2.3. Liquid Measurement

Measurement is the exact detection of certain volumes of liquids. Factors such as temperature and pressure must be taken into account during volume measurements as it is known that these factors show significant effects during the preparation of pharmaceutical solutions, especially on gases and liquids. A variety of materials are used to precisely measure the volumes of the liquids. Graduated cylinder is used for measurement of large volume liquids and graduated pipette and dropper are usually used for measurement of small volume liquids.

Measurement of large volume liquids:

1. The size of the graduated cylinder that can take measured volume is selected. The size of the graduated cylinder selected should not be greater than 5 times of the volume to be measured.

2. Be careful that the graduated cylinder is dry and clean.

3-After the label of the bottle is checked, the lid is opened by taking it to the right and the label is brought into the palm of the hand so that the label is not contaminated.

4.The graduated cylinder is kept upright in the eye direction, and the overlap of the upper surface of the volume line with the liquid surface is ensured.

5. The liquid is poured carefully into the middle of the graduated cylinder, and if there is liquid dripping in the edge, it is expected to flow down.

6. The bottle cap is closed, the correctness of the label is checked and the bottle is replaced.

Measurement of small volume liquids:

1- Select a pipette with a size appropriate to the volume of liquid to be measured.

2-Care is taken to ensure that the selected grade pipette is clean, dry and robust.

3-The selected pipette needs to be immersed in the liquid very little while taking liquid.

4-Pipes must be used during extraction of irritating and toxic liquids with a pipette.

5-In volume measurements made using droppers, attention must be paid to keeping the droppers perpendicular to the dropping and to ensure that the dropper used corresponds to the standard dropper definition in Pharmacopoeias.

Study 3.1.

1. Calculate the number of drops of 1 gram of water with the help of your pipette and scale.

2. Find the number of drops of 1 ml of water while the pipette is angled (about 20 degrees) and holding it upright.

3. Find out how many drops of 1 gram of water come from your droppings, keeping the droplet at an angle and upright.

4.a) Compare the conditions of the drops by dripping a drop of aqueous solution containing water and surface active agent onto a clean glass.

b) Find the number of drops of 1 ml and 1 g of the aqueous solution containing water and surface active substance using pipette and scale. Calculate the surface tension of the aqueous solution containing the surface active agent.

Questions:

1. Describe how to select the measuring cups you will use to measure pharmaceutical liquids?

2. What is standard dropper? Describe it. Describe your opinion of your dropper conforming to these standards by the dripping feature.

3. How many drops should you take to get 1 g of liquid (1 gram of this liquid comes with 30 drops with standard dropper) with your dropper (1 g of water comes with 24 drops)?

4. What are the factors that affect the drop weight? Explain this with a formula.

5. 1 gram of surface-active substance containing solution comes with 30 drops and 1 gram of water comes with 20 drops with the same dropper. Calculate the surface tension of the surface-active substance containing solution.

2.4. Alcohol Calculations

There are tables and formulas which indicate volume and weight of alcohol grades.

Alcohol grade: The amount of pure ethanol contained in an ethanol-water mixture is defined as the "alcohol grade" and is expressed in terms of (%) and (o).

Calculation examples:
- There are tables which showing the amounts of water and alcohol to be taken to prepare 1000 g of alcohol at the desired level in grams. With the help of these tables, you can find how many grams of alcohol will be taken from a certain degree of alcohol according to the desired alcohol level. The amount of purified water is added to the weighted alcohol.

Example 3.1: Prepare 50 g of 60° alcohol with 96° alcohols.

d_{60}= 0,907
$V_1 \times d_1 = V_2 \times d_2$

V_1: Amount of alcohol required
D_1:% of desired alcohol, h / h amount
V_2: Amount of ml to be taken from the alcohol in hand
D_2:% of alcohol in hand, h / h amount

d=m/v 0,907 = 50/ V V= 55,13 ml

$V_1 \times d_1 = V_2 \times d_2$
55,13x60= 96xV2 V2= 34,46 ml 96° alcohols

Take 34,46 ml of 96% alcohol and supplement with 55,1 ml of purified water in cylinder.

Example 3.2: Prepare 100 ml of 70° alcohol with 96° alcohols.

$V_1 \times d_1 = V_2 \times d_2$

(100 x 70)/96 = 72.9 ml

Take 72.9 ml of 96% alcohol and supplement with 100 ml of purified water in cylinder.

Example 3.3: Prepare 400 g of 40% w / w alcohol with 90% w / w alcohol.

$V_1 \times d_1 = V_2 \times d_2$

V_1: Gram amount of requested alcohol
D_1:% of desired alcohol, a / a amount
V_2: the amount of grams to be taken from the alcohol in hand
D_2:% of alcohol in hand, w / w amount

(400 x 40)/90 = 177.7 g

Weigh 177.7 g 90% w / w alcohol and complete with 400 g of purified water on scale.

Example 3.4: Prepare 100 g of 70% w / w alcohol with 96° alcohol.

Current alcohol grade (h / h) x 0.7938 (absolute alcohol concentration) = The concentration of current alcohol

(96 x 0.7938) / 0,808 = 94.31% w / w (96°)

$V_1 \times d_1 = V_2 \times d_2$

(100 x 70)/ 94,31 = 74.22 g

Take 74.22 g of 94.31% w / w alcohol and complete with 100 g of purified water on scale.

Example 3.5: Prepare 200 ml of 50% v / v alcohol with 90% w / w alcohol.

Current alcohol grade (w / w) x The concentration of current alcohol = 0.7938 (absolute alcohol concentration)

(90 x 0.820) / 0,7938= 92.97% h / h (90% w / w)

$V_1 \times d_1 = V_2 \times d_2$

(200 x 50) / 92,97 = 107.56 ml

Take 107.56 ml of 92.97% v / v alcohol and complete with 200 ml of purified water in cylinder.

Questions:
1. Prepare 50 ml of 50% v / v alcohol with 95% v / v alcohol.
2. Prepare 50 g of 40% w / w alcohol with 90% w / w alcohol.
3. Turn the grades of 50% w / w and 70% w / w alcohol to v / v alcohol.
4. Turn the 60% h / h and 80% v / v alcohol grades to w / w alcohol.

Note: When preparing alcohol dilutions, care should be taken to slow the additions to avoid heating and volume reduction during mixing of alcohol and water.