

CHAPTER

18

PHARMACOLOGY

MULTIPLE CHOICE QUESTIONS

- (1) The drugs obtained from plants and fungi:
 - (a) Antibiotics
 - (b) Cardiotonics
 - (c) Certain analgesics
 - (d) All of these
- (2) Digitalis is obtained from
 - (a) *Pencillium*
 - (b) *Notatum*
 - (c) Foxglove
 - (d) *Spirogyra*
- (3) Morphine is used to relieve:
 - (a) Fever
 - (b) Pain
 - (c) Inflammation
 - (d) Swelling
- (4) Powder form of which is applied on wounds to stop bleeding and prevent infection?
 - (a) Sodium nitrate
 - (b) Silver nitrate
 - (c) Potassium sulphate
 - (d) Copper sulphate
- (5) Which one is obtained from bacteria?
 - (a) Penicillin
 - (b) Digitalis
 - (c) Morphine
 - (d) Streptomycin
- (6) Drugs are classified on the basis of:
 - (a) Chemical properties
 - (b) Modes of action
 - (c) Both a and b
 - (d) None of these
- (7) Which one is an antibiotic?
 - (a) Tetracycline
 - (b) Aspirin
 - (c) Diazepam
 - (d) Morphine
- (8) Which medicines inhibit or kill bacteria within or on the body?
 - (a) Antiseptics
 - (b) Antibiotics
 - (c) Disinfectants
 - (d) Sedatives
- (9) Which destroy microorganisms found on non-living objects?
 - (a) Antiseptics
 - (b) Antibiotics
 - (c) Disinfectants
 - (d) Sedatives
- (10) Which antibiotic was discovered by Sir Alexander Fleming?
 - (a) Morphine
 - (b) Penicillin
 - (c) Cephalosporin
 - (d) Tetracycline
- (11) Vaccines have been developed for?
 - (a) Small pox
 - (b) Whooping cough
 - (c) Both a and b
 - (d) None of these
- (12) Date of birth of Alexander Fleming:
 - (a) 1880
 - (b) 1881
 - (c) 1882
 - (d) 1883

- (13) **Date of death of Joseph Lister:**
 (a) 1910 (b) 1911 (c) 1912 (d) 1913
- (14) **Which medicines reduce pain?**
 (a) Antiseptics (b) Antibiotics (c) Analgesics (d) Sedatives
- (15) **Which belong to narcotics?**
 (a) Morphine (b) Codeine (c) Heroin (d) All of these
- (16) **In which century pharmacology developed?**
 (a) 17th (b) 18th (c) 19th (d) 20th
- (17) **Until 1890, the subject of pharmacology was known as:**
 (a) Materia Medica (b) Biomedical science (c) Both a & b (d) None of these
- (18) **Which one is a non-prescription drug?**
 (a) Barbiturates (b) Tranquilizers (c) Antibiotics (d) Aspirin
- (19) **Antitoxins are obtained from which source?**
 (a) Plant (b) Fungi (c) Animal (d) Bacterium
- (20) **A liquid that helps prevent infection when applied to cuts:**
 (a) Tincture iodine (b) Glycerine (c) Cardiotonic (d) Expectorant

ANSWER KEY

Q.No.	Ans	Q.No.	Ans	Q.No.	Ans	Q.No.	Ans	Q.No.	Ans
1	d	2	c	3	b	4	b	5	d
6	c	7	a	8	b	9	c	10	b
11	c	12	b	13	c	14	c	15	d
16	c	17	a	18	d	19	c	20	a

SHORT QUESTIONS**Q. No. 1 What is pharmacology?****PHARMACOLOGY**

The study of drug composition, properties, medical applications sources of drugs is called pharmacology.

Q. No. 2 What do you know about clinical pharmacology?**CLINICAL PHARMACOLOGY**

Clinical pharmacology was present in Middle Ages. Early pharmacologists focused on natural substances, mainly plant extracts. Pharmacology developed in the 19th century as a biomedical science.

Q. No. 3 What is a drug?**DRUG**

Any substance that, when absorbed into the body of a living organism, alters normal body functions is known as a drug.

Q. No. 4 What is a pharmaceutical drug?**PHARMACEUTICAL DRUG**

Any chemical substance that is used in the diagnosis, cure, treatment or prevention of a disease is called a pharmaceutical or medicinal drug.

Q. No. 5 What is an addictive drug?**ADDICTIVE DRUG**

The drugs that make person dependent on them or addicted are called addictive drugs.

Effect:

By using addictive drug, the person's body becomes familiar to it and the user can not function well without it.

Q. No. 6 What are prescription drugs?**PRESCRIPTION DRUGS**

The drugs that are sold only on physician's prescription are called prescription drugs.

Examples:

These include

- Barbiturates
- Tranquilizers
- Antibiotics

Q. No. 7 What are non-prescription drugs?**NON-PRESCRIPTION DRUGS**

The drugs that can be sold over the counter without physicians' prescription because these are considered safe enough are called non-prescription drugs.

Examples:

These include:

- Aspirin
- Some cough medicines

Q. No. 8 What do you know about Materia Medica?**MATERIA MEDICA**

Until 1890, the subject of pharmacology was known as Materia Medica.

Q. No. 9 How terramycin was developed?

DEVELOPMENT OF TERRAMYCIN

Researchers of a pharmaceutical company spent two years testing soil from all parts of the world to find new antibiotics. The project resulted in the development of one antibiotic, Terramycin, which is used to treat many infections.

Q. No. 10 What is the contribution of Sir Alexander Fleming?

CONTRIBUTION OF SIR ALEXANDER FLEMING

Period:

1881 – 1955

Place:

He was a Scottish Biologist.

Contribution:

He discovered the antibiotic penicillin from the fungus *Penicillium notatum*.

Noble Prize:

He was awarded Noble Prize in 1945.

Q. No. 11 What is the contribution of Joseph Lister?

CONTRIBUTION OF JOSEPH LISTER

Period:

1827 – 1912

Place:

He was an English Surgeon.

Contribution:

He promoted the idea of sterile surgery for the first time. He introduced carbolic acid to sterilize surgical instruments and to clean wounds.

Q. No. 12 Why heroin is prescribed?

HEROIN PRESCRIPTION

In many western countries, heroin is prescribed as a strong analgesic under the name diamorphine. Its use includes treatment for acute pain, such as:

- Severe physical trauma
- Myocardial infarction
- Post-surgical pain

Q. No. 13 What are hallucinations?

HALLUCINATIONS

The perceptions that have no basis in reality, but that appear entirely realistic are called hallucinations.

Q. No. 14 What is the difference between broad-spectrum and narrow-spectrum antibiotics?

BROAD-SPECTRUM ANTIBIOTICS

The antibiotics that can be used to treat a wide range of infections are known as broad spectrum antibiotics.

NARROW-SPECTRUM ANTIBIOTICS

The antibiotics that are only effective against a few types of bacteria are known as narrow spectrum antibiotics.

Q. No. 15 What is the most common method of administering vaccine?

MOST COMMON METHOD OF ADMINISTERING VACCINE

The most common method of administering vaccines is by injection, but some vaccines are given by mouth or nasal spray.

Q. No. 16 When children are required to be vaccinated?

VACCINATION TO CHILDREN

The children are required to be vaccinated before attending school.

Q. No. 17 What are the outcomes of vaccination to children?

OUTCOMES OF VACCINATION TO CHILDREN

The vaccination of children has resulted in marked decrease of many once common diseases including:

- Whooping cough
- Polio
- Smallpox

Q. No. 18 Why booster shots of vaccines are required?

REQUIREMENT OF BOOSTER SHOTS OF VACCINES

Some vaccines do not provide life time immunity. For example, tetanus vaccines are only effective for a limited period of time. In such cases, booster shots are necessary to maintain continuous protection.

Q. No. 19 What is the side effect of expired drugs?

SIDE EFFECT OF EXPIRED DRUGS

The expired drugs can cause damage to kidneys.

Q. No. 20 On what basis the drugs are classified?

BASIS OF CLASSIFICATION OF DRUGS

The drugs are classified on the basis of:

- Chemical properties
- Modes of action

LONG QUESTIONS

Q. No. 1 What are medicinal drugs? Explain the sources of medicinal drugs.

MEDICINAL DRUGS**Definition:**

The chemical substances that are used in the diagnosis, cure, treatment or prevention of a disease are called medicinal drugs.

Advantage:

Various diseases have been made easier to treat in recent years by the production of *medicinal drugs*.

SOURCES OF DRUGS

Drugs are obtained from the following sources:

1. Synthetic drugs
2. Drugs from plants
3. Drugs from fungi
4. Drugs from animals
5. Drugs from minerals
6. Drugs from bacteria

1. Synthetic drugs:

Such drugs do not occur naturally but are synthesized in laboratory. Pharmaceutical companies produce these drugs.

Example:

- Aspirin

2. Drugs from Plants:

Many important drugs are obtained from plants. These medicines include:

- Antibiotics
- Cardiotonics
- Certain analgesics

Examples:**Digitalis:****Function:**

It is a cardiotonic which is used to stimulate the heart.

Source:

It is made from the leaves of purple flowered plant, foxglove.

Morphine:**Function:**

It is a pain reliever.

Source:

It is obtained from opium, which comes from the juice of poppy plant.

Addictive Drugs:

Many addictive illegal drugs are also obtained from plants e. g.

- Marijuana

3. Drugs from Fungi:

Some medicines are obtained from fungi.

Example:

The antibiotic penicillin is obtained from a fungus, *Penicillium notatum*.

4. Drugs from Animals:

Drugs obtained from animals are usually their glandular products.

Examples: The following are obtained from animal sources:

- Fish liver oil
- Musk
- Bee's wax
- Certain hormones
- Antitoxins

5. Drugs from Minerals:

Several common drugs are produced from minerals:

Examples:

Iodine:

The mineral iodine is used in making tincture of iodine.

Function:

It is a liquid that helps prevent infection when applied to cuts and bruises.

Silver Nitrate:

The powder form of silver nitrate is applied on wounds to stop bleeding and prevent infections.

6. Drugs from Bacteria:

Many antibiotics are obtained from bacteria:

Example:

- Streptomycin

Q. No. 2 Describe the principal usage of important medicinal drugs.

PRINCIPAL USAGE OF IMPORTANT MEDICINAL DRUGS

The drugs are classified on the basis of:

- Chemical properties
- Modes of action

The principal usage of important medicinal drugs is as follow:

1. Analgesics:

These are the pain killers. These reduce pain.

Examples:

- Aspirin
- Paracetamol

2. Antibiotics:

These inhibit or kill bacteria with in or on the body and treat bacterial infections.

Examples:

- Tetracycline
- Cephalosporins

3. Sedatives:

These induce sedation by reducing irritability or excitement.

Example:

- Diazepam

4. **Vaccines:**

These are used to develop immunity against viral and bacterial infections.

Examples:

- Smallpox
- Whooping cough
- Hepatitis B

5. **Antiseptics:**

These reduce the possibility of infections on skin.

Example:

- Tincture of iodine

6. **Disinfectants:**

These destroy microorganisms found on non-living objects.

Q. No. 3 What precautions should be taken before taking medicines?

PRECAUTIONS FOR THE USAGE OF MEDICINES

Medicines can help you feel better. But if medicines are taken incorrectly, they can actually make you feel worse. The following precautions should be kept in mind:

1. Dosage
2. Expiry Date
3. Self Medication
4. Duration
5. Treatment Discontinuation
6. Dosage for Children
7. Darkness
8. Carriage
9. Children's Reach
10. Tampered Medicines

1. **Dosage:**

Always check the instructions on doctor's prescription slip and make sure you take the doses of medicine strictly as your doctor prescribed.

2. **Expiry Date:**

Always check the expiry date printed on the medicine pack. The expired medicines may prove poisonous.

3. **Self Medication:**

Never take medicines prescribed for someone else, even if you think you have the same medical problem.

4 **Duration:**

Some medicines - such as antibiotics - must be taken for a specific number of days. Make sure you take the medicine for the fated time. Otherwise the problem may come back again.

5. **Treatment Discontinuation:**

Always check with your doctor before you stop taking a medicine or consider a new treatment.

6. **Dosage for Children:**

Some medicines are not suitable for children, and there are special children's dosages for many medicines.

7. **Darkness:**
Do not take medicine in the dark.
8. **Carriage:**
If your prescription medicines are crucial for your health and life, carry medicines and dosage instructions with you, whenever you are out of home.
9. **Children's Reach:**
Always keep healthcare products out of the reach of children.
10. **Tampered Medicines:**
Do not use the medicine if there are signs of tampering. Inform the pharmacist and the manufacturer of the medicine, about it.

Q. No. 4 Write a note on addictive drugs.

ADDICTIVE DRUGS

Definition:

The drugs that make person dependent on them or addicted are called addictive drugs.

Effect:

By using addictive drug, the person's body becomes familiar to it and the user can not function well without it.

CATEGORIES OF ADDICTIVE DRUGS

The following are major categories of addictive drugs:

1. Sedatives
 2. Narcotics
 3. Hallucinogens
1. **Sedatives:**
These drugs induce sedation by reducing irritability or excitement.

Mode of Action:

These drugs interact with central nervous system to depress its activities.

Effects: Sedative drugs induce:

- Dizziness
- Lethargy
- Slow brain function
- Depression

Long Term Use:

Long term use of sedative drugs induces suicidal thoughts.

2. **Narcotics:**

Narcotics are strong pain killers.

Prescription:

These drugs are often prescribed in conjunction with other less potent pain killers like paracetamol or aspirin.

Usage:

These are used to relieve pain for patients with chronic diseases like cancer. These are also used to relieve acute pain after operations.

Drug Abuse:

But some people may abuse narcotics for ecstatic effects.

Examples:**Morphine:**

Morphine is derived from opium (poppy). It acts directly on central nervous system to relieve pain. Morphine has a high potential for addiction.

Codeine:

It is also derived from opium.

Heroin:

It is the most commonly abused narcotic. It is semi-synthetic drug from morphine. It effects on central nervous system and causes drowsiness.

Usage in Western Countries:

In many western countries, heroin is prescribed as a strong analgesic under the name diamorphine. Its use includes treatment for acute pain, such as:

- Severe physical trauma
- Myocardial infarction
- Post-surgical pain

3. Hallucinogens:

Hallucinogens are the drugs that cause changes in:

- Perception
- Thought
- Emotion
- Consciousness

Mode of Action:

Physiologically, hallucinogens affect on the sympathetic nervous system causing:

- Dilation of pupils
- Constriction of some arteries
- Rise in blood pressure

Examples:**Mescaline:**

Mescaline is derived from cactus.

Psilocin:

Psilocin is derived from a mushroom.

Marijuana (Hashish):

Marijuana is a hallucinogen, which is smoked.

Sources:

It is obtained from the flowers, stems and leaves of the marijuana plant.

- *Cannabis sativa*
- *Cannabis indica*

Less Dosage:

Small doses of marijuana result in a feeling of well being that lasts for two to three hours.

High Dosage:

High doses increase heart rate.

Adverse Effects:

It also effects the production of sperms in men and also weakens the short-term memory.

Usage:

Marijuana is one of the most commonly used drugs in the world, followed by caffeine, nicotine and alcoholic beverages in popularity.

Q. No. 5 Explain problems with drug addiction.

PROBLEMS WITH DRUG ADDICTION

There is a long list of drug related associated problems, some of them are as follow:

Withdrawal of Social Contact:

Drug abusers go through withdrawal of social contact or communication. The addicts are very weak in their social behaviour. They face social stigma i.e. the society dislikes them because of their unpredictable behaviours.

Problems for Government:

The jails and prisons of our country are full of such people who have committed no other crime than the illegal possession of narcotics.

Increase in Crime Rate:

Many studies by the experts of social sciences prove that there exists a close relationship between drug addiction and crime. The compulsion for narcotic drug makes every drug addict a criminal.

Law Violator:

The drug addicts are law violators. Mere possession of a narcotic drug is violation of the law. Thus, every drug addict is subject to arrest by the police.

Psychic Patients:

Drug addicts may commit violent crimes since so many become psychic patients.

Other Crimes:

Most narcotic addicts get involved in various types of crimes, like:

- Robbery
- Shop lifting
- Burglary
- Embezzlement

Q. No. 6 What are antibiotics? Explain major groups of antibiotics.

ANTIBIOTICS

Definition:

An antibiotic is a drug that kills or retards the growth (reproduction) of bacteria. They are the chemicals produced by or derived from microorganisms like bacteria and fungi.

Types of antibiotics:

There are two main types of antibiotics:

Bactericidal Antibiotics

The antibiotics that kill the bacteria are called bactericidal antibiotics.

Bacteriostatic Antibiotics

The antibiotics that work by stopping the bacterial growth are called bacteriostatic antibiotics.

GROUPS OF ANTIBIOTICS

There are three major group of antibiotics:

1. Cephalosporins
2. Tetracyclines
3. Sulpha Drugs – Sulfonamides

1. Cephalosporins:

Mode of action:

Cephalosporins interfere with the synthesis of bacterial cell wall.

Category:

These are bactericidal antibiotics.

Indications:

Cephalosporins are used to treat

- Pneumonia
- Sore throat
- Tonsillitis
- Bronchitis

2. Tetracyclines:**Mode of Action:**

Tetracyclines inhibit bacterial protein synthesis.

Category:

These are broad-spectrum bacteriostatic antibiotics.

Indications:

Tetracyclines are used in the treatment of infections of:

- Respiratory tract
- Urinary tract
- Intestine

Contraindications:

Tetracyclines are not used in children under the age of 8, and especially during periods of tooth development.

3. Sulpha Drugs – Sulfonamides:**Composition:**

Sulpha drugs are synthetic antibiotics that contain sulfonamide group.

Category:

Sulfonamides are broad spectrum bacteriostatic antibiotics.

Mode of Action:

They inhibit the folic acid synthesis of bacteria.

Indications:

They are used to treat:

- Pneumonia
- Urinary tract infections

Q. No. 7 Write a note on antibiotic resistance.

ANTIBIOTIC RESISTANCE

Antibiotics are extremely important in medicine, but unfortunately bacteria are capable of developing resistance to them. Such bacteria are not affected by commonly used antibiotics.

Definition:

The ability of bacteria not to be affected by the particular antibiotic is called antibiotic resistance.

Reason:

When bacteria are exposed to the same antibiotic over and over, they can change and are no longer affected by the drug.

WAYS OF DEVELOPING RESISTANCE

Bacteria have number of ways of developing resistance.

Stoppage by Internal Mechanism:

Sometimes, their internal mechanism stops the working of antibiotic.

Transfer of Genes:

Bacteria can also transfer the genes responsible for antibiotic resistance between them. So such resistance bacteria make it possible for other bacteria to acquire resistance.

Unethical Usage:

Another reason for increasing antibiotic resistance in bacteria is their use in diseases in which they have no efficacy e.g. antibiotics are not effective against infections caused by viruses.

A Growing Problem:

Resistance to antibiotics poses a serious and growing problem, because some infectious diseases are becoming more difficult to treat. Some of the resistant bacteria can be treated with more powerful antibiotics, but there are some infections that do not eliminate even with new antibiotics.

Q. No. 8 Write a note on vaccines. Explain mode of action of vaccines.

VACCINES**Definition:**

A material containing weakened or killed pathogens and is used to produce immunity to a disease by stimulating the production of antibodies is called a vaccine.

Work of Edward Jenner:

In 1796, a British physician, Edward Jenner, infected a young boy with cowpox, by injecting pus cells. After the boy had recovered from cowpox, Jenner injected the pus cells from a smallpox patient into him. The boy did not get smallpox.

Result:

So it became clear that intentional infection with cowpox protected people from smallpox.

Vaccination:

This method was named "vaccination" and the substance used to vaccinate was called a "vaccine".

MODE OF ACTION OF VACCINES**Antigens:**

Pathogens contain special proteins called "antigens".

Antibodies:

When pathogens enter the body (blood) of host, these proteins stimulate the immune response in host i.e. synthesis of "antibodies". Antibodies bind to pathogens and destroy them.

Production of Memory Cells:

In addition, "memory cells" are produced, which remain in blood and provide protection against future infections with the same pathogen.

Stimulation of White Blood Cells:

When a vaccine i.e. weakened or dead pathogen is introduced into bloodstream, the white blood cells are stimulated.

Recognition by B-lymphocytes:

B-lymphocytes recognize the weakened or dead pathogens as enemies and start producing antibodies against them.

Protection against Pathogens:

These antibodies remain in blood and provide protection against pathogens. If real pathogens enter blood, the already present antibodies kill the

REVIEW QUESTION:**MULTIPLE CHOICE QUESTIONS**

- Antibiotics are used for the:
 - Treatment of viral infections
 - Treatment of bacterial infections
 - Immunization against infections
 - Both a and b
- The substances used for the treatment, cure, prevention or diagnoses of diseases are called:
 - Medicinal drugs
 - Narcotics
 - Hallucinogens
 - Sedatives
- Aspirin is categorized as;
 - A drug from animals
 - A synthetic drug
 - A drug from plants
 - A drug from minerals
- The drugs used to reduce pain are known as;
 - Analgesics
 - Antiseptics
 - Antibiotics
 - Sedatives
- Which of the following drugs obtained from plants?
 - Aspirin
 - Opium
 - Cephalosporin
 - Insulin
- Which of these addictive drugs are also used as painkillers?
 - Narcotics
 - Sedatives
 - Hallucinogens
 - All can be used
- Sulfonamides affect bacteria in the following way;
 - Break the cell wall
 - Inhibit protein synthesis
 - Stop the synthesis of new cell wall
 - Stop the synthesis of folic acid
- What is true about vaccines?
 - Protect against the future viral and bacterial infections
 - Treat the existing bacterial infections only
 - Treat existing infections and also protect against future infections
 - Protect against viral infections only

ANSWER KEY

Q.No.	Ans	Q.No.	Ans	Q.No.	Ans	Q.No.	Ans
1	b	2	a	3	b	4	a
5	b	6	a	7	d	8	a

SHORT QUESTIONS

1. Define pharmacology and distinguish it from pharmacy.

PHARMACOLOGY

The study of drug composition, properties, medical applications sources of drugs is called pharmacology.

Difference from Pharmacy:

Pharmacology is not synonymous with pharmacy, which is the name used for a profession, though in common usage the two terms are confused.

2. Differentiate between medicinal drug and addictive drug.

Consult Long Question No. 1 and 4

3. Differentiate between analgesic and antibiotic.

Consult Long Question No. 2

4. What is marijuana? To which category of addictive drugs it belongs?

Consult Long Question No. 4

5. Differentiate between narcotics and hallucinogens.

Consult Long Question No. 4

UNDERSTANDING THE CONCEPT

1. What are the sources of drugs? Give examples.

Consult Long Question No. 1

2. Write a note on sedatives, narcotics and hallucinogens.

Consult Long Question No. 2 and 4

3. Describe the main groups of antibiotics.

Consult Long Question No. 6

4. Write a note on resistance against antibiotics.

Consult Long Question No. 7

5. Describe the mode of action of vaccines.

Consult Long Question No. 8

THE TERMS TO KNOW

Addictive Drug:

The drug which makes the person dependent on it or addicted

Analgesic:

The medicines that reduce pain

Antibiotics:

The medicines that inhibit or kill bacteria

Aspirin:

Acetaminophen; A pain like medicine

Bactericidal:

The antibiotics that work by killing bacteria

Bacteriostatic:

The antibiotics that work by stopping bacteria multiplying

Cardiotonic:

Medicines for giving strength to heart muscles

Cephalosporins:

A group of antibiotics; interfere with synthesis of bacterial cell wall

Hallucinogen:

Drug that causes changes in perception, thought, emotion and consciousness

Heroin:

A commonly abused narcotic; derived from morphine; affects the central nervous system and causes drowsiness, disorientation, hypotension etc.

Marijuana:

A hallucinogen and addictive drug; obtained from the flowers, stems and leaves of the marijuana plant

Medicinal Drug:

Any chemical substance intended for use in the medical diagnosis, cure, treatment or prevention of disease

Morphine:

A commonly used narcotic; derived from the juice of opium; acts directly on the CNS to relieve pain; has a high potential for addiction

Narcotics:

Strong painkiller drugs; also used as addictive drugs; commonly abused narcotics include heroin, morphine, methadone etc.

Pharmacology:

The study of drug composition, properties and medical applications

Sedatives:

Types of drugs that interact with the central nervous system to depress its activities; make a person calm or drowsy

Sulfonamides:

Sulpha drugs; synthetic antibiotics that contain the sulfonamide group; bacteriostatic in action

Tetracyclines:

Broad spectrum bacteriostatic antibiotics; inhibit bacterial protein synthesis

Vaccines:

The material used to produce immunity to a disease by stimulating the production of antibodies.