LESSON ASSIGNMENT

LESSON 6

Solid Dosage Forms.

LESSON ASSIGNMENT

Paragraphs 6-1 through 6-15.

LESSON OBJECTIVES

After completing this lesson, you should be able to:

6-1. From a group of statements, select the advantage of the capsule as a dosage form.

6-2. Given a list of numbers corresponding to the sizes of capsules, select the number that corresponds to the largest size capsule.

6-3. Given a group of procedures, select the procedure to be followed when dispensing capsules.

6-4. Given a group of definitions, select the definition of the term tablet.

6-5. From a group of statements, select the advantage associated with the tablet as a dosage form.

6-6. Given a group of statements, select the disadvantage associated with the tablet as a dosage form.

6-7. Given a list of substances and/or types of substances, select the substance and/or type of substance that is often a component of tablets.

6-8. Given a group of definitions and the name of a particular type of tablet (that is, chewable tablet), select the definition of the given type of tablet.
6-9. Given a group of uses and the name of a particular type of tablet (that is, chewable tablet), select the use of the given type of tablet.

6-10. Given a group of statements, select the statement associated with the dispensing of tablets.

6-11. From a group of definitions, select the most appropriate definition of sustained-release dosage form.

6-12. Given a group of graphs, select the graph that best illustrates the blood level of medication obtained by the administration of a sustained-release dosage form.

6-13. From a group of methods, select the means by which a tablet dosage form can be made into a sustained-release form.

SUGGESTION

After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.
LESSON 6
SOLID DOSAGE FORMS

Section I. CAPSULES

6-1. INTRODUCTION TO CAPSULES

a. Capsules are one of the leading dosage forms. Countless capsules are dispensed to patients every day. Perhaps you have taken some capsules during the past year. If you have, you are already aware of some of the advantages and disadvantages of this dosage form.

b. A capsule is a gelatin or methylcellulose shell designed to hold solids and liquids for oral administration. Capsules are of two varieties. The hard capsule is intended to contain solids, while the elastic (soft) capsule is designed to hold liquids.

6-2. ADVANTAGES OF CAPSULES

Capsules have advantages over other dosage forms. Some of these advantages are:

a. Capsules effectively mask the odor and taste of substances.

b. Capsules are a professional looking, uniform, clean, and elegant dosage form.

c. Capsules provide a rapid release of medication in the stomach because of their rapid disintegration.

d. Capsules provide accurate dosage.

6-3. SIZES OF CAPSULES

Figure 6-1 shows the actual sizes of some capsules and the relative amounts of aspirin each will hold.
6-4. STORING AND DISPENSING

a. Storing. Gelatin capsules become brittle when they are stored at low humidity and they become soft, sticky, or liquid at high humidity. Consequently, empty gelatin capsules, as well as filled ones should be stored in a cool, dry place in tight containers.

b. Dispensing. Capsules should be dispensed in glass or plastic containers that protect them from moisture and dust. Capsules that are adversely affected by the atmosphere should be in a tightly closed container and the patient should be instructed to keep the bottle tightly closed except when withdrawing a dose.

Section II. PILLS AND TABLETS

6-5. PILLS

a. The word "pill" is probably one of the most misused words in pharmacy. Invariably, a person will call a tablet, a capsule, or any other shaped solid medication for oral administration a "pill." To many people, a pill is not a particular class of medication, but rather many different-looking, variously shaped and sized little things that are to be swallowed, dissolved in water, retained in the mouth, or chewed and swallowed. Therefore, you should know what a pill really is. A pill is a spherical or oval form of oral medication. It is made by incorporating a medication into a plastic or pliable mass, rolling out this mass into a long pipe, cutting it into the specified number of pieces, and rolling these pieces between the fingers or in a pill machine until they are globular. A pill should be distinguished from tablets, capsules, and other forms of medication.
b. Less than a century ago, the vast majority of the prescriptions filled were for pills. Due to the advent of more easily prepared, cheaper, and more efficacious dosage forms, pills are rarely prepared in pharmacies now and constitute only a very small fraction of the commercially prepared medications.

6-6. TABLETS

a. The tablet is a widely used dosage form. Tablets are supplied in many shapes, sizes, and colors.

b. A tablet is a solid medicated dosage form made by compression or molding.

6-7. ADVANTAGES OF TABLETS

a. **Precision of Dosage.** Suppose you select a bottle of 250 aspirin tablets which has a label statement that each tablet contains 325-milligrams (mg) of aspirin. How can you be confident that each tablet contains 325-mg of aspirin? The United States Pharmacopoeia/National Formulary is specific in stating standards for tablets. Thus, when a physician prescribes two tablets of aspirin (325-mg per tablet), the patient will receive 650-mg of drug. Liquid preparations are difficult to measure accurately (for example, one teaspoon might contain 5-milliliters (ml), while another teaspoon might contain 4-ml).

b. **Prolonged Stability.** Some drugs are more stable in tablet form than in solution or suspension form. Hence, supplying the medication in tablet form ensures that the drug will have an acceptable stability period. Of course, the expiration date of any medication should be checked before that medication is dispensed.

c. **Ease of Handling.** Tablets are easy to count and dispense. They are also easy for the patient to obtain from the container for administration purposes.

d. **Ease of Storage.** Tablets come supplied in a wide-variety of container sizes. The containers are easy to store. Many tablets are now supplied in plastic containers.

6-8. DISADVANTAGES OF TABLETS

Although tablets are widely used, they do have some disadvantages. The following are two disadvantages of tablets:

a. **Predictability of Absorption.** It is sometimes difficult to predict the actual amount of active ingredient that will be absorbed into the patient's bloodstream. For example, if a tablet fails to disintegrate properly in the patient's gastrointestinal tract, the patient cannot receive the therapeutic dose of the drug the prescriber desired.

b. **Inability of the Patient to Swallow.** Very young or elderly patients may be unable to swallow tablets. In this situation, another dosage form should be prescribed.
6-9. COMPONENTS OF A TABLET

You closely observe two tablets that are the same size. One tablet is labeled 325 mg while the other tablet is labeled 500 mg. How can this be since they are the same size? Tablets contain ingredients other than the active ingredient as stated on the drug container label. Most tablets contain at least five ingredients. Other tablets contain additional ingredients (for example, sweeteners and coloring agents). The following five components are often found in tablets:

a. **Active Ingredient.** The active ingredient is the chemical substance that is to produce a desired pharmacological effect in the patient.

b. **Binder.** The binder is the substance that holds the tablet together.

c. **Diluent.** The diluent is the "filler" that provides the desired extra volume for the tablet. For example, imagine a tablet that is labeled 2-mg. Actually, the tablet might weigh 175 mg. Does this mean the manufacturer made a mistake and put too much active ingredient in the tablet? Probably not. Much of this extra weight is diluent.

d. **Lubricant.** A lubricant is a substance that serves two functions. First, the lubricant prevents wear and tear on the tablet-making machine. Second, it makes it easier for the tablet to be removed from the tablet-forming mold.

e. **Disintegrant.** A disintegrant helps the tablet break apart and dissolve in the patient's gastrointestinal tract. Many disintegrants act by absorbing water and splitting the tablet into many small pieces.

6-10. TYPES OF TABLETS

Many types of tablets exist. Tablets are frequently categorized based upon their use.

a. **Common Oral Tablets.**

   (1) **Definition.** An oral tablet is a solid medicated dosage form made by compression or molding and intended to be swallowed whole.

   (2) **Use.** The oral tablet is used when the patient is able to swallow and the drug is not hindered by gastric juices.

b. **Chewable Tablets.**

   (1) **Definition.** A chewable tablet is a tablet meant to be chewed before swallowing.
(2) **Use.** The chewable tablet is used when the patient cannot swallow a whole tablet. Further, the chewable tablet is used whenever the tablet needs to be broken down before entering the patient's stomach. Chewable children's vitamins are frequently seen advertised.

c. **Enteric-Coated Tablets.**

(1) **Definition.** An enteric-coated tablet is a tablet that has a special outer covering designed to dissolve in the small intestine. Once the enteric-coating is dissolved, the tablet disintegrates and the active ingredient can be absorbed by the patient.

(2) **Use.** Enteric-coated tablets are used when the active ingredient is destroyed by substances in the stomach. In addition, enteric-coated tablets are indicated when the stomach is irritated by the drug in the tablet.

d. **Buccal Tablets.**

(1) **Definition.** A buccal tablet is designed to be dissolved in the mouth between the cheek and gum.

(2) **Use.** Buccal tablets are used when the drug is unstable in the stomach or when a rapid onset of drug action is desired.

e. **Sublingual Tablets.**

(1) **Definition.** A sublingual tablet is dissolved in the mouth under the tongue.

(2) **Use.** Sublingual tablets are used when the drug is unstable in the stomach or when a rapid onset of drug action is desired. For example, nitroglycerin tablets are placed under the tongue by patients who are having certain types of cardiac (heart) difficulties.

f. **Effervescent Tablets.**

(1) **Definition.** Effervescent tablets are dissolved in water with a subsequent release of carbon dioxide. Effervescent tablets should always be dissolved in water since patients who swallow the tablets whole can experience certain gastrointestinal difficulties.

(2) **Use.** Effervescent tablets are easily placed in solution for a patient to drink. The patient absorbs the drug more rapidly because the active ingredient is in solution.
g. **Extended Action Tablets.**

   (1) **Definition.** An extended action tablet releases its medication over a prolonged period of time.

   (2) **Use.** Since the active ingredient is released over a prolonged period, the drug is able to produce its actions over a long period.

h. **Lozenge.**

   (1) **Definition.** A lozenge is a tablet designed to be slowly dissolved in the mouth or upper throat.

   (2) **Use.** Lozenges are used for their local action. Many over-the-counter "sore throat" medications are supplied in lozenge form.

6-11. **DISPENSING TABLETS**

   a. Tablets should not be touched by the hands during the process of filling the prescription.

   b. Tablets should be dispensed in glass or plastic vials. A container with a tight seal will help protect the tablets from moisture. A child-resistant container should be used to contain the dispensed tablets.

Section III. **SUSTAINED-RELEASE DOSAGE FORMS**

6-12. **INTRODUCTION TO SUSTAINED-RELEASE DOSAGE FORMS**

   A sustained-release dosage form is designed to maintain constant levels of a drug in the patient's bloodstream by releasing the drug over an extended period. Maintaining constant blood levels of the drug in the bloodstream increases the therapeutic effectiveness of the drug.

6-13. **ADVANTAGES**

   One advantage of sustained-release dosage forms is that medication must be administered less often than other dosage forms. Another advantage is that it reduces fluctuations of drug concentration in the blood. (See figures 6-2 and 6-3 for a graphic illustration of this principle.) Thus, the patient is not repeatedly subjected to amounts of the drug which are less than adequate or more than adequate. Nor does the blood chemistry undergo repeated chemical imbalances, which might be detrimental to the patient's health.
Figure 6-2. Effect of divided doses in blood.

Figure 6-3. Effect of sustained-release dosage form in blood.

6-14. DISADVANTAGES

There are several disadvantages and limitations of this form of dosage. Sustained-release dosage forms are more expensive to produce. Variation of the size of the dose for a particular individual is difficult or impractical. Once the medication has been administered, it cannot be discontinued until its effects have finally ceased. In addition, some drugs are not suitable for preparation in this form.
6-15. MODES OF OPERATION

The initial dose of sustained-release medication provides sufficient drug at the time it is administered to produce the desired therapeutic effect. Thereafter, as the drug is removed from the body, more drugs, the sustained-release, must be supplied to keep a constant level in the blood. There are various means of achieving this.

a. Capsules. The original medication in this category is a capsule containing a number of small pellets. A full and immediate dose is provided to the bloodstream from these capsules by uncoated pellets that dissolve quickly. Other pellets, coated with varying thicknesses of a slowly soluble aterial, supply the bloodstream with enough drug to keep the concentration at the desired level. In addition, ion exchange resins have been used in some sustained-release capsules to release drugs at the proper intervals.

b. Tablets. In addition to capsules, some tablets provide sustained release.

(1) Granules. Some sustained-release tablets are made by compressing granules with varying coats into a tablet. The coats dissolve at different times, much like those in the capsules discussed above.

(2) Slowly soluble core. Some tablets are manufactured with an outer coating that dissolves quickly to give the initial dose. The core of this tablet, consisting of a slowly soluble base containing additional drug provides the sustained release. It is possible to achieve the same effect with layered tablets, which are often flat and cylindrical to give a constant sustained dose.

(3) Insoluble matrix. This tablet is an insoluble network of channels containing the drug. Enough of the drug is immediately extracted from the outer channels to provide the initial dose. Thereafter, the drug is extracted from the inner channels of the tablet less rapidly, producing the sustained release.

(4) Ion exchange resins. Ion exchange resins are sometimes used in tablets to provide sustained release.

(5) Repeat-action tablets. Repeat-action tablets are not really sustained-release tablets. They consist of an outer layer that dissolves quickly and provides the initial dose. Within is another tablet with a special coating that dissolves in about four hours and releases another full dosage. It is useful in avoiding the necessity of waking in the middle of the night to take a second tablet.
EXERCISES, LESSON 6

INSTRUCTIONS: Answer the following exercises by marking the lettered response that best answers the question or best completes the incomplete statement or by writing the answer in the space provided.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. From the group of statements below, select the appropriate advantage of the capsule as a dosage form.
   a. Capsules can be made opaque so light cannot penetrate the shell and decompose the drug.
   b. Capsules can mask the odor and taste of a drug.
   c. Capsules can be handled with the fingers without harming the shell.
   d. Capsules can be easily and quickly prepared without the use of pharmacy equipment (that is, mortar and pestle, pharmaceutical balance, and so forth).

2. From the list of capsule sizes below, select the number that represents the largest size capsule.
   a. 0.
   b. 1.
   c. 3.
   d. 5.
3. Select the statement that best describes a procedure to be followed when dispensing capsules.

a. Capsules should be dispensed in paper boxes so the capsules will not stick together.

b. Capsules can be dispensed in any type of container since they are not readily affected by atmospheric conditions.

c. Capsules should be dispensed in glass or plastic containers that can be tightly closed.

d. Capsules can be handled with the fingers while counting for dispensing.

4. From the group of definitions below, select the most appropriate definition of the term tablet.

a. A spherical or oval form of oral medication made by incorporating a medication into a plastic or a pliable mass, rolling the mass into a long pipe, cutting the pipe into appropriate size pieces, and rolling the pieces into globular shapes.

b. A solid medicated dosage form made by compression or molding.

c. A solid dosage form prepared using soft or hard capsule shells.

d. A type of oral medication designed to disintegrate in the small intestine to avoid gastric irritation.

5. From the group of statements below, select the advantage associated with the tablet dosage form.

a. Tablets can be made in a variety of colors and sizes to please patients.

b. Tablets can be handled with the fingers since they are not required to be sterile.

c. Tablets can be quickly and easily broken to prepare intravenous injections.

d. Tablets are precise in terms of delivering a desired dose to a patient.
6. From the group of statements below, select the disadvantage associated with the tablet dosage form.

   a. Tablets are prepared in so many shapes, colors, and sizes that it is hard to remember exactly which tablet contains a particular drug.

   b. Tablets are difficult for some patients to swallow.

   c. Tablets must be dispensed in plastic containers since they are prone to breakage in glass bottles.

   d. Tablets, especially the small ones, are difficult to accurately count since they tend to roll so easily.

7. From the list below, select the substance that is often a component of a tablet.

   a. Disinfectant.

   b. Carbon dioxide (in effervescent tablets only).

   c. Sodium chloride.

   d. Binder.

8. From the group of definitions below, select the most correct definition of an enteric-coated tablet.

   a. A tablet that has a special outer covering designed to dissolve in the small intestine.

   b. A tablet that has a special outer covering designed to dissolve in the enteric mesentery.

   c. A tablet that has a special active ingredient designed to dissolve in the small intestine.

   d. A tablet that has a special binder that protects the tablet from disintegration until it reaches the upper portion of the esophagus.
9. From the group below, select the statement that best defines the term buccal tablet.

a. A tablet designed to be dissolved in the mouth under the tongue.
b. A tablet designed to be dissolved in the mouth between the cheek and gum.
c. A tablet designed to be dissolved in water before administration of the drug.
d. A tablet designed for its slow and steady release of medication.

10. From the group of statements below, select the most appropriate statement associated with the dispensing of tablets.

a. Tablets should be dispensed in plastic vials since the tablets are prone to breakage in glass bottles.
b. Tablets should be dispensed in containers that contain some moisture so the tablets will disintegrate faster in the patient’s stomach.
c. Tablets should be dispensed in childproof containers.
d. Tablets should be dispensed in see-through containers so the patient can see the type of medication inside the bottle.

11. From the definitions below, select the most appropriate definition of the term—sustained release dosage form.

a. A dosage form designed to maintain therapeutic effectiveness of a drug at a constant level over an extended period of time.
b. A dosage form designed to rapidly disintegrate upon entrance into the patient’s stomach.
c. A dosage form designed to be used to relieve the symptoms of the common cold.
d. A dosage form used to slowly disintegrate so that most of the active ingredient is released in the large intestine.
12. From the graphs below, select the graph that best illustrates the blood level of a medication given in a sustained-release dosage form.

![Graphs showing blood level of drug in blood over time]

13. From the methods below, select the means by which a tablet dosage form can be made into a sustained-release form.

a. Granules.
b. Small pellets.
c. Scoring.
d. Soluble matrix.

Check Your Answers on Next Page
SOLUTIONS TO EXERCISES, LESSON 6

1. b  (para 6-1a)
2. a  (para 6-3)
3. c  (para 6-5b)
4. b  (para 6-6b)
5. d  (para 6-7a)
6. b  (para 6-8b)
7. d  (para 6-9b)
8. a  (para 6-10c(1))
9. b  (para 6-10d(1))
10. c  (para 6-11b)
11. a  (para 6-12)
12. c  (para 6-3)
13. a  (para 6-14b(1))

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