

LIQUID DOSAGE FORM

(1) Monophasic

(i) Internal

- ◆ **Syrup** - 66.67 % W/W Sucrose, No Presentative in Pharmacopoeial syrups.
- ◆ **Elixir**- Alcohol 4-40 %
- ◆ **Linctus** - Cough Preparation, Sipped and Swallowed slowly.

(ii) External

- ◆ **Liniment** - [use with Friction and rubbing.
Not applied to broken skin.
- ◆ **Lotion** - Without friction and rubbing-used with absorbant cotton wool.
- ◆ **Gargle** - Throat infection -Concentrated preparation used by dilution.
- ◆ **Mounth Wash-**
- ◆ **Throat Paint** -- Glycerine is used for long duration of action and sweet taste
- ◆ **Eye/Ear/Nasal drops-**

(2) Biphasic

- ◆ **Emulsion-** (1)O/W (2)W/O
- ◆ **Suspension-**

PARTICLE SIZE

Significance of Particle size-

- (1) Suspension
- (2) Mixing
- (3) Separation of solid - Filtration
- (4) Surface Area
- (5) Adsorption --- Particle Size
- (6) Absorption of Drug

Sieving

10	-	→ 1700 μm
22	-	→ 710 μm
44	-	→ 355 μm
60	-	→ 250 μm
85	-	→ 180 μm
120	-	→ 125 μm
350	-	→ 45 μm

Method of particle size Measurement

- 1 Sieving → 50 μm onward
- 2 Microscopy → 0.2 μm onward
- 3 Sedimentation → 200-2 μm
- 4 Coulter counter → Particle volume 0.5 μm onward.

SIZE REDUCTION

FACTORS AFFECTING SIZE REDUCTION

- | | | | |
|---|------------------------------|--|------------------------------|
| 1) Hardness- | Moh's Scale | 1-3
4-7
More than 7-10 | Soft
Intermediate
Hard |
| 2) Toughness- | Can be reduces | Cool -100 to -150°C by liq. Nitrogen, rubber | become brittle |
| 3) Stickness- | Gummy Substance | create problem | |
| 4) Softning temp. | Waxy Substance | Cool the mill | |
| 5) Material Structure | | | |
| 6) Moisture content | Less than 5% → | Dry Grinding | |
| | More than 50% → | Wet Grinding (Levigation) | |
| 7) Physiological effect- | (should be enclosed system) | | |
| 8) Purity required- | Wearing, (cleaning the mill) | | |
| 9) Bulk Density | | | |
| 10) Abrasiveness | | | |
| 11) Ratio of feed size of product size. | | | |

For size reduction energy use in predicted by various theories-

- 1) **Rittenger Law** - Energy use \propto new surface area formed
- 2) **Kick's Law**- Energy use \propto Ratio of initial and final particle diameter
- 3) **Bond's Law**-

Mechanism of size Reduction

- | | | |
|--|----------------------------------|---------------------------------|
| 1) Cutting - | Cut | by Cutter mill |
| 2) Compression - | Compress | by Roller mill |
| 3) Impact - | Hit by high speed moving surface | by Hammer mill, Disintegrator |
| 4) Attrition - | Friction between two surface | by Roller mill |
| 5) Combined Impact and attrition- | | by Ball mill, fluid energy mill |

MILLS

Size reduction mill consist three parts

- 1) **Feeding**
- 2) **Grinding** → Rotor

↓
Stator

3) Discharger

- Open circuit mill- Powder once pass through mills
- Closed circuit mill- Discharged particle pass through size separation device (like classifier)

Ball mill

- ◆ Cylinder - 1 meter
- ◆ Ball- 30-50% volume of cylinder
- ◆ Ball size - 75mm, 150 mm
- ◆ Larger Ball- crush
- ◆ Smaller Ball- Fine
- ◆ $\frac{2}{3}$ of maximum speed (optimum) (60-85%)
- ◆ Enclosed form
- ◆ Noisy machine
- ◆ Wear occur - Contamination may be possible.

Fluid Energy mill

- ◆ Loop of pipe - 2m height
20-200mm diameter
- ◆ Air at high pressure - 100 - 150 pound/inch²
- ◆ For very fine powder-
- ◆ Feed in the mill pretreated up to 100 mesh.
- ◆ The product is small up to $5\mu\text{m}$ or less.
- ◆ Generally 1 – $30\mu\text{m}$

Hammer mills-

- ◆ Hammers attached
- ◆ Work on impact
- ◆ Speed up to 10,000 rpm
- ◆ Due to high speed - Heat is generated so cool-machine time to time .

Disintegrator

- ◆ Beaters attached
- ◆ Work on impact
- ◆ Speed up to 5000-7000 rpm
- ◆ Surface is undulation/Roughness so helps in size reduction.

Colloid mill

- ◆ High speed rotor
- ◆ Speed 3000 to 20,000 rpm
- ◆ Used for homogenisation
- ◆ Material should be pre-milled
- ◆ Process of suspension and emulsion
- ◆ Not used Dry material

DIFFERENT GRADES OF POWDER

Powder	Sieve Through which all particles must pass	Sieve through which not more than 40% of particles passes
(1) Coarse Powder (10/44)	10	44
(2) Moderately coarse Powder (22/60)	22	60
(3) Moderately fine Powder (44/85)	44	85
(4) Fine Powder (85/120)	85	120
(5) Very fine Powder (120/350)	120	350
(6) Micro fine Powder - not less than 90% Particle should be less than 45μ		
(7) Super fine powder - not less than 90% Particle should be less than 10μ		

Powder size compare to coarse powder

Coarse	1
Moderately coarse	1/6
Moderately fine	1/24
Fine	1/90
Very fine	1/200

SIEVE

- 1) **Number of Sieve**- No. of meshes in length of 2.54 cm. in each transverse direction parallel to the wire
 - 2) **Nominal size of aperture** - distance between wires.
 - 3) **Approximate percentage sieving area** - Area of mesh as a total area of sieve .
- ◆ Sieve made up of -Iron, copper, copper alloy, stainless steel.

Method of size separation

1. Sieving
2. Cyclone separator
3. Air separator
4. Elutriation

(1) **Sieving**- Agitated by oscillation, vibration and gyration.

(2) **Cyclone separator** - based on centrifugal force, separation depends not only on particle size but also on density of particle.

◆ Generally used suspension of solid in gas.

◆ Suspension of Solid in gas or solid in liquid- Tangentially introduced at high velocity, Remove coarse particle

