LESSON ASSIGNMENT

LESSON 2
Basic Pharmacology; Antiseptics and Disinfectants; Other Topical Drugs; Gastrointestinal Agents; Respiratory Drugs; Local Anesthetics.

LESSON ASSIGNMENT
Paragraphs 2-1 through 2-45.

LESSON OBJECTIVES
Upon completion of this lesson, you should be able to define terms commonly used in pharmacology; describe common dosage forms; name and describe important factors affecting drug action; and discuss the actions, uses, untoward effects, administration, cautions, and contraindications for common antiseptics, disinfectants, antacids, cathartics, antidiarrheals, antitussives, expectorants, and local anesthetics.

SUGGESTION
After studying the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.
LESSON 2

BASIC PHARMACOLOGY; ANTISEPTICS AND DISINFECTANTS;
OTHER TOPICAL DRUGS; GASTROINTESTINAL AGENTS;
RESPIRATORY DRUGS; LOCAL ANESTHETICS

Section I. INTRODUCTION TO PHARMACOLOGY

2-1. DEFINITIONS

a. **Drug**. A drug may be broadly defined as any substance or group of substances that affects living protoplasm. However, the term is used most often to refer to any substance used to prevent, diagnose, or treat disease or to prevent conception. A drug of choice is the most effective or most commonly used drug for achieving a desired therapeutic effect.

b. **Pharmacology**. Pharmacology is the study of drugs in all their respects.

c. **Therapeutics**. Therapeutics is the science and art of healing.

d. **Poison**. A poison is a substance which when absorbed or ingested into the body may alter physiology to a mild or a critical extent by damaging body tissues or cells.

e. **Toxicology**. This is the study of poisons, their actions, the treatment of poisoning, and the use of antidotes.

f. **Pharmacy**. This is the art and science of preparing and dispensing drugs for medical purposes. Pharmaceutical is an adjective which means pertaining to pharmacy.

g. **The United States Pharmacopeia and The National Formulary (U.S.P/ N.F.)**. This one reference contains standards and tests for quality, purity, strength, packaging, and labeling of drugs in the United States. The U.S.P./N.F. has information which is useful to persons whose jobs require them to work with various medications. Annual supplements to the reference ensure that it contains the latest information on drugs.

h. **Official Drug or Preparation**. An official drug or preparation is one that is listed in the U.S.P./N.F.
2-2. DOSAGE FORMS

a. Discussion. Drugs are compounded into various types of preparations depending upon the physical characteristics of the drugs, the purpose for which intended, and the method by which they are to be administered. Some drugs are prepared in more than one form and may therefore be administered in several ways.

b. Solid Preparations.

(1) **Powder.** A drug that is ground up and used in powder form.

(2) **Capsule.** A drug placed in a gelatin container (figures 2-1C and D).

(3) **Tablet.** A molded or compressed solid mass of one or more medicinal substances, often diluted and bound together by other ingredients. The shape, usually discoid, may vary considerably from one tablet to another (figure 2-1A).

(4) **Suppository.** A drug that is molded into shape for insertion in a body opening and which melts or dissolves at body temperature (figure 2-1B).

(5) **Ointment.** A drug suspended in lard, Vaseline, lanolin, or other solid or semisolid base, intended for external application.

![Figure 2-1. Solid dosage forms.](image-url)
c. **Fluid Preparations.** Fluid drugs for oral and external use are packaged in bottles; those for injection are packaged sterile in vials or ampules.

(1) **Fluidextracts.** Alcoholic or hydroalcoholic solutions of the active constituents of vegetable drugs. They are usually prepared so that each milliliter of the finished preparation contains the extractive from 1 gm of the crude drug. These drugs should be kept in dark bottles because many of them precipitate in light. They are not to be used if precipitate has formed.

(2) **Spirit.** An alcoholic solution of volatile substances.

(3) **Elixir.** A solution containing alcohol, sugar, and flavoring substance in which one or more drugs may be dissolved.

(4) **Tincture.** Alcoholic or hydroalcoholic solution or ostrichion of a drug. Tinctures of potent drugs are 10 percent in strength; of most other drugs, 20 percent in strength.

(5) **Emulsion.** A mixture of two liquids, usually oil and water, one of which is dispersed as droplets in the other. Any emulsion should have a "SHAKE WELL" label on the container.

(6) **Suspension.** A liquid preparation containing undissolved material. A "SHAKE WELL" label is applied to the container.

(7) **Syrup.** A highly concentrated sugar solution containing a flavoring agent into which a drug may be incorporated.

(8) **Liniment.** A solution of drugs in a soapy, oily, or alcoholic base, intended for external application with friction.

(9) **Lotion.** An aqueous preparation, usually containing suspended insoluble matter, to be applied externally. A "SHAKE WELL" label should be on the container.

d. **Cautions Concerning Certain Fluid Drugs.** Fluidextracts, spirits, elixirs, and tinctures (paragraph 2-2c(1)-(4) above) are preparations that are generally potent and, hence, the dosage is likely to be small. The usual dose range is from a few drops up to 2 to 4 ml. In addition, these drugs are never to be injected. Fluid drugs containing alcohol should not be applied to open lesions.

2-3. **POSOLOGY**

Posology is the science of dosage. It deals with the amount of drug necessary to produce a desired physiological, therapeutic, or prophylactic effect.
a. The average dose, also called the usual dose, is the amount of drug that ordinarily produces the effect for which the drug is intended. In addition to the usual dose, the usual dose range is often indicated for many drugs in standard pharmacy references. This provides a guide to dispensing personnel in deciding whether the prescriber should be consulted about the correctness of a prescribed dose. The usual dose range is the range of doses that consistently produce the effect for which the drug is intended.

b. The minimum dose is the smallest dose that produces a therapeutic effect.

c. The maximum dose is the largest dose that can be safely administered.

d. The toxic dose is the dose that produces harmful effects.

e. The lethal dose is the dose that will result in death. The minimum lethal dose (MLD) is the smallest amount that will cause death.

f. The single dose is the amount of a drug taken at one time. The daily dose is the total amount of a drug taken in 24 hours. A continuous dose consists of small doses taken at short intervals. A maintenance dose is that amount of drug taken to replace previous doses that have been inactivated, detoxified, or excreted. The purpose of a maintenance dose is to maintain the required concentration of the drug in the body.

2-4. FACTORS AFFECTING DRUG ACTION

In drug administration, many factors affect the action of the medication. These factors also affect the dose to be administered. The usual adult dose of medication as listed in standard references, is based on the assumption that the adult weighs 150 pounds, but since the following variables influence the action of the medication, they also may alter the quantity of the drug necessary to produce the desired results.

a. Weight. Heavy, burly clients require larger doses than weak, emaciated ones. The doses of many drugs are calculated on a weight basis; a specified number of grams or milligrams are administered per pound or kilogram of body weight.

b. Age. As a rule, the very young and the very old require less than the normal adult dose. As you recall from lesson 1, several formulas are available for estimating a child's dose when the average adult dose is known.

c. Sex. Females usually require smaller doses than males. Iron preparations and other hematinsics are exceptions to this rule because of the blood lost by women during menstruation.

d. Race. Race can be a factor affecting drug action, since enzyme systems, body chemistry, and stature may vary.
e. **Temperament.** The high-strung, nervous, always-busy type of individual requires smaller amounts of stimulants but larger amounts of sedatives than the phlegmatic (dull, apathetic) individual.

f. **Climate.** Cathartics seem to be effective in smaller doses in warm climates than in cold.

g. **Occupation.** Men who work outdoors and who engage in strenuous, physical activity usually require larger doses than those who are engaged in sedentary or indoor work.

h. **Disease.** Some pathological conditions require changes in dosage. People in extreme pain need more analgesic and sedative drugs than those suffering only mild pain. The extremely weak or debilitated client may require smaller doses of some medications.

i. **Tolerance.** The therapeutic effects of some medications are lessened in individuals after prolonged use. Thus, a person who has used such a drug for a long time needs larger doses than he did when he first began to take it in order to realize the same therapeutic effects from it. This is called tolerance. Users of opium, morphine, cocaine, amphetamines, and barbiturates fall into this category. Cross-tolerance develops when the use of one drug causes a tolerance to another. Alcoholics, barbiturate habitues, and narcotic addicts develop a cross-tolerance to sedatives and anesthetics. These individuals require very large amounts of anesthetics before surgical anesthesia can be attained.

j. **Mode of Administration.** Generally, drugs given parenterally are used in smaller quantities and those given rectally are used in greater quantities than the usual oral dose.

k. **Frequency of Administration.** Drugs given at frequent intervals are administered in smaller doses than those given at wide intervals.

l. **Time of Administration.** Some drugs given by the oral route are absorbed more rapidly before a meal (on an empty stomach) than they would be if they were administered immediately after a meal.

m. **The Drug.** Many factors of the drug itself can influence its action. They may alter its potency, making some preparations weaker and others stronger. The form of a drug, that is, solution, powder, or suspension, may alter the amount of the drug necessary and the effects derived from it.

n. **Additive Effect.** If two drugs exhibit the same overt effect and their combined effects are equal to the sum of their individual effects, they are additive.
o. **Synergism.** Synergism is the joint action of two or more drugs such that their combined effects are greater than the sum of their individual effects. A reduced dosage may be necessary.

p. **Antagonism.** If only one of two drugs exhibits an effect, but that effect is decreased when the two drugs are given in combination, they are antagonistic. An increased dosage of the active component may be necessary.

q. **Accumulation.** When the body is unable to detoxify and excrete a drug as rapidly as it is being absorbed, or when a drug is stored in the tissues for an appreciable length of time, pronounced drug effects and poisoning can follow. Usually this is noticed when a number of doses are administered over a period of time. This may require progressively smaller doses (or "rest" days between doses) to allow the accumulated drug to be expended.

r. **Side Effects.** Most drugs are not singular in action. They may produce several different physiological responses at the same time. Antihistamines used for their anti-allergic effect tend to produce drowsiness, which is a side effect of the drug. Amphetamines are sometimes used to appease appetite in weight control, but at the same time they cause nervousness and insomnia, which are side effects to the diet client. Thus, to minimize undesirable side effects, a lower dose may be given, or another drug may be given concomitantly to antagonize the side effect.

s. **Drug Allergy (Hypersensitivity).** A few individuals may be allergic, or hypersensitive, to a drug because of prior contact with a particular substance called an allergen (perhaps the same drug). This phenomenon of acquiring an allergy is called sensitization. The symptoms of an allergic reaction are not related to the ordinary effects of the drug. Thus, the allergic individual should not be confused with the individual who is highly responsive to a drug and thus requires only a small dose to achieve the desired therapeutic effect. Allergic reactions to a drug may range in severity from a mildly irritating skin rash to a fatal state of shock (anaphylaxis). One drug to which many clients are allergic is penicillin.

**Section II. ANTISEPTICS AND DISINFECTANTS**

2-5. **DEFINITIONS**

The antiseptic and disinfectant drugs are used extensively by both medical personnel and the general public. These drugs act locally to produce their effects.

a. **Antiparasitic.** A preparation used to eliminate body parasites.
b. **Antiseptic.** A preparation that checks or prevents the growth or development of pathogenic (disease-producing) bacteria. Antiseptics are primarily intended for use upon animate (living) objects. Antiseptics usually act as bacteriostats.

c. **Bactericide.** A drug that kills bacteria.

d. **Bacteriostat.** A drug that inhibits the growth of bacteria.

e. **Disinfectant.** A preparation that kills infectious organisms, but does not necessarily destroy their spores. Disinfectants are primarily intended for use upon inanimate (nonliving) objects. For the most part, disinfectants act as bactericides.

f. **Fungicide.** A drug used to kill fungus that infects the body surface.

g. **Fungistat.** An agent that inhibits the growth of fungous organisms without necessarily killing them.

h. **Pediculicide.** A preparation used to kill lice.

i. **Scabicide.** A preparation used to kill itch mites (scabies).

j. **Sterile.** An object is sterile if it is free from all living organisms. The appropriate use of antiseptics and disinfectants will greatly reduce the number of pathogenic (disease-producing) organisms present, but these agents will seldom sterilize objects.

### 2-6. ALCOHOLS

a. **Discussion.** Both ethyl alcohol and isopropyl alcohol have an antiseptic action when applied to the skin. Alcohol is commonly applied to the skin prior to giving an injection to cleanse the infection site. In addition, alcohol may be used for the disinfection of some medical equipment, such as thermometers. Isopropyl alcohol is a more effective antiseptic agent than ethyl alcohol.

b. **Strength.** For both ethyl alcohol and isopropyl alcohol, the optimum concentration for antiseptic purposes is 70 percent. If this concentration is varied, either higher or lower, these products become less effective. Stronger concentrations of ethyl alcohol may result in the formation of spores.

c. **Other Uses.**

   (1) Both ethyl alcohol and isopropyl alcohol may be applied to the skin as a cooling rub in concentrations of 35 percent-70 percent.
(2) Alcohol may be ordered to be taken internally. Only alcohol, USP (ethanol, ethyl alcohol), is to be taken internally. Receipts and expenditures of ethyl alcohol must be accounted for in the narcotic and controlled drug register.

d. Precautions.

(1) When the alcohols are used to disinfect metal instruments, an antirust agent (such as sodium nitrite) should be put into the solution. Ethyl alcohol produces more rusting than does isopropyl alcohol.

(2) Both alcohols are flammable in concentrations over 50 percent; therefore, these solutions should not be used in the presence of open flames, nor when there is danger of electrostatic sparks.

(3) Isopropyl alcohol is not to be given internally.

(4) Both alcohols should be kept covered when not being used, because the alcohols will evaporate rapidly if left in an open container.

e. Supply. Both ethyl and isopropyl alcohol are ordinarily supplied in quarts.

2-7. BENZALKONIUM CHLORIDE

a. Action and Uses.

(1) Benzalkonium chloride (Zephiran) has either a bacteriostatic or a bactericidal action, depending upon the concentration of the solution. Both the aqueous solution and the tincture act as a bactericide when used in a concentration of 1:1000.

(2) Benzalkonium chloride is used to prepare the skin for surgery, and to prepare an injection site. It is also used to disinfect surgical instruments and polyethylene tubing.

b. Precautions.

(1) An antirust agent should be used when benzalkonium chloride is being used for the disinfection of instruments.

(2) Care must be taken to carefully rinse articles that have been washed before soaking them in benzalkonium chloride, since soap and other anionic detergents will inactivate it.

(3) Benzalkonium chloride is not to be taken internally.
c. Supply.

(1) Benzalkonium chloride solution is supplied in a 10 percent concentration that must be diluted to the proper concentration before it is used. To make a 1:1000 solution, 10 ml of the drug is combined with enough water to make 1 liter of solution.

(2) Benzalkonium chloride tincture is supplied tinted, so that it is readily identified as containing alcohol. It is available in both 10-ml and 2-ml bottles with applicator tip, in a 1:1000 concentration.

2-8. HYDROGEN PEROXIDE

a. Action and Uses. Hydrogen peroxide is an antiseptic agent that is used as a mouthwash, as a germicide, and as a mechanical cleansing agent for wounds. The antiseptic action of hydrogen peroxide is produced by the release of oxygen when the drug is applied to a wound. The drug is an effective antiseptic only as long as oxygen is being released. The bubbling, effervescent action of oxygen affords a mechanical means for the removal of debris from a wound. Particles of dirt and dead skin are brought to the surface of the wound and allowed to be washed away. Such mechanical cleansing is thought to be more valuable than the antiseptic action. Medicinal hydrogen peroxide contains 3 percent hydrogen peroxide in water.

b. Precautions.

(1) It is dangerous to use hydrogen peroxide in wounds or in body cavities from which the released oxygen cannot freely escape.

(2) Care must be taken to use only medicinal (3 percent) peroxide. Bleaching peroxide, used for the hair, is a 20 percent solution and will cause irritation if used for medicinal purposes. (Bleaching peroxide is not a standard item, but it may be available at some installations.)

(3) Hydrogen peroxide should be stored in tight, light-resistant containers to prevent deterioration.

c. Supply. Hydrogen peroxide solution is available in a 3 percent concentration. It is packaged in one-pound (pint) bottles.

2-9. HEXACHLOROPHENE (SURGICAL DETERGENT AND SURGICAL SOAP)

a. Action and Uses. Hexachlorophene is the active ingredient of surgical soap and surgical detergent (pHisoHex). Surgical detergent cleanses the skin, and hexachlorophene is effective against staphylococci and other gram-positive bacteria. Cumulative antibacterial effect develops with continued use. Surgical detergent is indicated for use as a surgical scrub and a bacteriostatic skin cleanser. It is often used for preoperative cleansing of clients. It may be used to control an outbreak of gram
positive infection in the nursery when ordinary procedures have failed, but only as long as necessary to control the infection.

b. **Precautions.**

   1. The residue of hexachlorophene should not be rinsed from the skin by the subsequent use of alcohol, soaps, or other cleansers which contain no hexachlorophene.

   2. Hexachlorophene products should not be used on burned or denuded skin.

   3. They should not be used as a wet pack, occlusive dressing, or lotion.

   4. They should not be routinely used for prophylactic total body bathing.

   5. They should not be used on any mucous membranes (such as a vaginal pack or tampon).

   6. Persons who evidence sensitivity to the drug (such as the appearance of a skin rash) should discontinue its use. Sensitivity occurs infrequently.

   7. Products containing hexachlorophene are for external use. If a large amount is swallowed, the drug can be harmful.

c. **Supply.**

   1. Surgical detergent contains 3 percent hexachlorophene and is supplied in 5-ounce and 1-gallon containers.

   2. Surgical soap, containing 2 percent hexachlorophene, is available in 1.75-ounce and 4-ounce bars. A liquid surgical soap containing 1 percent hexachlorophene is available in 1-pint and 1-gallon containers.

2-10. **THIMEROSAL**

Thimerosal (Merthiolate) is a general purpose antiseptic or disinfectant depending upon the concentration. It also has mild fungistatic properties. The drug can be used safely as a skin antiseptic on abraded skin in concentrations of 1:1000. Aqueous solutions of the drug in the appropriate concentrations can be used on mucous membranes such as the urethra, the nasal mucosa, and the eye. The tincture is for use on the skin only. Thimerosal tincture should not be used in the presence of open flames, as tinctures are flammable. An occasional person may be sensitive to the mercury contained in the drug, but such a sensitivity is rare. Thimerosal is supplied as an aqueous solution in pint bottles, a tincture in pint bottles, and as a solid in 1/4-ounce quantities.
2-11. DISINFECTANT--GERMICIDAL AND FUNGICIDAL CONCENTRATE (WESCODYNE)

Wescodyne (trade name) is a general purpose germicide, suitable for hand cleansing as well as for disinfecting thermometers and instruments, washing furniture, floors, and equipment. The concentrate must be diluted to make a 75 parts-per-million (ppm) solution. This 75-ppm solution is made by adding 18 ml. of concentrate to 4 liters (1 gallon) of water. The clear, dark amber color of this solution is an indication of its germicidal effectiveness; when the color fades, a fresh solution must be prepared.

2-12. POVIDONE-IODINE

Povidone-iodine (Betadine, Isodine) slowly releases its iodine after it has been applied to a surface. However, a 10 percent solution is equivalent to only 1 percent of available iodine. The attenuated effect is claimed to compensate for the decreased concentration of free iodine. It is effective as an antiseptic. Povidone-iodine may be used to disinfect inanimate objects, but it is not very effective against spores or fungi.

2-13. FORMALDEHYDE SOLUTION (FORMALIN)

Formaldehyde solution (37 percent by weight) is used as a disinfectant and deodorant. It is not only effective against vegetative bacteria and fungi, but also against spores and viruses. A solution of 20 percent formaldehyde and 50 percent ethanol is even more effective.

Section III. OTHER TOPICAL DRUGS

2-14. ALUMINUM ACETATE SOLUTION (BUROW'S SOLUTION)

Aluminum acetate solution is diluted with 10 to 40 parts of water for use as an antiseptic dressing and astringent.

2-15. ZINC OXIDE OINTMENT

Zinc oxide has a mild astringent and antiseptic action and is used in treatment of disorders of the skin, such as impetigo, eczema, ringworm, pruritis, varicose ulcers, and psoriasis. The drug is applied directly to the area affected. Zinc oxide ointment is supplied in 1-ounce and 1-pound containers.

2-16. CALAMINE LOTION, PHENOLATED AND MENTHOLATED

This lotion acts as a mild astringent and antiseptic agent, as described for zinc oxide ointment. In addition, it has a soothing effect upon irritated or itchy skin. The
lotion should be shaken thoroughly before being applied, and it should be patted on the skin area to be treated. Calamine lotion is available in 53-ml (1.8-fl. oz.) and 118-ml (4-fl. oz.) sizes.

2-17. COMPOUND BENZOIN TINCTURE

Compound benzoin tincture is used as a protective agent (demulcent) to alleviate irritation of the skin or mucous membranes. When mixed with glycerin and water, it is used for bedsores, cutaneous ulcers, fissures of the lips or anus, and cracked nipples. On sugar, it may be used for throat and bronchial infection. When it is mixed with boiling water, the vapor may be inhaled as a soothing expectorant for croup and acute laryngitis. Compound benzoin tincture is supplied in 1-pt containers.

2-18. HYDROCORTISONE CREAM

Hydrocortisone cream is used topically to suppress the inflammatory response in numerous skin diseases. The antibiotic neomycin is included in some preparations to protect against bacterial infections that might be favored by this suppression and to clear up infections secondary to the inflammation.

2-19. SODIUM FLUORESCIN APPLICATORS

Sodium fluorescein is an ophthalmic diagnostic aid with which damaged parts of the cornea appear green and foreign bodies are surrounded by a green ring. A yellow hue indicates loss of substance on the conjunctiva. Merely dipping the paper strips into the lacrimal fluid releases an adequate amount of this highly soluble drug.

Section IV. ANTACIDS

2-20. INTRODUCTION

Antacids are agents used to neutralize excess hydrochloric acid in the stomach, especially to treat ulcers. Antacids are often abused; many people unwisely take antacids at the first sign of gastrointestinal (GI) discomfort.

a. Systemic Antacids. Systemic antacids are those which are readily absorbed from the GI tract and thus produce changes throughout the body. Prolonged use or overdose of systemic antacids, such as sodium bicarbonate, may injure the health. For example, a predisposition to kidney stones may result. Systemic antacids can cause systemic alkalosis, a potentially dangerous change in the acid-base balance of the body in which the base predominates.

b. Nonsystemic Antacids. Fortunately, not all antacids are systemic. A nonsystemic antacid contains a cation, for example, aluminum, calcium, or magnesium,
which is not easily absorbed by the lining of the stomach. The accompanying anion, for example, a hydroxide or carbonate ion, helps neutralize the extra acid concentration in the stomach. The cations from the antacid react with anions in a portion of the small intestine called the jejunum, where the pH is basic, and the compound thus formed may produce additional antacid effects in the small intestine.

2-21. SODIUM BICARBONATE

a. **Action and Uses.** Sodium bicarbonate, a systemic antacid, may be used to combat systemic acidosis or render the urine alkaline. As a gastric antacid, it has several disadvantages: its duration of action is short; its reaction with hydrochloric acid produces carbon dioxide, which may cause stomach pains or exacerbate an ulcer, and it will produce systemic alkalosis.

b. **Usual Dose.** The usual dose is 300 mg to 2 grams, 1 to 4 times daily.

c. **Supply.** Sodium bicarbonate is supplied as 600-mg tablets and as a powder. It is also available as a tablet combined with charcoal and peppermint.

2-22. ALUMINUM HYDROXIDE GEL

a. **Action and Uses.** Aluminum hydroxide (Amphojel) is not an adsorbent, but it does act chemically to neutralize gastric acidity. It is a nonsystemic antacid.

b. **Administration.** The drug is usually given orally 1 hour after meals or when needed. The average single dose of tablets is 0.6 gm (2 tablets). The tablets are chewed thoroughly before being swallowed. The usual dose of the liquid is 5 to 15 ml. The bottle is shaken thoroughly before the drug is poured.

c. **Untoward Effects.** Constipation occurs in some people who take aluminum compounds. However, there are no systemic effects, since the drug is not absorbed from the gastrointestinal tract.

d. **Cautions and Contraindications.** The liquid preparation should be kept from freezing.

e. **Supply.** The drug is supplied as a liquid suspension (320mg/5ml) in one-pint bottles and as 300 mg and 600 mg flavored tablets.

2-23. ALUMINUM HYDROXIDE GEL AND MAGNESIUM HYDROXIDE

a. **Action and Uses.** Magnesium hydroxide is an antacid that acts both by chemically reacting with stomach acid and by adsorbing it. This preparation is used to treat hyperacidity and ulcers of the stomach. The drug is not adsorbed from the intestinal tract. A preparation of magnesium hydroxide combined with aluminum
hydroxide gel (Gelusil) is available. The untoward effect of constipation that may occur with the administration of aluminum compounds is generally offset by the laxative action of the magnesium. Such a combined preparation is standard for the Army.

b. **Administration.** The drug is given orally in a usual dosage of 2 tablets or 5 to 15 ml. of the liquid preparation four times a day. Greater dosages are sometimes prescribed. The tablets should be chewed thoroughly and the liquid suspension shaken as was described for aluminum hydroxide gel.

c. **Untoward Effects.** Slight diarrhea may result due to local irritation of the bowel by the magnesium salt. Since the drug is not absorbed, no systemic side effects are seen.

d. **Cautions and Contraindications.** The liquid preparation should not be allowed to freeze, and the tablets are subject to deterioration as noted on the manufacturer's label.

e. **Supply.** This drug is supplied in both liquid and tablet form.

2-24. **MILK OF MAGNESIA**

Preparations containing magnesium hydroxide, such as milk of magnesia, are fairly effective in reducing gastric acidity, but they may also cause diarrhea. For this reason, magnesium hydroxide is often used also as a cathartic by increasing the dosage.

2-25. **ALUMINUM HYDROXIDE AND MAGNESIUM HYDROXIDE**

Aluminum hydroxide and magnesium hydroxide are both nonsystemic antacids. They are included together in many familiar over-the-counter preparations (Maalox, Mylanta, Aludrox, Bidrox, Wingel, Creamalin, and so forth). The constipating effect of the aluminum hydroxide is counteracted by the laxative effect of the magnesium hydroxide.

2-26. **CHOICE OF AN ANTACID**

Since antacids are available without a prescription, many individuals develop their own preference for a particular antacid. This choice is logically based on flavor, texture, dosage form, and laxative or constipating effects. It is important to choose an antacid that does not adversely affect the consistency or frequency of bowel movements or to train the client to use more than one antacid as needed. The precaution against systemic antacids, such as sodium bicarbonate, is also important.
Section V. CATHARTICS

2-27. INTRODUCTION

a. Cathartics, agents that promote evacuation of the bowels, are frequently self-prescribed and misused. The occasions when cathartics are therapeutically useful are infrequent. However, they are overused due to the misconception that a periodic cleansing of the bowels is necessary for good health, that a regular frequency of bowel movements must be maintained, or to a neurotic preoccupation with bowel movements.

b. Catharsis is naturally followed by a period in which there are no bowel movements. The individual may construe this as an indication that a cathartic is needed once again. This may lead to the formation of the "cathartic habit," in which the individual depends upon a cathartic again and again to induce a bowel movement.

c. Constipation occurs more frequently among older people, due in part to inactivity, dietary factors, and inadequate water intake. However, their attitudes, formed when "regular bowel habits" were viewed as a key to good health, also play an important part.

2-28. INDICATIONS AND CONTRAINDICATIONS FOR CATHARTICS

a. Cathartics may be used for specific situations of brief duration. The following are a few examples of situations in which cathartics may be used:

(1) To relieve constipation caused by the use of opiate drugs.

(2) To soften the stool, thereby reducing irritation of hemorrhoids or following hemorrhoidectomy.

(3) To avoid straining in clients confined to bed for an acute illness such as myocardial infarction.

(4) To prepare an individual for proctoscopy.

b. Milk cathartics such as the hydrophilic colloids may be useful for bedridden clients who become constipated because of lack of activity. However, people who are habitually constipated should generally not be given cathartics. Cathartics are useful for softening the stool of clients with hemorrhoids, diverticulitis, hernias, or cardiac disease. Castor oil is useful in treating some clients for poisoning and in preparing others for special examinations.
c. Cathartics should **NOT** be used when the client has an undiagnosed intestinal pain such as cramps, nausea, or vomiting; a cathartic may cause an inflamed appendix to rupture. Nor should cathartics be used when the GI tract is mechanically obstructed; the intestine may rupture. Pregnant clients should ordinarily not be given cathartics.

### 2-29. STIMULANT (IRRITANT) CATHARTICS

Stimulant cathartics function either by irritating the mucous membranes of the intestines or directly stimulating the nerves and muscles concerned with bowel movement. Since individual reactions to stimulant cathartics vary, the usual dose may in some clients cause excessively severe effects, including diarrhea and intestinal cramps, and in other clients have no effectiveness.

a. Aromatic cascara fluidextract is a mild, effective stimulant laxative that takes about 8 hours to take effect, since it acts on the colon rather than the small intestines. Another stimulant laxative containing cascara sagrada is cascara tablets. After about 8 hours, these preparations produce a single evacuation of the bowels.

b. Bisacodyl (Dulcolax) is another stimulant cathartic that acts primarily on the colon. Bisacodyl cleanses the bowel thoroughly enough to obviate the need for an enema.

c. The one stimulant cathartic that stimulates the small intestine is castor oil. Castor oil is not used routinely but only when prompt, thorough evacuation of the bowels is desired, such as for a special examination.

### 2-30. SALINE CATHARTICS

Saline cathartics, salts which draw water into the GI tract and thereby increase the bulk of the intestinal contents, usually take about 3 to 6 hours to produce a bowel evacuation, which is watery or fluid-like. Saline cathartics, unless administered with sufficient amounts of water, tend to dehydrate the body and are sometimes used for this purpose alone. In order to avoid magnesium poisoning, cathartics containing magnesium compounds must never be given to clients with impaired kidney function. Cathartics containing sodium compounds should not be administered to clients with congestive heart disease.

a. A mild saline cathartic is milk of magnesia, which contains magnesium hydroxide and which is also used as an antacid. The cathartic dose is 15-30 ml.

b. Magnesium sulfate (epsom salt) is a widely used saline cathartic. Its main disadvantage is its bitter taste, which can be masked to some extent by mixing with ice water or orange juice. The usual dose is 15 grams.
2-31. FECAL SOFTENERS

During prolonged bed rest and dietary change, it may be necessary to prevent
dessication, hardening, or impaction of feces within the colon and facilitate defecation
by maintaining a soft stool. Fecal softeners include agents that mix with the intestinal
contents and others which serve as emulsifying agents.

a. Mineral oil (heavy liquid petrolatum), also known as an emollient cathartic,
softens the fecal material by becoming emulsified with it. It is probably harmless when
taken on an occasional basis. However, if it is taken chronically, it may impair the
appetite and interfere with the absorption of fat-soluble vitamins. The usual dose is 15
ml.

b. Dioctyl calcium sulfosuccinate (Surfak) is an emulsifying ("surface-acting" or
"wetting") agent that probably causes the fats and water in the intestine to mix and form
a soft stool. It should not be used with mineral oil since it might facilitate absorption of
mineral oil into the body. It is widely used in persons who should not strain at stool,
such as those with hemorrhoids, and in older persons to avoid constipation. The usual
dose is 240 mg.

c. Dioctyl sodium sulfosuccinate (Colace) lowers surface tension and is thought
to soften the contents of the intestines by causing the contents to absorb water. It
should not be used with mineral oil since it might facilitate absorption of mineral oil into
the body.

d. Psyllium dycrophilic mucilloid (Metamucil) is a light-colored, slightly granular
powder with only a slight acid taste. It consists of the mucilaginous portion of blond
psyllium seeds. It acts as a fecal softener, is demulcent, nonirritating, and may be used
over long periods. Not only does it increase intestinal activity, but it has psychological
value for some clients in that it increases the bulk of the stool. The usual dose is 4-7
grams (1 rounded teaspoonful), 1-3 times daily, in a glass of liquid followed by another
glass of liquid.

Section VI. ANTIDIARRHEALS

2-32. KAOLIN MIXTURE WITH PECTIN

Kaolin is an adsorbent; pectin is considered a protective. Pectin is capable of
creating a viscous colloidal solution in water. Kaolin mixture with pectin may provide
relief from mild diarrhea, especially among children. However, it is of little use in severe
diarrhea such as that associated with ulcerative colitis. The usual adult dose is 4 to 8
tablespoons after each loose bowel movement.
2-33. DIPHENOXYLATE HYDROCHLORIDE AND ATROPINE SULFATE TABLETS

The trade name for diphenoxylate hydrochloride and atropine sulfate is Lomotil. Diphenoxylate is a synthetic drug similar to the narcotic meperidine (Demerol), but diphenoxylate is more highly constipating. Since diphenoxylate cannot be taken by the parenteral route, and since it is mixed with atropine, it is not as likely to be abused as other narcotics. There is no evidence of addiction liability in therapeutic doses. Lomotil is used in the management of diarrhea due to gastroenteritis, functional hypermotility, ulcerative colitis, drugs, and food poisoning. Each Lomotil tablet contains 2.5 mg of diphenoxylate hydrochloride and 0.025 mg of atropine sulfate. The usual dose for initial control is two tablets, 4 times daily. This may be decreased after control has been established.

2-34. PAREGORIC

Paregoric (camphorated opium tincture) contains 0.4 percent to 1 percent opium. In the Army it is subject to the same controls as ethyl alcohol and "hard" narcotics (this is indicated in the Federal Supply Catalog by a note R or Q). Opium induces spasm of the colon, increases tone, and prevents propulsive movement. Therefore, paregoric is used as an antidiarrheal agent and also as a weak agent for coughing, abdominal pains, and nausea. The usual dose is 5-10 ml, one to four times daily.

Section VII. RESPIRATORY DRUGS

2-35. ANTITUSSIVES

An antitussive is a drug used to suppress coughing. We are all familiar with the traditional antitussive remedies, such as hard candies, cough drops, and lozenges. By stimulating the flow of saliva, these agents help reduce the irritation which causes a cough. In this paragraph, however, we will discuss only those antitussives that produce a significant part of their effect after being absorbed into the body tissues (for example, from the GI tract). Many of these act directly on the nerve connections in the medulla which are responsible for the cough reflex.

a. Narcotics. The narcotic antitussives are very effective and have been in use for some time. The fact that they are narcotics is not normally a decisive contraindication for their use. However, they should not be used in the treatment of a chronic (prolonged) cough or the cough of a client who tends to become psychologically dependent on drugs. Among the cough remedies, it is possible to become addicted to codeine (or its salts, such as codeine sulfate or codeine phosphate). This frequently used antitussive will be discussed in a later section.
b. Other Antitussives. Other antitussives include the following:

   (1) Dextromethorphan hydrobromide. This antitussive is a morphine derivative, but it has few of the observable properties of a narcotic. No cases of addiction or severe central nervous system depression have been reported with it.

   (2) Benzonatate (Tessalon). This drug has an effect on the mucous membranes of the respiratory system similar to that of a local anesthetic. In addition, like the other antitussives discussed, it has an effect on the nerve connections in the medulla concerned with the cough reflex. It does not appear to be as effective clinically as codeine.

2-36. EXPECTORANTS

Expectorants are drugs that increase the volume of secretions from the mucous membranes of the respiratory tract below the epiglottis. They also help liquefy the mucous secretions, which are subsequently spat out by the client. Expectorants are useful in treating coughs. Since some of the difficulty of asthma arises from obstruction of breathing by mucus, expectorants are sometimes useful in treating asthma.

a. Potassium Iodide. Potassium iodide is one of the most effective expectorants. Mild side effects, including weeping of the eyes and nose, sometimes occur, but serious side effects are rare. Potassium iodide is also used to treat iodine deficiencies.

b. Ipecac Syrup. This preparation may be used as an expectorant, but the dose is lower than when it is used as an emetic. It is useful when the client has unpleasant reactions to potassium iodide.

c. Ammonium Chloride. As is part of the effect of potassium iodide, the expectorant effect of ammonium chloride is due to its irritation of the stomach lining. Large doses may cause nausea.

d. Guaiifenesin. In large doses, this is an effective expectorant. It is an ingredient in many cough syrups.

e. Terpin Hydrate. This drug can be used as an expectorant but terpin hydrate elixir, NF, does not contain enough terpin hydrate to make the elixir a useful expectorant.
2-37.  INTRODUCTION

Pain can be abolished by inducing unconsciousness with the general anesthetics or by preventing painful impulses from reaching the cortex by blocking the sensory nerve impulses from a localized area. This loss of feeling and sensation to a localized portion of the body is known as local anesthesia. It is accomplished by using local anesthetic drugs. Local anesthetics can be broken down into two main categories; those that lower skin temperature and those that have a specific effect on sensory nerves.

a.  Skin Refrigerants.  The local anesthetics that create anesthesia through the production of cold are liquids of low boiling point. Since ethyl chloride evaporates from the skin rapidly, it quickly reduces skin temperature and thereby produces its anesthetic action. Dichlorotetrafluoroethane also belongs to this group.

b.  Specifics.  The specific local anesthetics are those drugs that have a specific effect on the sensory nerve or on nerve endings. This category can be further subdivided into drugs of the water-soluble group that are intended for injection, such as procaine hydrochloride, and those that are only slightly water-soluble which are intended for topical use, such as benzocaine. Local anesthetics are detoxified by the liver. In the later discussion of specific local anesthetics, notice that almost all the names end in "caine." When you see a drug name with this suffix, you should immediately recognize it as a probable local anesthetic.

2-38.  METHODS OF ADMINISTRATION

The ways in which local anesthetic agents may be applied so that they will produce their anesthetizing action are as follows:

a.  Topical application to the skin or mucous membrane may be used.

b.  The drug may be infiltrated (injected) into the tissue, thus anesthetizing adjacent nerves.

c.  The drug may be injected into or around a nerve trunk, producing regional anesthesia (the region of the body supplied by the nerve trunk is anesthetized).

d.  The drug may be introduced into the spinal canal (spinal block anesthesia), or at certain sites around the spinal canal (such as peridural or caudal anesthesia). Use of this method results in a more extensive area of anesthesia than is possible with the other methods above.
2-39. OVERDOSAGE TOXICITY

All local anesthetic agents are toxic to some degree. Therefore, the smallest amount of anesthetic solution compatible with successful anesthesia should be used. The toxicity of local anesthetic agents depends not only upon the strength of the solution and the total dose given, but also upon the rate of absorption (rapid absorption of an agent increases its toxicity). As all local anesthetic agents are potentially toxic, it is imperative that anyone using them be familiar with, and have the facilities for the treatment of overdosage toxicity and true allergic reactions. However, true allergic reactions occur infrequently.

a. Symptoms of Overdosage Toxicity. The symptoms may begin with brief or persistent central nervous system (CNS) stimulation, followed by CNS and cardiovascular depression, or there may be depression without apparent prior CNS stimulation.

(1) Early CNS stimulation. This stage is characterized by anxiety, nausea, slightly lowered pulse rate, slightly elevated blood pressure, increased respiratory rate and depth, and pale, moist skin.

(2) Profound CNS stimulation. With greater CNS stimulation, there may be muscular twitching leading to convulsions. Blood pressure and pulse rate rise. Breathing may be rapid, shallow, and less effective even between convulsions.

(3) Depression and shock. The client may go into depression and shock due to depression of the medulla, vasodilation, and postconvulsive depression. This state may involve areflexia (absence of reflexes), coma, extreme hypotension, and respiratory failure.

b. Treatment. Oxygen and assisted respiration help the client to tolerate the convulsive period. Shock is treated as any other form of shock, but the need for assisted respiration is much greater.

2-40. PROCAINE HYDROCHLORIDE

a. Action and Uses. Procaine hydrochloride (Novocaine Hydrochloride) is an effective, local anesthetic when given by injection. It is not useful as a topical anesthetic because of its poor penetrating power but is used for infiltration, nerve block, peridural, and spinal anesthesia. Generally, procaine is combined with epinephrine hydrochloride, which delays absorption, prolongs anesthesia, reduces toxic effects, and promotes hemostasis. In addition to its use as a local anesthetic, procaine can also be used intravenously, in special cases (with great caution), as an analgesic in cases of burn, fracture, or trauma.
b. **Administration.** Procaine solutions of 0.25 percent to 0.5 percent, often combined with epinephrine 1:50,000, are used for infiltration anesthesia. For nerve block, a 1 percent to 2 percent solution is used. To produce spinal anesthesia, a dosage up to 150 mg may be used; the actual dosage varies with the technique used. The onset of surgical anesthesia requires 5 to 15 minutes and the duration is 45 to 90 minutes.

c. **Untoward Effects.** Procaine is one of the least toxic of the injectable local anesthetics. However, untoward reactions to the drug occur occasionally and may be manifested as discussed previously. Treatment of reactions has also been discussed in paragraph 2-39b.

d. **Cautions and Contraindications.** Care must be taken to have available facilities for combating overdosage. If symptoms of overdosage appear while the drug is being given, its administration should be stopped immediately. Procaine should not be administered to people allergic to it. An intradermal skin test should be administered to any person suspected of being allergic to the drug. (NOTE: An intradermal skin test will yield information concerning allergy only. It will not indicate a person's susceptibility to toxic effects.) The use of procaine is contraindicated during therapy with sulfonamide drugs because these have an antagonistic effect.

e. **Supply.** Procaine hydrochloride is supplied in 100 mg and 1 gram quantities of sterile crystals in ampules and as a parenteral 1 percent solution in 2 ml ampules.

2-41. **LIDOCAINE HYDROCHLORIDE**

a. **Actions.** Lidocaine hydrochloride (Xylocaine) is a potent local anesthetic agent which produces a prompt (5 to 15 minutes for the onset of operating analgesia), intense, and extensive anesthesia. Unlike procaine, lidocaine is effective when applied topically. Its anesthetic potency and area of anesthesia are greater than those of procaine hydrochloride. At a concentration of 0.5 percent, lidocaine has approximately the same toxicity as does procaine, but as the concentration of lidocaine is increased, its toxicity exceeds that of procaine. Moreover, lidocaine diffuses rapidly, a property that may increase the incidence of systemic reactions. Lidocaine is dissimilar to procaine in its chemical structure and, hence, may be used for persons sensitive to procaine. In addition, it produces effective anesthesia without the use of epinephrine, and so it may be used for persons allergic to epinephrine.

b. **Uses of Lidocaine Hydrochloride.** This agent is useful for topical, infiltration, and nerve block anesthesia. Lidocaine is also used for peridural block anesthesia. Its effect lasts from 1 1/2 to 3 hours with low dosage. This agent is often used in individuals sensitive to procaine. The drug is administered according to the type of local anesthesia to be induced. The onset of mucosal anesthesia may require 5 to 15 minutes, and depending on the procedure and the amount used, the anesthesia may persist for 30 minutes. The jelly form of the drug may be applied by means of cotton pledgets or applicators to the mucous membrane of the oral cavity and the urethra. An
ointment containing lidocaine is used topically in treatment of burns and abrasions, as well as for minor dermatological, anorectal, and otological conditions.

c. **Administration.** Lidocaine solutions of 0.5 percent, often combined with epinephrine, are usually administered for infiltration anesthesia. Solutions of 1 percent to 2 percent are used to produce nerve block. For topical anesthesia, 2 percent to 5 percent preparations are used. A 1 percent solution is generally used for peridural anesthesia.

d. **Untoward Effects.** Central nervous system stimulation followed by depression may occur as with the use of procaine. In addition, a drowsy, sleepy state may occur as an aftereffect of the use of lidocaine.

e. **Cautions and Contraindications.** Care should be taken not to administer the drug intravenously. The commercially prepared lidocaine-epinephrine solution should not be withdrawn ahead of time. This preparation should be injected immediately upon its withdrawal into a syringe. Lidocaine preparations deteriorate at or before 36 months from the date on the package, and they are damaged by freezing.

f. **Supply.** Lidocaine hydrochloride is supplied in 0.5 percent to 2 percent solutions, with and without epinephrine, and as a 2 percent jelly. Lidocaine is also available as a 5 percent ointment.

**2-42. DIBUCAINE OINTMENT**

a. **Action and Uses.** Dibucaine (Nupercaine) is the most potent, most toxic, and the longest acting of the local anesthetic agents available as standard items. It is about 15 times as potent and as toxic as procaine; its anesthetic action lasts about 3 times as long as that of procaine. The drug is employed topically for the relief of pain associated with conditions such as sunburn and hemorrhoids.

b. **Administration.** For topical application a 1 percent ointment is used, and it is applied to the painful surface.

c. **Cautions and Contraindications.** Caution should be exercised in the use of this drug because of its potential toxicity.

d. **Supply.** Dibucaine is supplied as a 1 percent ointment with rectal applicator.

**2-43. TETRACAINE**

Tetracaine hydrochloride (Pontocaine Hydrochloride) is an all-purpose anesthetic with a longer duration of action than procaine. Found in field sets are tetracaine hydrochloride ophthalmic solution (0.5 percent) and tetracaine ointment (0.5 percent).
2-44. EUGENOL

   a. **Action and Uses.** Eugenol (oil of cloves) is a pale yellow liquid obtained from clove oil. It is used as a surface anesthetic and an antiseptic. Its chief use is in the temporary relief of toothache and in the disinfection of root canals.

   b. **Supply.** The drug is supplied in 1-ounce bottles.

2-45. DICHLOROTETRAFLUOROETHANE ANESTHETIC

   This agent is a skin refrigerant. It is included in the field dispensary medical instrument and supply set. The loss of sensation that results when this agent is sprayed onto the skin enables minor surgical procedures to be done with relative freedom from pain. Its duration of action is less than 1 minute. The drug is supplied in an 8-ounce aerosol dispenser.

   Continue with Exercises

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EXERCISES, LESSON 2

INSTRUCTIONS. Answer the following exercises by marking the lettered response that best answers the question or completes the incomplete statement.

After you have completed all of these 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. A drug that is compressed into a small disk is a:
   a. Pill.
   b. Capsule.
   c. Tablet.
   d. Suppository.

2. When a standard pharmacy reference lists the usual adult dose of a particular drug, the dose is specifically appropriate for a normal adult whose weight is:
   a. 120-lbs.
   b. 150-lbs.
   c. 180-lbs.
   d. 210-lbs.

3. A client who has been taking a drug discovers one evening that the customary dose is no longer effective. He now requires a larger dose. This reaction, due to the chronic use of the drug, is called:
   a. Addiction.
   b. Dependence.
   c. Habituation.
   d. Tolerance.
4. Some drugs remain within the body for extended periods. In order to prevent the accumulation of excessive amounts of such a drug in the body, it is often necessary for the physician to prescribe:

   a. Any drug which is excreted faster.
   b. Great volumes of water to free the body of the accumulated drug.
   c. Smaller doses later in therapy.
   d. Special drugs to counteract the effects of the accumulated drug.

5. What is the function of a bacteriostat?
   a. The destruction of bacteria.
   b. The inhibition of bacteria.
   c. The isolation of bacteria.
   d. Microscopic examination of bacteria.

6. A preparation that kills pathogenic bacteria but does not necessarily kill their spores is called:
   a. An antiseptic.
   b. A disinfectant.
   c. A pediculicide.
   d. A scabicide.

7. Pediculicides are agents used to destroy:
   a. Amoebas.
   b. Fungi.
   c. Lice.
   d. Protozoa.
8. Ethyl alcohol should not be used in a stronger concentration than that needed for use as an antiseptic agent because stronger concentrations:
   a. Produce burns.
   b. Result in spore formation.
   c. Freeze tissue.
   d. Bleach clothing.

9. An alcohol that should NOT be given internally is:
   a. Alcohol, USP.
   b. Ethyl alcohol.
   c. Ethanol.
   d. Isopropyl alcohol.

10. When an alcohol solution or a Benzalkonium Chloride Solution is used for the disinfection of metal instruments, an agent should be put into the solution to protect the instruments from:
    a. Rust.
    b. Pathogenic bacteria.
    c. Discoloration.
    d. Spores.

11. The effectiveness of Benzalkonium chloride is radically reduced by the presence of even a very small amount of:
    a. Acetone.
    b. Alcohol.
    c. Soap.
    d. Water.
12. In the concentration in which it is supplied, how much Benzalkonium Chloride Solution is required to make 4000 ml of a 1:1000 solution?
   a. 10 ml  
   b. 20 ml  
   c. 40 ml  
   d. 100 ml

13. The antiseptic action of Hydrogen Peroxide is due to the release of:
   a. Iodine.  
   b. Oxygen.  
   c. Histamine.  
   d. Carbon dioxide.

14. What concentration of hydrogen peroxide is for medicinal use?
   a. 3 percent  
   b. 10 percent  
   c. 20 percent  
   d. 50 percent

15. The active ingredient in surgical detergent is:
   a. Benzalkonium chloride.  
   b. Hydrogen peroxide.  
   c. Hexachlorophene.  
   d. Thimerosal.
16. Residue of Hexachlorophene should not be rinsed from the skin because the residue:
   a. Continues to act against bacteria.
   b. Forms a mechanical barrier against bacteria.
   c. Protects the skin from discoloration.
   d. Makes further washing unnecessary.

17. A drug that is contraindicated for persons with ulcers is:
   a. Aluminum hydroxide gel.
   b. Magnesium trisilicate.
   c. Sodium bicarbonate.
   d. Belladonna.

18. A normal bowel frequency may be once or twice a day for one individual, once or twice a week for another individual. However, many people take drugs to produce bowel movements, often inadvisably. These drugs are called:
   a. Adsorbents.
   b. Cathartics.
   c. Demulcents.
   d. Digestants.

19. Magnesium Sulfate should NOT be given to clients with which of the following conditions?
   a. Edema.
   b. Impaired kidney function.
   c. Congestive heart disease.
   d. Impaired function of the lungs.
20. A cathartic that may interfere with the absorption of certain vitamins is:
   a. Magnesium sulfate.
   b. Cascara sagrada.
   c. Mineral oil.
   d. Dioctyl calcium sulfosuccinate.

21. Which of the following is the most desirable cathartic to give a person with bleeding hemorrhoids?
   a. Bisacodyl.
   b. Castor oil.
   c. Magnesium sulfate.
   d. Dioctyl calcium sulfosuccinate.

22. Which of the following drugs is effective in the control of diarrhea?
   a. Diphenoxylate.
   b. Dextromethorphan.
   c. Sodium bicarbonate.
   d. Magnesium hydroxide.

23. Which of the following is an expectorant which is also used to relieve deficiencies of iodine?
   a. Iodine.
   b. Ipecac.
   c. Guaiifenesin.
   d. Potassium iodide.
24. Which of the following local anesthetic agents is not effective if applied topically?
   a. Lidocaine.
   b. Procaine.
   c. Dibucaine.
   d. Eugenol.

25. A drug used for the relief of pain associated with hemorrhoids is:
   a. Procaine.
   b. Eugenol.
   c. Dibucaine.
   d. Dichlorotetrafluoroethane.

*Check Your Answers on Next Page*
SOLUTIONS TO EXERCISES, LESSON 2

1. c (para 2-2b(3))
2. b (para 2-4)
3. d (para 2-4i)
4. c (para 2-4q)
5. b (para 2-5d)
6. b (para 2-5e)
7. c (para 2-5h)
8. b (para 2-6b)
9. d (para 2-6c(2), d(3))
10. a (paras 2-6d(1); 2-7b(1))
11. c (para 2-7b(2))
12. c (para 2-7c(1)) 10 ml of a 10 percent concentration makes 1000 ml of a 1:1000 solution.

\[
\begin{align*}
\text{IF} & \quad \frac{10 \text{ ml}}{1000 \text{ ml}} \quad \text{THEN} \quad \frac{X \text{ ml}}{4000 \text{ ml}} \\
\frac{1000X}{4000} & = \frac{40,000}{1,000} \\
X & = 40 \text{ ml}
\end{align*}
\]

13. b (para 2-8a)
14. a (para 2-8a)
15. c (para 2-9a)
16. a (para 2-9a, b(1))
17. c (para 2-21a)
18. b (para 2-27a)
19. b (para 2-30)
20. c (para 2-31a)
21. d (para 2-31b)
22. a (para 2-33)
23. d (para 2-36a)
24. b (para 2-40a)
25. c (para 2-42a)

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