

Q1. (a) Classify anti tubercular drugs.

:- Anti-tubercular drugs are classified based on their mechanism of action, efficacy, and role in tuberculosis (TB) treatment. The classification is as follows:

### 1. First-Line Anti-Tubercular Drugs (Most effective and used in standard treatment)

These drugs form the core of the standard TB treatment regimen:

- **Isoniazid (INH)** – Inhibits mycolic acid synthesis in the bacterial cell wall.
- **Rifampicin (RIF)** – Inhibits bacterial RNA polymerase.
- **Ethambutol (EMB)** – Inhibits arabinosyl transferase, affecting cell wall synthesis.
- **Pyrazinamide (PZA)** – Disrupts membrane potential and energy metabolism in Mycobacterium tuberculosis.
- **Streptomycin (SM)** – Inhibits protein synthesis by binding to the 30S ribosomal subunit.

### 2. Second-Line Anti-Tubercular Drugs (Used for drug-resistant TB or when first-line drugs are not suitable)

#### a) Fluoroquinolones (Inhibit DNA gyrase)

- Levofloxacin
- Moxifloxacin
- Ciprofloxacin

#### b) Injectable Aminoglycosides & Polypeptides (Inhibit protein synthesis)

- Amikacin
- Kanamycin
- Capreomycin

#### c) Other Second-Line Drugs

- Ethionamide – Inhibits mycolic acid synthesis.
- Prothionamide – Similar to ethionamide.
- Cycloserine – Inhibits cell wall synthesis.
- Para-aminosalicylic acid (PAS) – Inhibits folate metabolism.

### 3. Newer and Third-Line Anti-Tubercular Drugs (Used in extensively drug-resistant TB - XDR-TB)

- **Bedaquiline** – Inhibits ATP synthase, disrupting energy production.
- **Delamanid** – Inhibits mycolic acid synthesis.
- **Pretomanid** – Works similarly to delamanid.
- **Linezolid** – Inhibits protein synthesis.

- **Clofazimine** – Interferes with DNA function and has anti-inflammatory effects.

#### 4. Combination Therapy Regimens

- **Fixed-Dose Combinations (FDCs)** – Contain multiple first-line drugs in one pill to improve adherence.
- **Shorter MDR-TB Regimens** – Include fluoroquinolones, bedaquiline, and linezolid.

This classification helps guide TB treatment based on drug resistance patterns and patient-specific factors.

(b) Therapeutic uses and mode of action of anti tubercular drugs, adverse effects and contraindication of anti tuberculosis drugs.

### **:- Anti-Tubercular Drugs: Therapeutic Uses, Mode of Action, Adverse Effects, and Contraindications**

#### 1. Therapeutic Uses

- **Treatment of Pulmonary and Extrapulmonary Tuberculosis (TB)** – Standard therapy for TB, including lung, lymph nodes, bones, meninges, and genitourinary TB.
- **Latent TB Infection (LTBI)** – Used in asymptomatic individuals with positive TB tests to prevent progression to active TB.
- **Multi-Drug Resistant TB (MDR-TB) and Extensively Drug-Resistant TB (XDR-TB)** – Second-line and newer drugs are used when TB is resistant to first-line drugs.

#### 2. Mode of Action of First-Line Anti-TB Drugs

Drug	Mode of Action
<b>Isoniazid (INH)</b>	Inhibits mycolic acid synthesis, essential for the bacterial cell wall.
<b>Rifampicin (RIF)</b>	Inhibits bacterial RNA polymerase, preventing transcription.
<b>Ethambutol (EMB)</b>	Inhibits arabinosyl transferase, disrupting cell wall synthesis.
<b>Pyrazinamide (PZA)</b>	Disrupts membrane potential and energy metabolism in Mycobacterium tuberculosis.
<b>Streptomycin (SM)</b>	Binds to the 30S ribosomal subunit, inhibiting protein synthesis.

#### 3. Adverse Effects of Anti-Tubercular Drugs

Drug	Adverse Effects
<b>Isoniazid</b>	Hepatotoxicity, peripheral neuropathy, drug-induced lupus.
<b>Rifampicin</b>	Hepatitis, orange discoloration of body fluids, flu-like syndrome.
<b>Ethambutol</b>	Optic neuritis (color blindness, decreased visual acuity).

Drug	Adverse Effects
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**Pyrazinamide** Hepatotoxicity, hyperuricemia (can cause gout).

**Streptomycin** Ototoxicity (hearing loss), nephrotoxicity.

#### 4. Contraindications of Anti-Tubercular Drugs

Drug	Contraindications
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**Isoniazid** Liver disease, hypersensitivity.

**Rifampicin** Severe liver dysfunction, concurrent use of protease inhibitors.

**Ethambutol** Optic neuritis, renal failure.

**Pyrazinamide** Severe liver disease, acute gout.

**Streptomycin** Pregnancy, kidney disease, hearing impairment.

This summary provides a concise yet detailed explanation suitable for a **5-mark** answer.

(c) explain nurse's role and responsibility of management and administration of anti-tubercular drugs.

#### **:- Nurse's Role and Responsibilities in the Management and Administration of Anti-Tubercular Drugs**

A nurse plays a crucial role in ensuring the effective management of tuberculosis (TB) by administering anti-tubercular drugs, monitoring patient responses, and providing education. The responsibilities include:

##### **1. Drug Administration and Adherence Monitoring (2 Marks)**

- Administer anti-TB drugs as per the prescribed regimen, ensuring correct dosage, timing, and duration.
- Implement **Directly Observed Treatment, Short-Course (DOTS)** to ensure adherence and prevent drug resistance.
- Educate patients on the importance of **completing the full course** to avoid relapse and drug resistance.

##### **2. Patient Assessment and Monitoring (1.5 Marks)**

- Assess patients for pre-existing conditions such as **liver disease, renal impairment, or pregnancy** before starting therapy.
- Monitor for **adverse effects** (e.g., hepatotoxicity, neuropathy, optic neuritis).
- Conduct regular **liver function tests (LFTs), kidney function tests (KFTs), and vision tests** as required.

##### **3. Infection Control and Prevention (1.5 Marks)**

- Educate patients on **cough etiquette, proper sputum disposal, and maintaining good hygiene** to prevent TB transmission.
- Encourage **isolation precautions** in infectious cases until sputum conversion is achieved.
- Promote **vaccination with Bacillus Calmette-Guérin (BCG)** for TB prevention.

#### 4. Patient Education and Counseling (1 Mark)

- Inform patients about **possible side effects** and when to seek medical help.
- Counsel on the interaction of anti-TB drugs with other medications (e.g., Rifampicin reducing oral contraceptive efficacy).
- Advise on dietary habits, especially avoiding alcohol to reduce the risk of hepatotoxicity.

#### 5. Documentation and Follow-Up (1 Mark)

- Maintain **accurate records** of drug administration, side effects, and patient progress.
- Ensure regular follow-ups and sputum examinations for treatment efficacy.
- Report **treatment non-compliance, drug reactions, or complications** to the healthcare team.

By effectively carrying out these responsibilities, nurses play a vital role in **TB control, improving patient outcomes, and preventing drug-resistant tuberculosis.**

Q2. Write short note on

(a) enlist the nurse's responsibility before fluid and electrolyte therapy.

**:- Nurse's Responsibilities Before Fluid and Electrolyte Therapy (5 Marks)**

A nurse plays a critical role in ensuring the safe and effective administration of fluid and electrolyte therapy. The key responsibilities before initiating therapy include:

##### 1. Patient Assessment (1 Mark)

- Assess vital signs (BP, pulse, respiratory rate).
- Evaluate hydration status (skin turgor, mucous membranes, urine output).
- Check for signs of fluid imbalance (dehydration, edema, electrolyte disturbances).

##### 2. Review Laboratory Reports (1 Mark)

- Monitor **serum electrolyte levels** (sodium, potassium, chloride, calcium, etc.).
- Check **renal function tests (BUN, creatinine)** to ensure proper fluid clearance.
- Assess **acid-base balance (ABG analysis)** if required.

##### 3. Verify Physician's Order and Type of Fluid (1 Mark)

- Ensure correct type (e.g., isotonic, hypotonic, hypertonic solutions).
- Confirm infusion rate and volume prescribed.
- Check for drug compatibility if mixed with medications.

#### 4. Assess for Contraindications and Allergies (1 Mark)

- Identify any history of **heart failure, kidney disease, or fluid overload risk**.
- Check for known allergies to any IV fluids or additives.

#### 5. Prepare Equipment and Patient (1 Mark)

- Select appropriate **IV cannula size** and ensure sterility.
- Educate the patient on the purpose and possible side effects.
- Obtain **informed consent** if necessary.

Proper preparation ensures **safe administration, prevents complications, and optimizes patient outcomes**.

(b) Which drugs are used in the treatment of the nervous system?

#### **:- Drugs Used in the Treatment of Nervous System Disorders (5 Marks)**

The nervous system disorders are managed using various classes of drugs, depending on the condition. The major categories include:

##### 1. Analgesics (Pain Relievers)

- **Opioids:** Morphine, Codeine, Fentanyl (for severe pain).
- **NSAIDs:** Ibuprofen, Aspirin, Diclofenac (for mild to moderate pain).

##### 2. CNS Stimulants and Depressants

- **Stimulants:** Methylphenidate, Amphetamines (for ADHD, narcolepsy).
- **Sedatives & Hypnotics:** Benzodiazepines (Diazepam, Lorazepam) for anxiety, insomnia.

##### 3. Anticonvulsants (For Epilepsy & Seizures)

- Phenytoin, Carbamazepine, Valproate, Levetiracetam.

##### 4. Antipsychotics (For Schizophrenia & Psychotic Disorders)

- Typical: Haloperidol, Chlorpromazine.
- Atypical: Risperidone, Olanzapine.

##### 5. Neurodegenerative Disease Medications

- **For Parkinson's Disease:** Levodopa-Carbidopa, Pramipexole.
- **For Alzheimer's Disease:** Donepezil, Memantine.

These drugs help manage pain, seizures, psychiatric disorders, and neurodegenerative diseases effectively.

(c) Oral contraceptives.

#### **:- Oral Contraceptives (5 Marks)**

Oral contraceptives are medications used to prevent pregnancy by altering hormonal levels to inhibit ovulation, fertilization, or implantation. They are classified into two main types:

### 1. Types of Oral Contraceptives (2 Marks)

#### a) Combined Oral Contraceptives (COCs)

- Contain **Estrogen (Ethinyl estradiol)** and **Progestin (Levonorgestrel, Norgestimate, Drospirenone, etc.)**.
- Prevent ovulation, thicken cervical mucus, and thin the endometrium.

#### b) Progestin-Only Pills (POPs) (Mini Pills)

- Contain only progestin (e.g., Norethindrone, Desogestrel).
- Primarily work by thickening cervical mucus and suppressing ovulation.
- Preferred in breastfeeding women and those at risk of estrogen-related side effects.

### 2. Mechanism of Action (1 Mark)

- Inhibit ovulation by suppressing **FSH and LH release** from the pituitary gland.
- Alter cervical mucus, making it **hostile to sperm penetration**.
- Thin the **endometrial lining**, preventing implantation.

### 3. Benefits and Uses (0.5 Marks)

- Prevent pregnancy with high efficacy.
- Regulate menstrual cycles and reduce dysmenorrhea.
- Lower the risk of ovarian and endometrial cancers.

### 4. Side Effects (0.5 Marks)

- Nausea, headache, breast tenderness.
- Weight gain, mood changes.
- Increased risk of blood clots (with estrogen-containing pills).

### 5. Contraindications (1 Mark)

- History of **thrombosis or stroke**.
- **Uncontrolled hypertension or liver disease**.
- **Breast cancer or undiagnosed vaginal bleeding**.

Oral contraceptives are an effective family planning method but should be used under medical supervision to minimize risks.

(d) Vaccines and sera

### :- Vaccines and Sera (5 Marks)

Vaccines and sera are immunological agents used to protect against infectious diseases.

### 1. Definition and Difference (1 Mark)

- **Vaccines:** Biological preparations that stimulate the immune system to produce long-term immunity against specific diseases.
- **Sera (Antisera):** Contain pre-formed antibodies that provide immediate, short-term immunity.

### 2. Types of Vaccines (2 Marks)

Type of Vaccine	Example
<b>Live Attenuated Vaccines</b> (Contain weakened pathogens)	Measles, Mumps, Rubella (MMR), BCG, Oral Polio (OPV)
<b>Inactivated (Killed) Vaccines</b>	Inactivated Polio (IPV), Rabies, Hepatitis A
<b>Toxoid Vaccines</b> (Contain inactivated bacterial toxins)	Tetanus Toxoid, Diphtheria Toxoid
<b>Subunit, Recombinant, or Conjugate Vaccines</b> (Contain specific antigens)	Hepatitis B, HPV, Pneumococcal, Meningococcal
<b>mRNA Vaccines</b> (Provide genetic instructions for immunity)	COVID-19 vaccines (Pfizer, Moderna)

### 3. Sera (Antisera) and Their Uses (1 Mark)

- Contain **ready-made antibodies** used for immediate immunity.
- Examples:
  - **Tetanus Antitoxin** – Used in tetanus-prone wounds.
  - **Rabies Immunoglobulin** – Given after a rabies exposure.
  - **Diphtheria Antitoxin** – Treats diphtheria infections.

### 4. Importance and Uses (1 Mark)

- **Vaccines** provide long-term immunity and prevent diseases.
- **Sera** provide immediate protection in emergency situations.
- Help in **disease eradication** (e.g., smallpox, polio control).

Vaccination programs and immunoglobulin therapy are essential for global public health.

Q3. Short Answer

(a) NSAID

**:- NSAIDs (Non-Steroidal Anti-Inflammatory Drugs) – Short Answers**

#### 1. Definition:

- NSAIDs are medications that reduce inflammation, relieve pain, and lower fever by inhibiting cyclooxygenase (COX) enzymes.

## 2. **Examples:**

- Ibuprofen, Aspirin, Naproxen, Diclofenac, Celecoxib.

## 3. **Mechanism of Action:**

- Inhibit **COX-1 and COX-2 enzymes**, reducing prostaglandin synthesis, which decreases pain, inflammation, and fever.

## 4. **Therapeutic Uses:**

- Pain relief (headache, arthritis, muscle pain).
- Anti-inflammatory (rheumatoid arthritis, osteoarthritis).
- Antipyretic (reduces fever).

## 5. **Adverse Effects:**

- Gastric irritation, ulcers, kidney damage, increased bleeding risk.

## 6. **Contraindications:**

- Peptic ulcer disease, kidney disease, bleeding disorders, hypersensitivity.

## 7. **Aspirin-Specific Use:**

- Low-dose aspirin is used to **prevent heart attacks and strokes** by inhibiting platelet aggregation.

(b) Side effects of penicillin.

### **:- Side Effects of Penicillin**

Penicillin antibiotics are widely used but can cause various side effects, including:

#### 1. **Allergic Reactions** (Most Common)

- Skin rashes
- Hives (urticaria)
- Anaphylaxis (severe life-threatening reaction)

#### 2. **Gastrointestinal Effects**

- Nausea, vomiting
- Diarrhea
- Abdominal pain

#### 3. **Neurological Effects** (In High Doses)

- Seizures
- Confusion
- Dizziness

#### 4. **Hematologic Effects**



- Anemia
- Low white blood cell count (leukopenia)
- Low platelet count (thrombocytopenia)

## 5. Superinfections

- Oral or vaginal **candidiasis (yeast infection)**
- Clostridium difficile-associated diarrhea (**pseudomembranous colitis**)

## 6. Renal Effects

- Interstitial nephritis (kidney inflammation) in rare cases

Penicillin allergies should be reported to healthcare providers to avoid severe reactions.

(c) Two drugs of bronchodilators.

### **: - Two Drugs of Bronchodilators**

#### 1. Salbutamol (Albuterol)

- Class: **Beta-2 adrenergic agonist**
- Use: **Relieves acute asthma attacks and COPD symptoms**
- Mechanism: **Relaxes bronchial smooth muscles** by stimulating beta-2 receptors.

#### 2. Theophylline

- Class: **Methylxanthine derivative**
- Use: **Long-term control of asthma and COPD**
- Mechanism: **Inhibits phosphodiesterase (PDE), leading to bronchodilation and reduced airway inflammation.**

(d) Nursing responsibilities while giving insulin injections.

### **: - Nursing Responsibilities While Giving Insulin Injections**

#### 1. Verify Doctor's Order

- Check the type (rapid-acting, short-acting, intermediate, long-acting) and dosage.
- Confirm the correct **route (subcutaneous or intravenous for emergencies).**

#### 2. Patient Assessment

- Check **blood glucose levels** before administration.
- Assess for **signs of hypoglycemia or hyperglycemia.**
- Verify the patient's **allergy history.**

#### 3. Correct Preparation

- **Roll (do not shake) cloudy insulins** (e.g., NPH) to mix properly.
- Use the **correct syringe (insulin syringe 40 or 100 units/mL).**

- Ensure proper **dose calculation and drawing technique**.

#### 4. Proper Administration Technique

- Administer **subcutaneously at a 45° or 90° angle** (IV in emergencies).
- Rotate **injection sites** (abdomen, thigh, upper arm) to prevent lipodystrophy.
- Avoid injecting into **scarred or inflamed areas**.

#### 5. Patient Education

- Teach self-administration techniques.
- Educate about **hypoglycemia symptoms** (sweating, dizziness, confusion) and management.
- Advise on dietary considerations and exercise.

#### 6. Monitoring and Documentation

- Observe for **adverse reactions** (hypoglycemia, allergic reaction).
- Record **dose, time, site, and blood glucose level** in patient records.
- Follow up with regular glucose monitoring.

Proper insulin administration ensures **effective diabetes management and prevents complications**.

(e) Alternative system of medicine.

#### **:- Alternative Systems of Medicine**

Alternative systems of medicine refer to **non-conventional healing practices** used for disease prevention and treatment. These systems focus on **holistic well-being** and natural healing.

### **1. Major Alternative Systems of Medicine**

#### **1. Ayurveda**

- Origin: **India (over 5000 years old)**
- Uses **herbs, diet, yoga, and Panchakarma therapy** for balance in body energies (Vata, Pitta, Kapha).

#### **2. Homeopathy**

- Principle: **"Like cures like"** – Small doses of natural substances stimulate the body's healing response.
- Common remedies: **Arnica, Nux vomica, Belladonna**.

#### **3. Unani Medicine**

- Origin: **Greek-Arabic system**
- Uses herbal formulations, cupping therapy, and regimental therapy (**Ilaj-bit-Tadbeer**).

#### **4. Siddha Medicine**

- Origin: **Ancient Tamil culture (India)**
- Uses **herbal, mineral, and animal-based products** with yoga and meditation.

## 5. Naturopathy

- Focuses on **self-healing through diet, fasting, exercise, hydrotherapy, and herbal medicine.**

## 6. Traditional Chinese Medicine (TCM)

- Includes **Acupuncture, Herbal Medicine, Tai Chi, and Qigong** for energy balance (Yin-Yang, Qi flow).

## 2. Benefits

- **Holistic approach** to health.
- **Fewer side effects** than conventional medicine.
- **Personalized treatments** based on individual needs.

## 3. Limitations

- Lack of scientific validation for some treatments.
- Slower effects compared to modern medicine.
- Requires **trained practitioners** for effective treatment.

Alternative medicine is **widely used alongside modern medicine** for integrative healthcare.

## SECTION -B PATHOLOGY (25 MRKS) & GENETICS (12 MRKS)

Q1 Explain important of study of pathology.

**:- Importance of Studying Pathology (5 Marks)**

Pathology is the branch of medical science that deals with the study of **diseases, their causes, mechanisms, effects, and diagnosis**. It is essential for healthcare professionals for various reasons:

### 1. Understanding Disease Mechanisms (1 Mark)

- Helps in identifying how diseases develop (**etiology**) and progress (**pathogenesis**).
- Aids in distinguishing between **infectious, inflammatory, genetic, and neoplastic diseases**.

### 2. Accurate Diagnosis and Treatment (1 Mark)

- Essential for detecting **abnormal changes in tissues and organs**.
- Helps in diagnosing diseases like **cancer, infections, and autoimmune disorders** using laboratory tests.

### 3. Helps in Disease Prevention (1 Mark)

- Identifies **risk factors and early signs** of diseases.

- Aids in developing **preventive measures and vaccines** to control disease spread.

#### 4. Role in Forensic Medicine (1 Mark)

- Helps determine **cause of death** in medico-legal cases.
- Supports criminal investigations through **autopsies and toxicology reports**.

#### 5. Contribution to Medical Research (1 Mark)

- Supports the development of **new drugs, therapies, and diagnostic techniques**.
- Advances knowledge in **genetic disorders, stem cell therapy, and regenerative medicine**.

Studying pathology is **crucial for medical professionals** to improve diagnosis, treatment, and prevention of diseases, ultimately enhancing patient care.

Q2. (a) Define Peptic ulcer.

**:- Definition of Peptic Ulcer**

A **peptic ulcer** is an open sore or lesion in the inner lining of the **stomach, duodenum (first part of the small intestine), or esophagus** due to the erosion caused by **gastric acid and pepsin**.

**Types of Peptic Ulcers:**

1. **Gastric Ulcer** – Occurs in the stomach lining.
2. **Duodenal Ulcer** – Forms in the duodenum.
3. **Esophageal Ulcer** – Develops in the esophagus (rare).

**Common Causes:**

- **Helicobacter pylori (H. pylori) infection**
- **Long-term use of NSAIDs (Aspirin, Ibuprofen)**
- **Excess stomach acid secretion (Zollinger-Ellison syndrome)**
- **Stress, smoking, alcohol, and spicy foods (aggravating factors).**

**Symptoms:**

- Burning stomach pain, especially on an **empty stomach**.
- Bloating, nausea, vomiting.
- Dark, tarry stools (indicating bleeding ulcer).

Peptic ulcers can lead to **serious complications** like bleeding, perforation, and obstruction if left untreated.

(B) sign and symptoms of peptic ulcer.

**:- Refer to MSN 2019 Q1 (b)**

(C) Pathological changes in peptic ulcer.

**:- Pathological Changes in Peptic Ulcer (4 Marks)**

Peptic ulcers cause progressive damage to the stomach or duodenal mucosa due to acid and pepsin erosion. The key pathological changes include:

### 1. Mucosal Damage (1 Mark)

- Initial **loss of protective mucus layer**, leading to exposure of the gastric lining to **acid and digestive enzymes**.
- **Inflammation and superficial erosion** occur.

### 2. Ulcer Formation (1 Mark)

- A well-defined **crater-like lesion** develops in the gastric or duodenal mucosa.
- The ulcer extends through the **mucosa into the submucosa and muscularis layers**.

### 3. Tissue Necrosis and Inflammatory Response (1 Mark)

- The damaged area undergoes **necrosis (cell death)**.
- Surrounding tissues show **edema, congestion, and leukocyte infiltration** due to inflammation.

### 4. Fibrosis and Complications (1 Mark)

- **Chronic ulcers** lead to **fibrosis (scar tissue formation)**, which may cause **gastric outlet obstruction**.
- In severe cases, ulcers may **perforate** (leading to peritonitis) or cause **bleeding** due to erosion of blood vessels.

These **pathological changes** contribute to ulcer-related symptoms like pain, bleeding, and digestive issues.

Q2. Short note on

(A) Inflammation and infection.

### Short Note on Inflammation and Infection

#### 1. Inflammation

- **Definition:** Inflammation is the body's **protective response** to injury, infection, or irritation, aimed at eliminating harmful stimuli and initiating healing.
- **Causes:**
  - **Infections (bacteria, viruses, fungi)**
  - **Physical injuries (cuts, burns, trauma)**
  - **Chemical irritants (toxins, allergens)**
- **Signs (Cardinal Symptoms):**
  - **Redness (Rubor)** – Due to increased blood flow.
  - **Swelling (Tumor)** – Due to fluid accumulation.

- **Heat (Calor)** – Increased metabolic activity.
  - **Pain (Dolor)** – Nerve stimulation by inflammatory mediators.
  - **Loss of function (Functio laesa)** – Due to tissue damage.
  - **Types:**
    - **Acute Inflammation** – Short-term (e.g., skin wound).
    - **Chronic Inflammation** – Long-term (e.g., arthritis, tuberculosis).
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## 2. Infection

- **Definition:** Infection is the **invasion and multiplication** of pathogenic microorganisms (bacteria, viruses, fungi, parasites) in the body, leading to disease.
- **Common Types of Infection:**
  - **Bacterial (Tuberculosis, Pneumonia)**
  - **Viral (COVID-19, Influenza)**
  - **Fungal (Candidiasis, Ringworm)**
  - **Parasitic (Malaria, Amoebiasis)**
- **Symptoms:** Fever, fatigue, pain, swelling, pus formation (in bacterial infections).
- **Treatment:**
  - **Antibiotics** (for bacterial infections).
  - **Antivirals, antifungals, antiparasitic drugs** as per infection type.

### Difference Between Inflammation and Infection

Aspect	Inflammation	Infection
<b>Cause</b>	Injury, toxins, immune response	Pathogenic microorganisms
<b>Nature</b>	Protective response	Disease-causing
<b>Treatment</b>	Anti-inflammatory drugs	Antibiotics, antivirals, antifungals

Inflammation **can occur without infection** (e.g., trauma), but **infection often triggers inflammation** as a defense mechanism.

(B) Blood grouping and cross matching.

### **:- Short Note on Blood Grouping and Cross-Matching**

#### **1. Blood Grouping**

- **Definition:** Blood grouping is the classification of blood based on the presence or absence of **antigens (A, B) on red blood cells (RBCs)** and **antibodies in plasma**.

- **Major Blood Group Systems:**

- **ABO System:**

- **Type A** – A antigen, Anti-B antibodies
    - **Type B** – B antigen, Anti-A antibodies
    - **Type AB** – A & B antigens, No antibodies (**Universal recipient**)
    - **Type O** – No antigens, Anti-A & Anti-B antibodies (**Universal donor**)

- **Rh System:**

- **Rh-positive (Rh<sup>+</sup>)** – Has Rh antigen
    - **Rh-negative (Rh<sup>-</sup>)** – No Rh antigen

## **2. Cross-Matching**

- **Definition:** Cross-matching is a laboratory test done before blood transfusion to check **compatibility between donor and recipient blood.**
- **Procedure:**
  1. **Mix donor RBCs with recipient plasma** and observe for agglutination (clumping).
  2. If agglutination occurs, the blood is **incompatible** and cannot be transfused.
  3. If no reaction occurs, the blood is **safe for transfusion.**

## **Importance of Blood Grouping & Cross-Matching**

- **Prevents transfusion reactions** (hemolysis, shock).
- Ensures **safe blood transfusion.**
- Avoids complications in **pregnancy (Rh incompatibility in newborns – Hemolytic Disease of the Newborn, HDN).**

(c) Hemiplegia

### ***:- Short Note on Hemiplegia***

#### **Definition:**

- Hemiplegia is a **neurological condition** characterized by **paralysis of one side of the body (right or left)** due to damage in the brain or spinal cord.

#### **Causes:**

- **Stroke (most common cause)** – Ischemic or hemorrhagic.
- **Traumatic brain injury (TBI).**
- **Brain tumors.**
- **Infections** (Meningitis, Encephalitis).
- **Cerebral palsy (in congenital cases).**

**Symptoms:**

- **Loss of movement** on one side.
- **Muscle weakness or stiffness (spasticity).**
- **Difficulty with balance and coordination.**
- **Speech and vision problems** (if the brain's affected areas control these functions).

**Treatment:**

- **Physical therapy** – To improve mobility and strength.
- **Occupational therapy** – Helps with daily activities.
- **Medications** – Muscle relaxants, pain relievers.
- **Surgical interventions** – In severe cases.

**Prognosis:**

- Recovery depends on the **cause, severity, and timely rehabilitation.**

Q4. Short notes on

(A) Genetic Counseling .

**:- Short Note on Genetic Counseling (4 Marks)**

**Definition:**

Genetic counseling is a **process of providing information, guidance, and support** to individuals or families who have a risk of inherited genetic disorders.

**Objectives:**

1. **Assess the risk** of genetic disorders in individuals or offspring.
2. **Educate patients** about genetic conditions, inheritance patterns, and possible outcomes.
3. **Support decision-making** for reproductive choices, disease management, and preventive measures.
4. **Recommend genetic testing** if needed.

**Who Needs Genetic Counseling?**

- Couples with a **family history of genetic disorders** (e.g., thalassemia, sickle cell anemia).
- **Pregnant women** with abnormal prenatal screening results.
- Parents of children with **congenital disabilities**.
- Individuals with a **history of recurrent miscarriages**.
- People with a family history of **cancer or hereditary diseases**.

**Benefits:**

- Helps in **early detection and prevention** of genetic diseases.



- Provides **emotional and psychological support**.
- Aids in **informed decision-making** regarding family planning and treatment options.

(B) Prenatal testing and diagnosis.

### **:- Short Note on Prenatal Testing and Diagnosis**

#### **Definition:**

Prenatal testing and diagnosis involve medical tests performed during pregnancy to detect **genetic, chromosomal, or structural abnormalities** in the developing fetus.

#### **Types of Prenatal Tests:**

1. **Screening Tests (Non-Invasive)** – Identify the risk of abnormalities but do not confirm the diagnosis.
  - **Ultrasound** – Detects structural defects (e.g., neural tube defects, heart abnormalities).
  - **Maternal Blood Tests** (e.g., Quad Screen, NIPT) – Screens for Down syndrome, trisomy 18, and neural tube defects.
2. **Diagnostic Tests (Invasive)** – Confirm the presence of genetic or chromosomal disorders.
  - **Amniocentesis** – A sample of **amniotic fluid** is taken to check for chromosomal abnormalities (e.g., Down syndrome).
  - **Chorionic Villus Sampling (CVS)** – A small tissue sample from the **placenta** is tested for genetic disorders.
  - **Fetal MRI** – Provides detailed imaging for structural abnormalities.

#### **Importance of Prenatal Testing:**

- **Early detection** of congenital disabilities and genetic disorders.
- Helps in **decision-making** for parents regarding pregnancy management.
- Allows for **early intervention and treatment planning** if needed.

Prenatal testing plays a **crucial role in ensuring fetal health** and guiding parental choices.

(c) Down Syndrome.

### **:- Short Note on Down Syndrome**

#### **Definition:**

Down Syndrome is a **genetic disorder** caused by the presence of an **extra copy of chromosome 21 (Trisomy 21)**, leading to **physical, intellectual, and developmental disabilities**.

#### **Causes:**

- **Trisomy 21 (95%)** – An extra full copy of chromosome 21 in all cells.
- **Mosaic Down Syndrome (1-2%)** – Some cells have an extra chromosome 21, while others are normal.

- **Translocation Down Syndrome (3-4%)** – A part of chromosome 21 attaches to another chromosome.

#### **Characteristics:**

- **Physical Features:**
  - Flat facial profile, small nose, upward-slanting eyes.
  - Short stature, single palmar crease, low muscle tone.
- **Intellectual Disabilities:**
  - Delayed speech and cognitive development.
  - Mild to moderate intellectual disability.
- **Health Issues:**
  - Congenital heart defects, hearing loss, vision problems.
  - Increased risk of thyroid disorders and leukemia.

#### **Diagnosis:**

- **Prenatal Testing:** Non-Invasive Prenatal Testing (NIPT), Amniocentesis, Chorionic Villus Sampling (CVS).
- **Postnatal Diagnosis:** Karyotyping (chromosome analysis).

#### **Management:**

- **Early intervention** (speech, occupational, and physical therapy).
- **Regular health check-ups** for associated medical conditions.
- **Special education and supportive care** for cognitive development.

With proper care, individuals with Down Syndrome can lead fulfilling lives with varying degrees of independence.

(d) Gene Therapy.

#### **:- Short Note on Gene Therapy**

##### **Definition:**

Gene therapy is a **medical technique that involves modifying or replacing defective genes** to treat or prevent genetic disorders and diseases. It aims to correct the underlying cause of a disease at the genetic level.

##### **Types of Gene Therapy:**

1. **Somatic Gene Therapy** – Targets **body (somatic) cells**, affecting only the treated individual (e.g., for cancer, cystic fibrosis).
2. **Germline Gene Therapy** – Alters **egg or sperm cells**, making changes inheritable (currently not widely used due to ethical concerns).

### Techniques Used:

- **Gene Replacement** – Defective gene is replaced with a normal one.
- **Gene Editing (CRISPR-Cas9)** – Specific gene sequences are modified or corrected.
- **Gene Addition** – A healthy gene is introduced without removing the defective one.

### Applications of Gene Therapy:

- **Genetic Disorders** – Treats diseases like **cystic fibrosis, sickle cell anemia, hemophilia**.
- **Cancer Treatment** – Modifies immune cells (e.g., CAR-T cell therapy).
- **Neurological Diseases** – Used in research for **Parkinson's and Alzheimer's disease**.

### Challenges & Ethical Issues:

- High cost and complex procedures.
- Potential risks like **immune reactions or unintended genetic mutations**.
- Ethical concerns in **germline gene therapy**.

Gene therapy is a **revolutionary approach** in medicine with potential for curing previously untreatable diseases.