CHAPTER 1 Introduction to Pharmacology

Chapter Review Exercises

QUIZ YOURSELF

1. a. The word *pharmacology* comes from the Greek word *pharmakon*, which means *drug* or *medicine*. Pharmacology is the study of drugs and their interaction with living organisms.

   b. The Latin word *medicina* means "remedy or cure," and it is where our words *medicine* and *medication* come from. *Medicine* refers to a drug that is administered for its value as a preventive, diagnostic, or therapeutic agent.

   c. The word *drug* is derived from the Dutch word *droog*, which means "dry" and refers to the use of dried herbs and plants as the first medicines. A drug can be thought of as any nonfood chemical substance that affects the mind or the body.

2. Prevent disease. Drugs taken before travel to prevent motion sickness OR vaccinations to prevent diseases OR contraceptive drugs to prevent pregnancy.

   Diagnose disease. Contrast dye used in x-ray procedures OR drugs to increase the heart rate of patients who cannot do an exercise stress test.

   Treat disease. Analgesic drugs to treat pain and inflammation OR drugs to lower the cholesterol level in the blood OR antibiotic drugs to kill an infection.

3. The word *drug* can be used interchangeably with the words *medicine* or *medication,* but the word *drug* can also refer to a chemical substance that does not have any legitimate use (example: an illegal or street drug).

4. CD means controlled delivery.

   DEA means Drug Enforcement Administration.

   DS means double strength.

   FDA means Food and Drug Administration.

   LA means long acting.

   OTC means over the counter.

   Rx means prescription.

   

   means a controlled substance, Schedule IV.

5. a. digoxin (Lanoxin) for congestive heart failure

   b. ziconotide (Prialt) for pain

c. vitamin C dietary supplement

d. morphine for pain

e. penicillin, an antibiotic drug

f. vincristine, an anticancer drug

g. auranofin (Ridaura) for rheumatoid arthritis

h. topical coal tar drugs (Cutar, Neutrogena T/Gel) for psoriasis

i. capsaicin (Zostrix) for pain

j. exenatide (Byetta) for type 2 diabetes mellitus

k. Premarin for menopause

l. aspirin for pain and inflammation

m. metformin, an antidiabetic drug

n. paclitaxel, an anticancer drug

o. galantamine (Razadyne) for Alzheimer disease

6. Frogs' bile, sour milk, lizards' blood, pigs' teeth, sugar cakes, dirt, spiders' webs, hippopotamus' oil, toads' eyelids.

7. The Egyptians applied moldy bread to abrasions, a practice that actually had some therapeutic basis as, many centuries later, the antibiotic drug penicillin was extracted from a mold. The Egyptians also used garlic to treat heart disease and tumors.

8. Opium, heroin, or cocaine

9. Food and Drug Administration

10. A prescription drug is a drug that can only be given to persons who are under the care of a licensed healthcare provider, such as a physician, physician's assistant, nurse practitioner, dentist, etc.).

    An over-the-counter (OTC) drug is defined as one that can be purchased without a prescription and is generally considered safe for consumers to use if the label's directions are followed carefully and all warnings are heeded.

    A Schedule drug is a prescription drug that has the potential for abuse or addiction.

    A designer drug is synthesized in an unauthorized laboratory for the purpose of creating a substance with a chemical structure that is similar enough to a Schedule I or Schedule II drug that it produces the same effect and can be sold illegally for a profit.

11. The Controlled Substances Act divides potentially addictive drugs into five categories or Schedules based on their potential for physical and psychological dependence.

12. The purpose of the Orphan Drug Act was to facilitate the development of new drugs used to treat rare diseases. .It provides financial incentives to a drug company, including federal grants, a tax credit, and a streamlined process for obtaining FDA approval for the drug.

13. Rx only

14. Dextromethorphan to relieve coughing. Levothyroxine as a replacement for thyroid hormone.

15. A pharmacy is a site where drugs are received from a drug company, stored as inventory, and then dispensed to patients or consumers to fill an order or a prescription.

    Pharmacogenetics is the knowledge of how the genetic makeup of different people affects their response to drugs.

    Pharmacogenomics is the use of information from the patient's personal human genome.

    Recombinant DNA technology (rDNA) is a process that uses enzymes to cut apart segments of DNA. These segments are then transferred from the host organism into a recipient organism.

16. A pharmacy technician is an assistant, who performs pharmacy-related tasks under the direction of the pharmacist. These include filling prescriptions, labeling prescription bottles, stocking shelves, and giving instructions to customers.

17. Brand name, proprietary name

True or False

1. F
2. T
3. F
4. T

Fill in the Blank

1. compounding
2. ambulatory
3. PharmD
4. isomer
5. twice
6. narcotic
7. I
8. designer

CLINICAL APPLICATIONS

1. a. Schedule II
   b. Over the counter
   c. Prescription

d. Schedule IV
e. Dietary supplement
f. Over the counter
g. Schedule II
h. Prescription
i. Prescription
j. Schedule II
k. Dietary (herbal) supplement
l. Prescription
m. Schedule IV
n. Schedule II
o. Prescription
p. Over the counter
q. Schedule IV
r. Schedule V

2. By recombinant DNA technology (rDNA)
3. a. aripiprazole (Abilify)
   b. atenolol
   c. potassium and chloride (Klor-Con)
   d. fluoxetine
   e. eszopiclone (Lunesta)
   f. esomeprazole (Nexium)
   g. alprazolam
   h. rosuvastatin (Crestor)
   i. sildenafil (Viagra)

CRITICAL-THINKING QUESTIONS

1. Monoclonal antibody drugs are produced by identifying a specific antigen or substance produced by the cancer cell. The antigen or substance is injected into a mouse. The mouse's B lymphocytes then begin to produce antibodies to that antigen or substance. Then the cancer cell and the mouse's B lymphocyte are fused to produce a hybrid cell that grows rapidly (like a cancer cell) but also produces antibodies against that particular type of cancer. The hybrid cells are then grown in enough quantity to make a drug.
2. (a) A prescription drug can be reclassified as an OTC drug if the following criteria are met:

   - The indication for the drug's OTC use is similar to its use as a prescription drug.
   - The patient can easily diagnose and monitor his or her own condition when using the OTC drug.
   - The OTC drug has a low rate of side effects/toxicity, and a low potential for abuse.
   - Use of the OTC drug does not require the patient to have any special monitoring or ongoing laboratory tests.

   (b) Student's answer can be either a vote for or a vote against with an explanation as to why.

Chapter 1

Introduction to Pharmacology

This section contains the following helpful information for instructors.

1. Teaching Strategies
2. Pharmacology Insights
3. Testing Methods and Materials

1. Teaching Strategies

Read aloud the chapter Table of Contents and the learning objectives (or instruct online students to read them themselves). If you plan to administer a chapter test after students study this chapter, specifically state this as you introduce the chapter. If you plan to administer a chapter spelling test and/or chapter pronunciation test, specifically state this, and tell students how this will be accomplished.

For Chapter 1, stress these broad concepts at the beginning of the lecture or online presentation.

- The three broad medical uses for drugs
- How drugs have been used from the earliest times to the present
- How sources of new drugs have changed, but how original sources are still in use
- The differences between prescription, over-the-counter, schedule, and orphan drugs.

2. Pharmacology Insights

Include this additional updated information in your lecture and in your online course for Chapter 1.

Understanding the origin of pharmacology words helps students remember their meanings. The practice of medicine in ancient Rome and Greece led to the development of different descriptive medical terms in both the Latin and Greek languages. The same holds true for pharmacology words. In addition, some pharmacology words come from other languages (Dutch, French). The classical Greek word *pharmakon* from which we get the word *pharmacology* had three meanings: "charm," "poison," and "remedy." Primitive healers used natural substances of animal, vegetable, and mineral origin with confidence in their power to cure. Now we know that some of those cures took place through the power of suggestion, a potent force still recognized today as the "placebo effect." Some patients were cured but others were killed by the very remedies that were intended to cure. Even today, the toxicity of drugs is a major problem. Some of the most effective drugs have a narrow margin of safety.

The administration of a preventive drug is known as *prophylaxis*. This noun is related to the adjective prophylactic, which is often mentioned as a contraceptive device such as a condom, because it prevents the occurrence of something that is not desired. Vaccination is also an example of the preventive use of drugs. Many people think of vaccinations as only related to the immunizations that infants receive. However, adolescents are encouraged to get vaccinations that prevent meningococcal meningitis and human papillomavirus that causes genital warts and cervical cancer. Adults also need to receive a booster shot for tetanus every 10 years and an annual influenza vaccine (flu shot). The elderly can benefit from the vaccination that prevents the painful skin disease of shingles. Chapter 23, "Vaccines", discusses the preventative use of vaccines.

In the 1800s, the English drug company Beecham had this advertisement printed in hymnbooks:

Hark the herald angels sing

Beecham's pills are just the thing.

Peace on earth and mercy mild,

Two for man and one for child.

Ketchup was once used as a medicine in the United States! In the late 1830s, it was sold as Dr. Miles' Compound Extract of Tomato. A worthless drug, you say, but the antioxidant lycopene in tomatoes has been found to decrease the risk of prostate cancer! At one time, sharks' cartilage was advertised as being effective in preventing cancer. This started with the publication of the book "Sharks Don't Get Cancer" in 1992. This claim was not true. In fact, there are more than 40 different types of tumors that affect sharks.

Dr. John Eng, an endocrinologist in New York, was looking for a drug to treat diabetes mellitus. He noticed that persons bitten by venomous animals often developed pancreatitis because the venom overstimulated the pancreas. He discovered that a compound in the saliva of the Gila monster, a lizard from the southwestern United States, could stimulate the pancreas to secrete insulin. This compound became the oral antidiabetic drug Byetta.

Commonly used folk remedies often contain ingredients that are not safe. Lead is added to many of these folk remedies because it is supposed to have curative powers. In Arizona, where there is a large population from Latin America, lead-containing folk remedies given to children to treat constipation account for one-fourth of childhood lead poisoning cases.

In 2012, horse trainers were found to have been giving their race horses a performance-enhancing painkilling drug that was taken from the skin of a type of South American frog!

The concept of prescription drugs versus over-the-counter drugs is especially important to grasp. Prescription drugs are also known as legend drugs because the drug company or the pharmacist must add this legend (inscription) to the drug package or to the filled prescription bottle. This legend must say either "Caution: Federal law prohibits dispensing without a prescription" or "Rx only."

A schedule drug is a schedule drug, but in 2013, the Food and Drug Administration, supported by the Drug Enforcement Agency, made an unusual move to change the status of one schedule drug—hydrocodone— from a Schedule III drug to a Schedule II drug. Hydrocodone is used to treat severe pain. In 2011, 131 million prescriptions were written for hydrocodone, but it was one of the top most-abused drugs. The DEA asked the FDA to reclassify hydrocodone as a Schedule II drug so that it could be subjected to more controls. Now the patient can only receive a single prescription for a 90-day supply of hydrocodone, and hydrocodone cannot be prescribed by physician assistants.

3. Testing Methods and Materials

Test the Chapter 1 material in some or all of these ways.

- Chapter Review questions and Answer Key
- Discussion questions
- Chapter test
- Spelling test
- Pronunciation test

Chapter Review Questions. The Chapter Review section at the end of each chapter contains three sections that evaluate students' knowledge of the chapter material in three different ways:

1. **Quiz Yourself**. These questions evaluate a student's recall of facts presented in the chapter
2. **Clinical Applications**. These questions evaluate a student's ability to apply learned facts to clinical situations in the form of photographs of drugs and prescriptions.
3. **Critical Thinking**. These questions evaluate a student's ability to reason from cause to effect and to draw conclusions with higher-level thinking skills.

Chapter Review Questions Answer Key. The answers to all of the different types of Chapter Review questions are located in a separate file.

Discussion Questions. These open-ended questions require some research on the part of the student to understand and explain several sides of a current or controversial issue in pharmacology. These questions can be printed out and given to students during class. Or the file can be sent to students as an attachment to an e-mail, or it can be uploaded to your course's online site, if your college's learning software program can accommodate this.

Chapter Test. The instructor can construct a chapter test by selecting chapter test questions from the Test Bank. The material contained in each chapter can be tested separately or combined with two or three other chapters at the same time in a combined chapter test.

Spelling Test. Tell students to study the Spelling List for this chapter. The list can be printed out and given to students during class. Or the file that contains this list can be sent to students as an attachment to an e-mail, or it can be uploaded to your course's online site, if your college's learning software program can accommodate this.

Before administering the Spelling Test, use the Drug Reference section at the end of the textbook to verify your pronunciation of each drug name on the list.

To administer the Spelling Test during class, pronounce each drug name or drug word and have students write it. Instruct students to put generic drugs in lowercase letters, capitalize the first letter of trade name drugs, and include internal capitalization, if any is present in the trade name drug. Alternatively, both regular students and online students can take the Spelling Test online if your college's online learning software supports an audio file of pronounced drug names that you create that your students can listen to and then spell those words by sending an e-mail to you.

Pronunciation Test. Tell students to study the Pronunciation List for this chapter. Each drug name in the list has its own see-and-say pronunciation guide with it. The list can be printed out and given to students during class. Or the file that contains the list can be sent to students as an attachment to an e-mail, or it can be uploaded to your course's online site, if your college's learning software program can accommodate this.

To administer the Pronunciation Test in class, have each student come into a separate room and pronounce each of the words on the list in front of you or record it on your iPhone. This can be done while the rest of the students are taking a chapter test. Alternatively, have students call your office or home phone number and get your answering machine; then they give their name and pronounce each of the words on the list.

CHAPTER 1 SPELLING LIST

1. addictive
2. apothecary
3. medication

4. narcotic drug
5. pharmacology
6. pharmacopeia
7. prescription
8. prophylaxis
9. therapeutic
10. vaccination

CHAPTER 1 PRONUNCIATION LIST

1. addictive [ad-DIK-tiv]
2. diagnostic [DY-ag-NAW-stik]
3. narcotic [nar-KAW-tik]
4. pharmacology [FAR-mah-KAW-loh-jee]
5. pharmacogenetics [FAR-mah-KOH-jeh-NEH-tiks]
6. pharmacotherapy [FAR-mah-koh-THAIR-ah-pee]
7. preventive [pree-VEN-tiv]
8. prescription [preh-SKRIP-shun]
9. prophylaxis [PROH-feh-LAK-sis]
10. therapeutic [THAIR-ah-PYOO-tik]

Guidelines for Discussion Posts

Discussion Do's and Don'ts

Do these things to assure a good discussion post and the highest grade possible

1. Create your own substantive response to the discussion question. Provide two examples to support your post and appropriate Internet website sources. A personal example can be included as one of the examples.
2. Post at least two substantive responses to other students' post. Your responses should show some independent research that you did to contribute to every student's understanding of the issue/original post.
3. Use correct grammar and spelling in your discussion question response and in your posts to other students' posts.
4. Display professionalism, courtesy, and respect in your response to other students' posts.
5. Choose your words carefully so that your post might be interpreted as disrespectful, discriminatory, or rude. Do not use the Discussion Board as a forum to put down any student or anyone's opinions or thoughts.
6. Acknowledge and compliment at least one point in the other student's post, even if you do not agree with it.
7. Stay on topic by reading the threaded responses from others before adding your own response.
8. Establish your presence online as an active reader and participant who posts responses.
9. Explain how someone's post helped you understand an issue or made you rethink your own views.

10. Cite your sources for any ideas that are not your own.

Do not do these things

1. Do not write in the same style that is used to do texting and instant messaging. Avoid slang and abbreviations.
2. Do not use all capital letters (this is viewed as yelling).
3. Do not respond simply by saying "I agree" or "I disagree." This does count as a response.
4. Do not attack anyone's personal position as stated in a post. If you disagree, do so respectively.
5. Do not wait until the last minute to post.
6. Do not post information that is highly controversial or inflammatory.

CHAPTER 1 DISCUSSION QUESTIONS

1. Introduce yourself to your instructor and to the other students in the course! This will help you become comfortable with creating an online post and it will help everyone to get know each other.

   Tell us about what field of study/career you have chosen?

   Why is this field/career of interest to you?

   What would you like to learn from this pharmacology course?

   Finally, tell us about your personal interests.

2. Begin collecting the names of current drugs by viewing the evening news, sporting events, etc., on TV/cable and watching the commercials that advertise a particular drug. Or, while doing searches on the Internet, look for drug advertisements along the side

margin.

Make a list of at least three drugs that you found in this way. Post your list and compare it to the lists of other students to see what drugs they found.

You will be doing research on these drugs as you study them in the various chapters of the book.

3. Select a topic for your initial Discussion from the list below. Research your topic and create a post of at least 10 sentences. Include at least two published or Internet references for your topic.

   Select an item from the list below, describe what it is, and what is pharmacological uses are.

   a. vitamin E

   b. garlic

   c. opium poppy

   d. foxglove

   e. rose hips

   f. French lilac

   g. periwinkle