant remains cloudy
Particles experiences attractive forces.	Particles experience repulsive force.
Particles forms loose aggregates.	Particles exist as separate entities.
Rate of sedimentation is high, as flocs are the smaller particles (higher size).	Rate of sedimentation is slow as the size of the particles are small.
Sediment is loosely packed network and hard cake cannot form.	The sediment is closely packed and form hard cake.
Easy to redisperse	Cannot be redispersed
In the potential energy curve, it represents the secondary minimum.	In the potential energy curves, it represents the primary minimum.
Bioavailability is comparatively less	Bioavailability is relatively high
	

SAMPLE PDF
PHARMACY INDIA

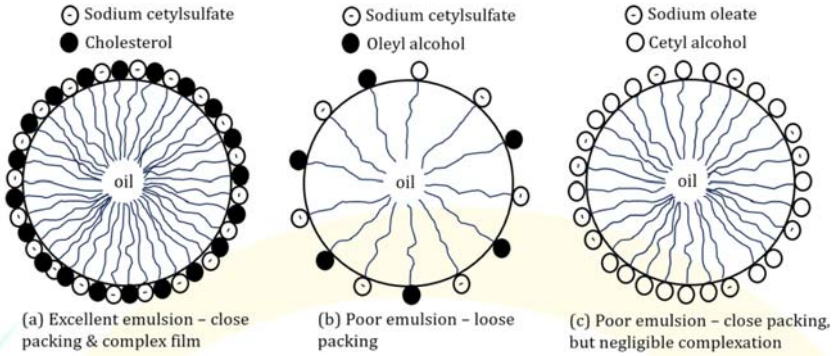


Figure – monomolecular adsorption

2. **Multimolecular adsorption**
   - The emulsifying agents such as acacia and gelatin tend to form a multimolecular film around the globules and prevent coalescence. Also known as Hydrocolloid Emulsifying agents
   - Normally, the stability is improved by adding viscosity inducing agents such as tragacanth, CMC etc.
3. **Solid particle adsorption**
   - The finely divided solid particles adsorb at the oil-water interface and form a rigid film of closely packed solids.
   - This film act as a mechanical barrier and prevents the coalescence of globules.

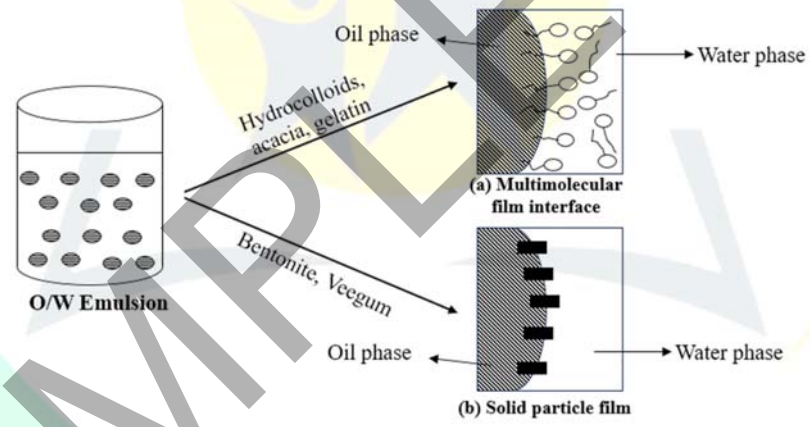
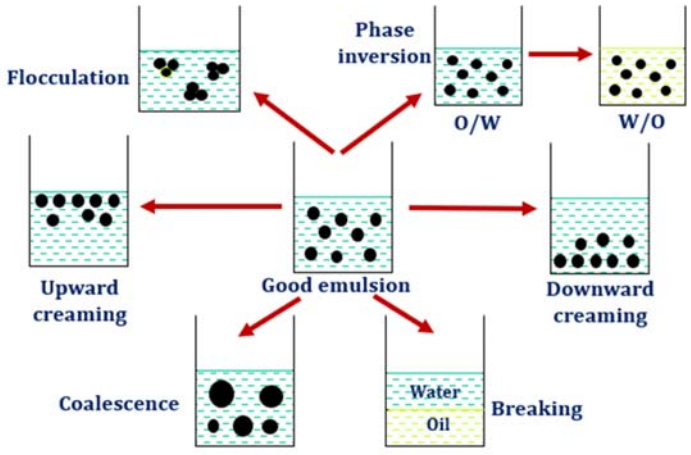


Figure – Solid particle adsorption

PHYSICAL INSTABILITY OF EMULSION



SAMPLE PDF

Chapter 8

PREFORMULATION STUDIES

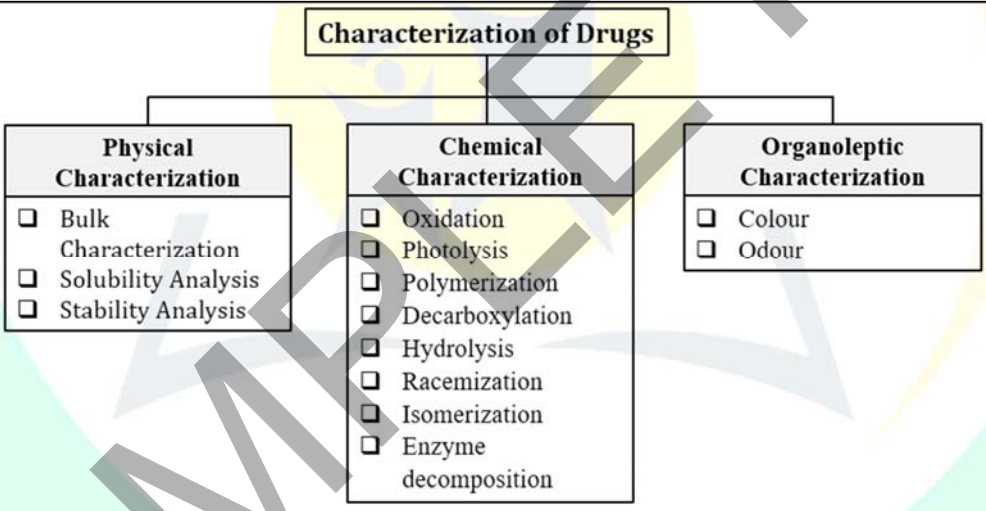
DEFINITION

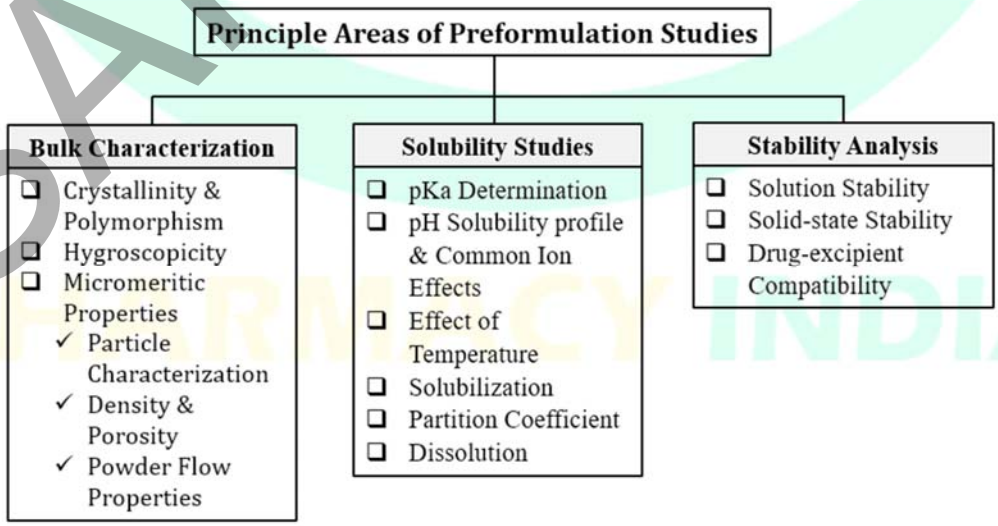
- This is an investigation of physical and chemical properties of drug substance alone and when combined with excipients.

GOALS OF PREFORMULATION STUDY

- To establish necessary physicochemical parameter of new drug substance.
- To determine its kinetic rate profile.
- To determine its physical characteristics.
- To establish its compatibility with common excipients.

CHARACTERIZATION OF DRUGS

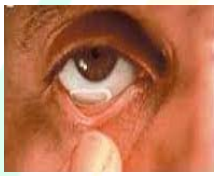




SAMPLE PDF

- **Evaluation of mucoadhesive: - Wilhelmy plate technique → it** is used for the measurement of dynamic contact angles. These instrument measures the bioadhesive force between mucosal tissue and the dosage form.

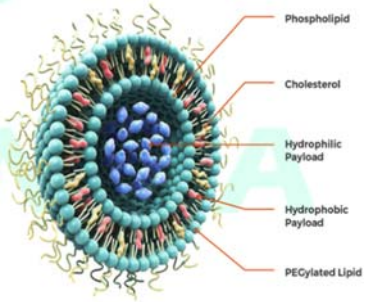
CLASSIFICATION OF CONTROLLED RELEASE SYSTEM

Diffusion Controlled	Dissolution controlled	Water penetration controlled	Chemically Controlled
• Reservoir system (Ocusert) • Monolithic system (TDDS – Nitro-dur) 	• Monolithic or matrix system • Reservoir systems 	• Osmotic regulated systems (OROS, Alzet, osmotic pump) • Swelling regulated system (Hydrogel) 	• **Biodegradable/ bioerodible systems** • **Pendent system:** combination of hydrolysis of pendent group and diffusion from bulk polymer • **Ion-exchange resins:** exchange of acidic or base drug with the ions presents on resins.

- Parenterally thermosensitive hydrogel, **ReGel** is being used as a drug delivery carrier for the continuous release of human insulin.
- ***Some biodegradable polymers:*** - Polylactides (PLA), polyglycoside (PGA), poly (lactide-co-glycolides) (PLGA), polyanhydrides, polyorthoesters.

COLLOIDAL CARRIERS

- **Liposome: -** liposomes are spherical vesicle having one lipid bilayer consist of hydrophilic head and hydrophobic tail.
  - **Liposomes in blood stream: -taken by reticulo-endothelial system (GPAT)**
  - **Size of liposome: -** 50nm-1µm
  - **Composition of liposome: -** Lecithin (mixture of phospholipids) & cholesterol. Phospholipids are amphipathic moiety with a hydrophilic head and hydrophobic tail. The most common phospholipid is phosphatidylcholine molecule.
  - **Phosphotidylcholine: -** phosphotidylcholine has glycerol bridge links a pair of hydrophobic acyl hydrocarbon chains having 10-24 carbon atoms with a polar head group.
  - Liposome can interact with cell by four different mechanism:
    1. Endocytosis by phagocytic cells
    2. Adsorption to the cell surface
    3. Fusion with the plasma cell membrane
    4. Transfer of liposomal lipid to cellular as subcellular membrane.



  - **Application of liposome: -**
    1. As drug delivery vehicle
    2. In tumour therapy and in gene delivery
    3. As radiopharmaceuticals and radiodiagnostic carriers
    4. In cosmetic and dermatology
    5. In enzyme immobilization and bio-reactor technology.

SAMPLE PDF
PHARMACY INDIA

delivery systems consists of (GPAT 2014)
(a) 1 chamber (b) 2 chamber
(c) 3 chamber (d) None of these

4. Dose dumping may be a general problem in the formulation of (GPAT 2014)
(a) Soft gelatin capsules
(b) Suppositories
(c) Modified release drug products
(d) None of thes

5. _____ system does not have orifice to release the drug (GPAT 2014)
(a) Elementary Osmotic Pump
(b) L-OROS
(c) Sandwich Osmotic Pump Tablet
(d) Controlled Porosity Osmotic Pump Tablet

6. Which method uses for synthesis for dendrimers (GPAT 2014)
(a) Divergent method
(b) Reverse Micelles
(c) Cellular Carrier method
(d) Polymer drug conjugation

7. Highly branched three dimensional macromolecules with controlled structures with all bands originating from a central core are known as
(a) Cyclodextrins (b) Dextrans
(c) Dendrimers (d) Liposomes

8. Group I Group II
(GPAT 2009) Transdermal drug delivery system Method of preparation
1. Membrane modulated system
2. Diffusion controlled system
3. Matrix dispersion system
4. Microreservoir system
[P] Drug is homogenously dispersed in polymer and then moulded into a patch
[Q] Drug reservoir is encapsulated in rate controlling polymer patch
[R] Drug dispersed in hydrophilic polymer and then cross linked with lipophilic polymer by high shear mechanical force
[S] Drug is directly dispersed in polymer patch
(a) 1-[Q]. 2-[S], 3-[P], 4-[R]
(b) 1-[P], 2-[Q], 3-[R], 4-[S]
(c) 1-(P), 2-[S], 3-[Q], 4-[R]
(d) 1-[S], 2-[P], 3-[R], 4-[Q]

9. A lipid bilayer structure that encloses an internal aqueous volume.
(a) Niosome
(b) Liposome
(c) Solid lipid nanoparticle
(d) Nanoparticle

10. A spherical solid lipid particle prepared from physiological lipid, dispersed in water or in aqueous surfactant solution.
(a) Solid lipid nanoparticle
(b) Liposome
(c) Niosome
(d) Nanoparticle

11. This particulate system is also known as "bodies of water".
(a) Aquasome (b) Liposome
(c) Niosome (d) Dendrimer

12. Alzet is an example of_____type of parenteral system.
(a) Osmotic pressure activated
(b) Vapour pressure activated
(c) Magnetically activated
(d) Hydration activated

13. Monolithic devices
(a) have drugs with large therapeutic indices
(b) have rapid drug permeation
(c) only hydrophilic polymers are used
(d) release is through a polymer membrane

14. One method to prepare nanoparticles is
(a) pan coating (b) filtration
(c) solubilisation (d) polymerization

15. _____ is a dispersed matrix system
(a) nanospheres (b) nanoparticles
(c) nanocapsules (d) nanopolymers

ANSWERS

1-c	2-c	3-b	4-c	5-d	6-a	7-c	8-a	9-b	10-a
11-a	12-a	13-d	14-d	15-a					

SAMPLE PDF

Chapter 12

COSMETIC TECHNOLOGY

SHAMPOO

1. **Surfactants:** anionic surfactant , example :- SLS
2. **Conditioning agent**: improve manageability, feel and lustre of hair. E.g., lanolin, mineral oil, egg albumin, amino acids, lecithin and herbal extract shikakai & henna.
3. **Thickening agent**: make shampoos viscous so they are easy to pour and handle. E.g., gum, CMC, HPMC, PVA, carbopol 934P.
4. **Chelating agent**: prevents deposition of calcium and magnesium salts of soap on hairs. E.g., disodium edetate, polyphosphates, citric acid etc.
5. **Anti-dandruff agent**: zinc pyridinium thiol–N-oxide (ZPTO), selenium sulphide, bithinol, resorcinol etc.

TYPES OF SHAMPOOS

- Liquid shampoo
- Powder shampoo
- Cream shampoo
- Gel shampoo

EVALUATION OF SHAMPOOS

- Changing power
- Foaming ability
- Eyes irritation potential

LIPSTICK

- Moulded sticks composed of colouring materials dispensed in a blend of fatty bases (oil and waxes).

Formulation

1. **Bases:** waxes and oil
   - **Waxes:** employed to obtain desired melting point viscosity. E.g., Hard paraffin (1-5%), ozokerite wax (1-10%), carnauba wax (1-3%), white beeswax (5-20%), lanolin (5-15%), cetyl alcohol (2-3%) (Emollient action).
   - **Oil:** Used for-
     1. Dispensing insoluble pigments.
     2. Dissolving eosin dye.
     3. Provide a thin film to the lips.

     E.g., Castor oil (30 -40%), Liquid paraffin (1-5%), IPM (2-3%).
2. **Bromomixture:** When a product is having a high staining property desired, bromo acid like tetrabromo fluorescence (2-3%) is used.
3. **Color mixture:** Insoluble dyes and lake colors are used as main color. E.g., Ti02 is used to modify the shades of basic pigment.
4. **Antioxidants:** BHA, BHT, Propyl gallate

SAMPLE PDF

Chapter 2

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

- The shape of a spherical particle can be easily expressed in terms of its diameter.
- A non-spherical particle also has a definite surface area and volume being assymetric its apparent length varies with its orientation.

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 to 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 to 1500 µm	Mechanical shaker	Standard sieves are used, Calibrated by National Bureau of Standards

SAMPLE PDF
PHARMACY INDIA

4.	BET equation	$\frac{p}{y(p_o - p)} = \frac{1}{y_m b} + \frac{b-1}{y_m b}\frac{p}{p_o}$	P → pressure of adsorbate molecules y → mass of vapour adsorbed per gm of adsorbent p_o → saturation vapour pressure

Factors affecting adsorption

1. **Solute –** increase in conc. of solute increases adsorption.
2. **Surface area -** increase in surface area of adsorbent increases adsorption.
3. **Temperature** - increase in temperature will decreases adsorption.
4. **Removal of adsorbed impurities –** Increase in impurities will decrease adsorption.
5. **pH of the medium –** adsorption would increase or decrease with change in pH.

Micellization

- Micelles are formed when the concentration of a surfactant reaches a given concentration called critical micelle concentration (CMC) in which the surface is saturated with surfactant molecules.
- The main reason for micelle formation is to obtain a minimum free energy state.

Electrical properties of interface

The study of electrical properties of interface finds applications in the formulation of dosage forms regarding-

- Stabilization of colloidal dispersion
- Preparation of flocculated suspension
- Stabilization of emulsion

MULTIPLE CHOICE QUESTIONS

1. The unequal attractive forces acting on the molecules at the surface of liquid gas inter face when compared with molecular forces in the bulk of the liquid is due to (GPAT 2020)
(a) Absence of adhesive force of attractio
(b) Less adhesive force of attraction
(c) Absence of cohesive force of attraction
(d) Less cohesive force of attraction

2. The interfacial tension of Oleic acid against water at 20°C is (GPAT 2019)
(a) 15.6 (b) 523 (c) 428 (d) 8.51

3. Dielectric constant of Ethanol room temperature is almost equal to (GPAT 2017)
(a) 24 (b) 48 (c) 54 (d) 72

4. Surface tension is categorized as a/an ____ factor (GPAT 2017)
(a) Capacity (b) Intensive
(c) Extensive (d) Tolerance

5. What is the surface tension of water of at 25°C (GPAT 2016)
(a) 58 dyne/cm (b) 68 dyne/cm
(c) 72 dyne/cm (d) 82 dyne/cm

6. For the wetting of a solid by liquids, the contact angle (in degree) should have a value nearly (GPAT 2016)
(a) 0 (b) 90 (c) 180 (d) 270

7. Which of the following apparatus can be used for determining the surface tension of liquids (GPAT 2015)
(a) Ostwald viscometer
(b) Rheometer
(c) Du Nouy tensiometer
(d) Coulter counter

8. Drave's test is associated with measuring the efficiency of (GPAT 2014)
(a) Detergents (b) Wetting agents

SAMPLE PDF

Chapter 10

DIFFUSION AND DISSOLUTION

INTRODUCTION

- **Diffusion -** The process of spontaneous migration of solute molecules from a region of higher concentration to a region of lower concentration until the concentration is uniform throughout the system.
- **Dissolution –** the process by which a solid solute enters into solution when added to an appropriate solvent.

Diffusion Laws

Fick's 1st law of diffusion	**Fick's 2nd law of diffusion**
The rate of diffusion of solute molecules through a barrier is proportional to the concentration gradient.	The change in concentration with respect to time at a particular region is proportional to the change in concentration gradient at that point in the system.
$\mathbf{J = \frac{dm}{dt}}$ or $\mathbf{J = - D \frac{dc}{dx}}$ where, D → diffusion coefficient J → flux of component	$\frac{dC}{dt} = D\frac{d^2C}{dx^2}$

Steady-state – the solute molecules diffuse through the barrier membrane to reach the receptor compartment which is kept under sink condition by constantly replacing the solution with fresh solvent to keep the concentration in receptor compartment at low level.

Time lag –

- The time required for the diffusant to establish a uniform gradient with in the membrane that separates the donor and receptor compartment.
- It is represented by t_L.

$$t_L = h^2/ 6D$$

Noyes-whitney equation

$$\frac{dC}{dt} = \frac{DS}{h}(C_s - C_t)$$

where,

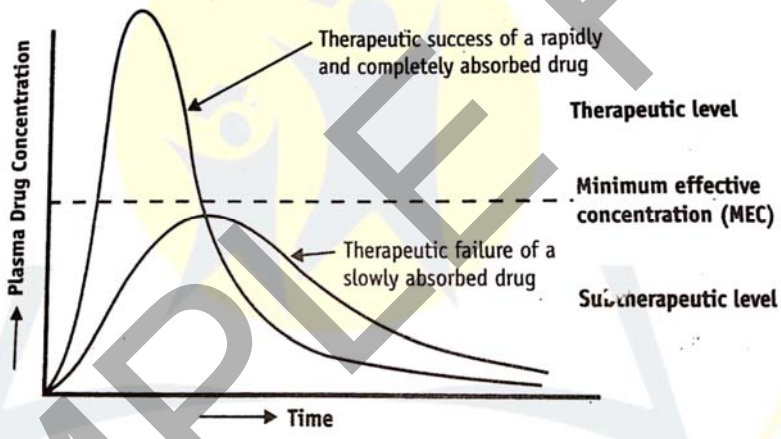
dc/dt → rate of dissolution
D → diffusion coefficient
S → surface area of the exposed solid
h → thickness of the diffusion layer
C_s → solubility of solid drug
C_t → solubility of drug at time t

SAMPLE PDF
PHARMACY

Chapter 2

ABSORPTION OF DRUGS

- **Drug absorption** is defined as the process of movement of unchanged, drug from the site of administration to systemic circulation.
- Following absorption, the effectiveness of a drug can only be assessed by its concentration at the site of action.
- However, it is difficult to measure the drug concentration at such a site. Instead, the concentration can be measured more accurately in plasma.
- There always exist a correlation between the plasma concentration of a drug and the therapeutic response and thus absorption can also be defined as the process of movement of unchanged drug from the site of administration to the site of measurement i.e. plasma.



Drugs that have to enter the systemic circulation to exert their effect can be administered by three major routes:

1. **The Enteral Route**: includes peroral i.e. gastrointestinal, sublingual/ buccal and rectal routes. The GI route is the most common for administration of majority of drugs.
2. **The Parenteral Route**: includes all routes of administration through or under one or more layers of skin. While no absorption is required· when the drug is administered i.v. it is necessary for extravascular parenteral routes like the subcutaneous and the intramuscular routes.
3. **The Topical Route**: includes skin, eyes or other specific members. The intranasal, inhalation, intravaginal and transdermal routes may be considered enteral or topical according to different definitions.

Join us on Whatsapp Group for Latest Pharma Alerts
Type "PINDIA" and send us on 8006781759

SAMPLE PDF

Methods for Studying Drug uptake

1. ***In vitro experiments***:
   - used to study the transport of drugs through different types of membranes or biological materials.
   - Such experiments may utilize
     (a) Diffusion cells
     (b) Segments of GIT of laboratory animals – Two well-known established techniques are –
         (i) Everted sac technique
         (ii) Everted ring technique
     (c) Cell cultures of gut epithelium e.g. Caco-2 cells.
2. ***In situ experiments:***
   - simulates the in vivo conditions for drug absorption and are based on perfusion of a segment of GIT by drug solution and determination of amount of drug diffused through it.
   - The two perfusion methods used in laboratory animals are –
     (a) Dissolution method
     (b) Single pass perfusion

Percutaneous Absorption of Drugs

- Certain ionic drugs are not absorbed transdermally despite the use of chemical penetration enhancers in the topical formulations.
- Percutaneous absorption of such drugs can be affected by novel techniques such as –
  1. **Iontophoresis –** Iontophoresis drug delivery implies delivery of ionic drugs into the body by means of an electric current.
  2. **Phonophoresis** – Phonophoresis is defined as the movement of drug molecules through the skin under the influence of ultrasound.

MULTIPLE CHOICE QUESTIONS

1. **The complexation of Quinine with hexyl is an example of absorption by (GPAT 2020)**
   (a) Convective transport
   (b) Facilitated transport
   (c) Pinocytosis
   (d) lon pair transport
2. **Which of the following equation is correct to determine the pH of weak base (GPAT 2016)**
   (a) pH =pKa +log ionized drug conc./unionized drug conc.
   (b) pH = pKa +log unionized drug conc./ionized drug conc.
   (c) pH = pKa -log ionized drug conc./unionized drug conc.
   (d) pH = pKa+ antilog unionized drug conc./ionized drug conc.
3. **Conc v/s time curve drown from single oral dose, which parameter can be calculated (GPAT 2015)**
   (a) Elimination constant
   (b) Rate constant
   (c) Absorption peak
   (d) Plasma conc.
4. **What kind of substances can't permeate membranes by passive diffusion (GPAT 2013)**
   (a) Lipid-soluble
   (b) Non-ionized substances
   (c) Hydrophobic substances
   (d) Hydrophilic substances
5. **Which among the following is the Henderson Hasselbach equation for a weak base and its salt (GPAT 2013)**
   (a) pH = pKa+Log([salt]/[base]
   (b) pH = pKa+Log([base]/[salt])
   (c) pH = pKb+Log([salt]/[base]]
   (d) pH = pKb+ Log([base]/[salt])
6. **Match the following (GPAT 2013)**

SAMPLE PDF

Chapter 4

PROTEIN BINDING OF DRUGS

INTRODUCTION

- The interacting molecules are generally the macromolecules such as proteins, DNA or adipose.
- The proteins are particularly responsible for such an interaction.
- The phenomenon of complex formation with proteins is called as **protein binding of drugs**.
- Protein binding may be divided into –
  1. **Intracellular binding** – where the drug is bound to a cell protein which may be the drug receptor; if so, binding elicits a pharmacological response. These receptors with which drug interact to show response are called as **primary receptors**.
  2. **Extracellular binding** – where the drug binds to an extracellular protein but the binding does not usually elicit a pharmacological response. These receptors are called **secondary** or **silent receptors**.

MECHANISMS OF PROTEIN-DRUG BINDING

- Binding of drugs to proteins is generally *reversible* which suggests that it generally involves weak chemical bonds such as –
  1. Hydrogen bonds
  2. Hydrophobic bonds
  3. Ionic bonds, or
  4. *van der Waal's* forces.
- Binding of drugs falls into 2 classes:
  1. Binding of drugs to blood components like—
     a. Plasma proteins
     b. Blood cells
  2. Binding of drugs to extravascular tissue proteins, fats, bones, etc.

BINDING OF DRUGS TO BLOOD COMPONENTS

- Following entry of a drug into the systemic circulation, the first things with which it can interact are blood components like plasma proteins, blood cells and haemoglobin.
- The extent or order of binding of drugs to various plasma proteins is:

ABUMIN > A1-ACID GLYCOPROTEIN > LIPOPROTEINS > GLOBULINS

Protein	Molecular weight	Concentration (%)	Drugs that bind
Human Serum Albumin	65,000	3.5-5.0	Large variety of all types of drugs
α 1-Acid Glycoprotein	44,000	0.04-0.1	Basic drugs such as imipramine, lidocaine, quinidine, etc.
Lipoproteins	200,000 to 3,400,000	Variable	Basic, lipophilic drugs like chlorpromazine
α 1-Globulin	59,000	0.003-0.007	Steroids like corticosterone, and thyroxine and cyanocobalamin
α 2-Globulin	1,34,000	0.015-0.06	Vitamins A, D, E and K and cupric ions
Haemoglobin	64,500	11-16	Phenytoin, pentobarbital, and phenothiazines

SAMPLE PDF

		enzyme responsible for its absorption
Tricyclic antidepressants	Chlorpromazine, haloperidol	Increased plasma half-life of tricyclics; increased risk of sudden death from cardiac disease in such patients
Coumarins	Metronidazole, phenylbutazone	Increased anticoagulant activity; risk of haemorrhage
Oral hypoglycaemics	Phenylbutazone, sulphaphenazole, chloramphenicol	Hypoglycaemia may be precipitated
Alcohol	Disulphiram, metronidazole, tinidazole	Disulphiram like reactions due to increase in plasma acetaldehyde levels
EXCRETION INTERACTIONS		
Changes in Active Tubular Secretion		
Penicillin, cephalosporin, nalidixic acid, PAS, methotrexate, dapsone	Probenicid (acid)	Elevated plasma levels of acidic drugs; risk of toxic reactions
Procainamide, ranitidine	Cimetidine (base)	Increased plasma levels of basic object drugs; risk of toxicity
Acetohexamide	Phenylbutazone	Increased hypoglycaemic effect
Changes in Urine pH		
Amphetamine, tetracycline, quinidine	Antacids, thiazides, acetazolamide	Increased passive reabsorption of basic drugs; increased risk of toxicity
Changes in Renal Blood Flow		
Lithium bicarbonate	NSAIDs (inhibitors of prostaglandin synthesis; the latter control renal blood flow partially by vasoconstriction)	Decreased renal clearance of lithium; risk of toxicity

MULTIPLE CHOICE QUESTIONS

1. **When the renal clearance (ml/min) is less than 130, which statement is true (GPAT 2016)**
   (a) Drug filtered and reabsorbed completely
   (b) Drug filtered and reabsorbed partially
   (c) Drug is filtered as well as secreted actively
   (d) Clearance equal to renal plasma flow rate
2. **If a basic drug reabsorbed significantly from kidney which of the following statement will be correct (GPAT 2015)**
   (a) Its renal clearance increases in basic urine
   (b) Its renal clearance decreases in basic urine
   (c) Its renal clearance increases in acidic urine
   (d) Its renal clearance decreases in acidic urine
3. **Creatinine clearance is used as a measurement of (GPAT 2015)**
   (a) Passive renal absorption
   (b) Glomerular filtration rate
   (c) Renal excretion rate
   (d) All of these

SAMPLE PDF
PHARMACY INDIA

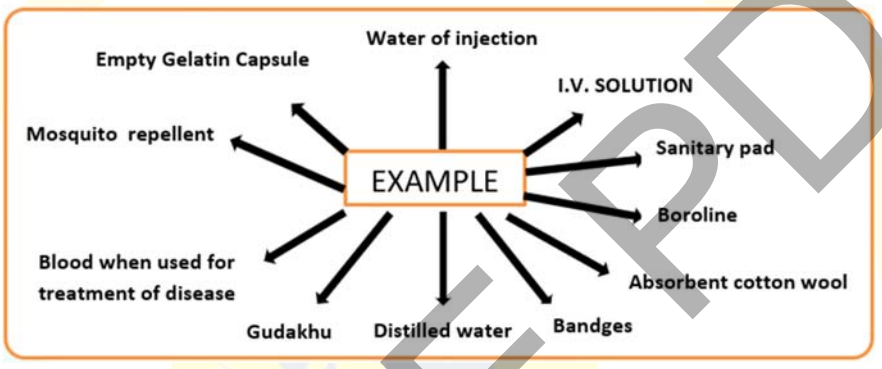
- **Chapter IV -** Manufacture, Sale and Distribution of Drugs and Cosmetics.
- **Chapter IV (A) -** Provisions Relating to Ayurvedic, Siddha and Unani Drugs.
- **Chapter V -** Miscellaneous

- There are 2 Schedules to the Act and 35 Schedules to the Rules framed under the Act.

Important Definitions

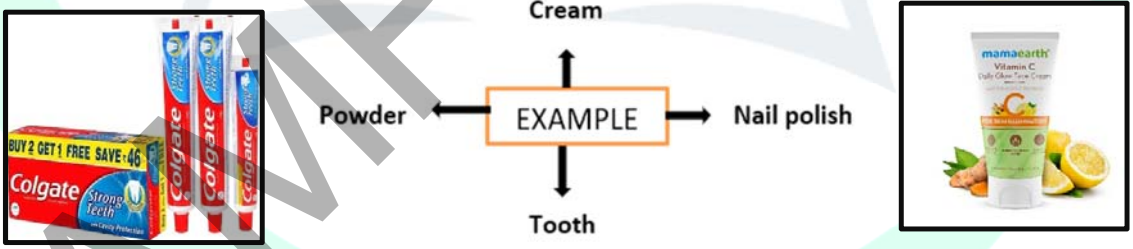
Drug [Section 3 (b)]

- All medicine for internal or external use of human beings or animals and all substance intended to be used for diagnosis, treatment, mitigation, or prevention of any disease or disorder in human being or animal including preparation applied on human body for the purpose of repelling insect like Mosquito.



Cosmetic: [Section 3 (a)]

- It means any article intended to be rubbed, sprayed, poured, sprinkled on or introduced into or otherwise applied to the human body thereof, for cleansing, beautifying or promoting the attractiveness or altering the appearance and also includes any article intended to be used as a component of cosmetic but does not include soap.



Over-The-Counter (OTC)

- Over-the-counter (OTC) drugs are medicines sold directly to a consumer without a prescription from a healthcare professional, as opposed to prescription drugs, which may be sold only to consumers possessing a valid prescription.
- Acetaminophen, Dextromethorphan, Ibuprofen, Vicks, loratadine.

Misbranded Drug	Adulterated Drug	Spurious Drug
• If it is not labeled in the prescribed manner	• If it is consist in whole or in. part, of any filthy, putrid, of decomposed substance.	• If it is imported (manufactured in relation to manufacture, sale and distribution of drugs) under a name which belong to another drugs.

SAMPLE PDF

7.	Inhalers and vitrallae		-----
8.	Tablet	60	20
9.	Large volume parenteral	250	150
10.	Surgical area	30	100(packaging)
11.	Repackaging of drugs and pharmaceutica.	35	30(if medicated)
12.	. Recommended area for retail sale	10	
13.	Recommended are for Wholesale	10	
14.	Recommended are for Retail and Wholesale	10	

DURATION OF LICENSE

- The licences are valid up to 31st December of the year, following the year it should be renewed.
- The licences should be renewed within 6 months after its expiry. Even after 6 months the licences can be renewed under specified conditions.

RENEWAL OF LICENCES

- The licences in Form 20, Form 21, Form 20B, Form 21B, Form 20F, Form 20G, Form 200 and Form 20D are valid for the period of five years from the date of granting them.

License for Retail sale	License of Wholesale	Application Form	License fee	Additional fee per month
From 20 From 20- B	From 20 From 20- B	From 19	1500	500
From 21 From 21- B	From 21 From 21- B	From 19	1500	500
From 20-F From 20- G	From 20-F From 20- G	From 19 c	500	250
From 20-C From 20- D	From 20-C From 20- D	From 19-B	250	50

DUPLICATE LICENCES

- If the original licences defaced, damaged or lost, the duplicate licences may be issued on application given by the licensee accompanied by the prescribed fee. The fees for different

License for retail sale License of wholesale	License for retail sale License of wholesale	Fees for Duplicate License
From 20 From 20- B	From 20 From 20- B	150
From 21 From 21- B	From 21 From 21- B	150
From 20-F From 20- G	From 20-F From 20- G	150
From 20-C From 20- D	From 20-C From 20- D	50

OFFENCES AND PENALTIES

Offences	Penalties	
	1ST convection	Subsequent convection
Manufacture and Sale of Drugs		

SAMPLE PDF
PHARMACY INDIA

Preparations

Choose the correct answer from the options given below

(a) 1 - [P], 2 - [Q], 3 - [R], 4 - [S]
(b) 1 - [Q], 2 - [S], 3 - [R], 4 - [P]
(c) 1 - [S], 2- [Q], 3- [R], 4- [P]
(d) 1- [R], 2- [P], 3- [Q], 4 - [S]

6. As per the Drugs and Cosmetics Act-1940, if a drug is not labelled in prescribed manner it is a (GPAT 2020)
(a) Spurious drug
(b) Substandard drug
(c) Adulterated drug
(d) Misbranded drug

7. Standards to be complied under D & C act -1940 for drugs imported, manufactured, stocked and exhibited for sale or distribution are covered under
(a) Schedule M
(b) Second Schedule
(c) First Schedule
(d) Schedule L

8. In which year India signed General Agreement on Trade and Tariffs (GATT) including Trade Related Intellectual Property Rights (TRIPS) (GPAT 2020)
(a) 1996 (b) 1994 (c) 1992 (d) 1990

9. As per the definition of D and C Act. Gudakhu (rubbed against human teeth) is considered as (GPAT 2020)
(a) Food (b) Drug
(c) Sweeting gum (d) Cosmetic

10. The version of GMP in India that describe the requirement of factory premises for the manufacture of cosmetics (GPAT 2020)
(a) Schedule-M (b) Schedule-M-III
(c) Schedule-M-II (d) Schedule M-I

11. As per US FDA, NDA's for new chemical entitles are classified as either (GPAT 2019)
(a) 'P' for product review or 'S' for standard review
(b) "P' for priority review or 'S' for standard review
(c) 'P' for product review or 'S' for safety review
(d) 'P' for priority review or 'S' for safety review

12. 21 CFR part 211 of USFDA describes (GPAT 2019)
(a) Current good clinical practice
(b) Current good packaging practice
(c) Current good manufacturing practice
(d) Current good laboratory practice

13. GMP regulation are pertaining to minimum requirements to be met by industry when (GPAT 2019)
(a) Manufacturing, packaging and holding of human drugs and veterinary drugs
(b) Manufacture of human drugs and veterinary drugs
(c) Manufacture and packaging of human drugs and veterinary drugs
(d) Manufacture and holding of human drugs and veterinary drugs

14. As per the Medical Termination of Pregnancy Act and rules, the safe custody of "Forms" is with (GPAT 2019)
(a) Standing committee
(b) Registered Medical Practitioner
(c) Owner of the approved place
(d) Chief Medical Officer

15. Choose the CORRECT statement with respect to "The Pharmacy Act, 1948 (GPAT 2019)
(a) Education regulation 1991 dose not prescribe the minimum qualification for the registration as Pharmacist
(b) Section 12 of the act deals with the approval of course of study under chapter 2 thereof
(c) Section 12 of the act deal with the approval of course of study and examination under chapter 2 thereof
(d) State Govt is authorized to make any rules with respect to course of study

16. In India the patent office has its head office at Kolkata and branch offices at (GPAT 2019)
(a) Dibrugarh, Indore and Vapi
(b) Kashmir, Ahmedabad and Trivandrum
(c) Chandigarh, Hyderabad and Goa
(d) Mumbai, Chennai and New Delhi

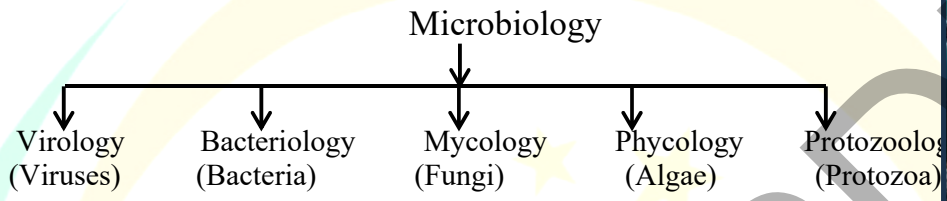
17. Penalty for the cultivation of any cannabis

SAMPLE PDF

MICROBIOLOGY

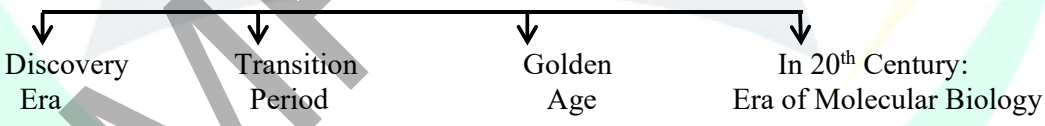
INTRODUCTION OF MICROBIOLOGY

- Microorganisms are living organisms that are usually too small to be seen clearly with the naked eye.
- Microorganisms are used to make different products. (e.g., Penicillin, Streptomycin, Chloromycetin), vaccines, vitamins, enzymes and many more important products.
- At present there is general agreement to include five major groups as microorganisms. The subdivisions are:



DISCOVERY OF MICROBES & THE DAWN OF MICROBIOLOGY

- The term microbiology was given by French chemist Louis Pasteur (1822-95).
- The term microbe was first used by Sedillot (1878).
- Robert Hooke was the first to coined the term "cells."
- Antonie van Leeuwenhoek is considered as the "Father of microbiology" & "Father of bacteriology".
- George Schroeder and Theodor Von Dusch (1854) were the first to introduce the idea of using cotton plugs for plugging microbial culture tubes.
- Pasteur in 1862 suggested that mild heating at 62.8°C (145°F) for 30 minutes
- The process was called Pasteurization.
- Domagk was awarded Nobel prize in 1939 for the discovery of the first sulpha drug.
- Recombinant Hepatitis B vaccine developed in 1982.
- The discovery of microbiology as a discipline could be" traced along the following historical eras:



TYPES OF MICROORGANISM:

1. **Psychrophiles (cold-loving):** m/o grow at cold temperature below 25ºC.eg., Pseudomonas
2. **Mesophiles**: m/o grow at moderate temperature between 25ºC- 45ºC.e.g., Salmonella, Proteus
3. vulgaris
4. **Thermophiles (heat-loving):** m/o grow above 45ºC, optimum 55-65ºC. Bacillus stearothermophiles
5. **Acidophil**: m/o which can tolerate highly acidic conditions. E.g., Lactobacilus
6. **Basophil**: m/o which can tolerate alkaline conditions. E.g., Vibrio cholera
7. **Obligate aerobes**: they require oxygen for growth. e.g., Mycobacterium tuberculosis
8. **Obligate anaerobes**: they do not require oxygen for growth. e.g., Clostridium species.
9. **Facultative anaerobes**: aerobic bacteria that can grow in the absence of air. e.g., E. coli
10. **Microaerophile**: Microorganisms require very low concentration of oxygen. e.g., Streptococcus pyogenes, Helicobacter pylori.

PROKARYOTES & EUKARYOTES

Characteristics	Prokaryotes	Eukaryotes
Type of Cell	Always unicellular	Unicellular and multi-cellular

SAMPLE PDF

Chloramphenicol	Streptomyces venezuelae
Cephalosporin	Penicillum chrysogemum
Neomycin	Streptomyces fradiae
Amylase	Aspergillus niger, Aspergillus oryzae, Bacillus subtilis
Lipase	Aspergillus niger
Dextran	Leuconostoc mesenteroides
Penicillinase	Bacillus subtilis
Vitamin B12	Pseudomonas and propionibacterium species
Riboflavin	Ashbya gossypii
Citric acid	Aspergillus niger
Lactic acid	Rhizopus oryzae, Lactobacillus bulgaricus
Fumaric acid	Rhizopus nigricans
Lysine	Corynebacterium glutamicum
Ethanol	Escherichia coli
Gluconic acid	Aspergillus niger
Gentamicin	Micromonospora purpura
Chlortetracycline	Streptomyces aureofaciens
Oxytetracycline	Streptomyces rimosus
Tetracycline	Streptomyces aureofaciens
Demeclocycline	Streptomyces aureofaciens
Bacitracin	Bacillus subtilis

Multiple Choice Questions

1. **Ig that helps in Opsonization is**
   (a) IgA (b) IgG
   (c) IgD (d) IgE
2. **Identify the incorrect match in context to shape of virus**
   (a) Tobacco mosaic virus Rod shaped
   (b) Rota virus - Wheel shape
   (c) Pox virus - Brick shaped
   (d) None of the above
3. **Variable portion of an immunoglobulin is**
   (a) Amino terminal
   (b) Carboxy terminal
   (c) Acid terminal
   (d) Amoxy terminal
4. **Which is not a live vaccine**
   (a) Measles (b) BCG
   (c) Yellow fever (d) Salk's vaccine
5. **Widal test is an example of**
   (a) Side flocculation test
   (b) Precipitation
   (c) Agglutination
   (d) Complement fixation
6. **Fungal spores formed by condensation of hyphal element**
   (a) Arthrospore (b) Conidiospore
   (c) Basidiospore (d) Ascospore
7. **Antigen antibody reaction is seen maximum in**
   (a) Excess antibody
   (b) Excess antigen
   (c) Antigen and antibody are equal
   (d) Antigen and antibody are low
8. **Immunoglobulin present in local Secretion is**
   (a) IgG (b) IgA (c) IgM (d) IgD
9. **Immunoglobulin that is inactivated by heating is**
   (a) IgG (b) IgA (c) IgM (d) IgE
10. **A woman with infertility receives an ovary transplant from her sister who is an identical twin. What type of graft it is**
    (a) Xenograft (b) Autograft
    (c) Allograft (d) Isograft
11. **Which is the first antibody elevated in fetal Life**
    (a) IgA (b) IgE (c) IgG (d) IgM
12. **Fungi of medical importance belongs to**
    (a) Basidiomycetes (b) Ascomycetes

SAMPLE PDF
PHARMACY INDIA

PHARMACEUTICAL ENGINEERING

SIZE REDUCTION & SIZE SEPARATION

DEFINITION

It is a unit operation in which reduction of materials to coarse particle or to fine powder before formulate into suitable dosage form.

Comminution, grinding, milling, pulverizing are other terms used for size reduction.

Factors affecting size reduction

1. Hardness: Harder the material, more difficult to reduce its size.

2. Toughness: Soft but tough material creates problem in size reduction and its toughness is reduced by decrease temperature.

3. Stickiness: Gum and resinous substances cause problem in size reduction.

4. Moisture content: <5% moisture suitable for dry grinding and >50% for wet grinding.

TYPE OF MILL	ACTION	PRODUCT SIZE	USED FOR	NOT USED FOR
Cutter	Cutting	20- to 80-mesh	Fibrous, Crude animal and vegetable drugs	Friable materials
Revolving	Attrition and impact	20- to 200-mesh	Fine grinding of abrasive material	Soft material
Hammer	Impact	4- to 325 - mesh	Almost all drugs	Abrasive material
Roller	Compression	20- to 200-mesh	Soft material	Abrasive material
Attrition	Attrition	20- to 200- mesh	Soft and fibrous material	Abrasive material
Fluid-energy	Attrition and impact	1 to 30µm	Moderately hard and friable material	Soft and Sticky material

MECHANISM OF SIZE REDUCTION

METHOD/ PRINCIPLE	COMMON EQUIPMENT	APPROX PARTICLE SIZE (MICRON)
Cutting	Cutter mill	100–80000
Compression	Roller mill	50–10000
Impact	Hammer mill	50–8000
Attrition	Colloid mill, Roller mill	1–50
Impact and Attrition	Ball mill, Fluid energy mill	1–2000

SIZE SEPARATION

Particle Size Separation by Different Method

SIZE SEPARATION METHOD	PARTICLE DIAMETER (MICRON)
Sieving	5–10000
Sedimentation A . Gravitational B . Centrifugal	5–1000 0.1–5
Elutriation A . Water and Air gravitational B . Centrifugal	10–500 0.5–50
Cyclone separation	2–50

SAMPLE PDF

PHARMACY INDIA

Our classes set up with an aim to provide coaching to the aspiring students who are dedicated and want to achieve excellence in their career. We provides more features test series & study material for GPAT, NIPER, DRUG INSPECTOR and PHARMACIST EXAMINATION.

Type "PHARMACY INDIA" in PlayStore

To Download this App from Playstore

GET IT ON Google Play

SAMPLE PDF

PHARMACY INDIA
Dayalpuram, Street -4, Khatauli
Muzaffarnagar, 251201
Phone : 8171313561, 8006781759
E-mail : pharmacyindia24@gmail.com