

# BIO-2600: PATHOPHYSIOLOGY

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## Cuyahoga Community College

**Viewing: BIO-2600 : Pathophysiology**

**Board of Trustees:**

March 2025

**Academic Term:**

Summer 2025

**Subject Code**

BIO - Biology

**Course Number:**

2600

**Title:**

Pathophysiology

**Catalog Description:**

General mechanisms of disease processes and health problems including inflammation, degeneration, immunity, congenital, hereditary, and neoplasia as well as diseases caused by deficiencies or excesses. The most commonly occurring diseases of body systems are surveyed

**Credit Hour(s):**

3

**Lecture Hour(s):**

3

**Lab Hour(s):**

0

**Other Hour(s):**

0

## Requisites

**Prerequisite and Corequisite**

BIO-2341 Anatomy and Physiology II.

## Outcomes

**Course Outcome(s):**

Compare, explain, and evaluate scientific aspects of disease using appropriate vocabulary related to the language of disease processes in pathology and pathophysiology.

**Objective(s):**

1. Evaluate common terms used to describe diseases such as lesions, organic and functional disease, symptomatic and asymptomatic disease, etiology, and pathogenesis.
2. Describe the major categories of human disease.
3. Evaluate the approach that a practitioner uses to make a diagnosis and decide on a patient's treatment.
4. Describe various diagnostic tests/studies and procedures that can help a practitioner in making a diagnosis and deciding on proper treatment.
5. Describe how cells are organized to form tissues and how tissues are organized to form organ systems.
6. Describe how cells utilize the genetic code within DNA to convey genetic information to daughter cells during cell division (mitosis) in both somatic and germ cells (meiosis).
7. Explain the process by which the DNA in the nucleus directs the synthesis of enzymes and other proteins in the cytoplasm.
8. Explain how an aging cell becomes increasingly vulnerable to injury.

9. Explain how cells adapt to changing conditions: atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia, and increased enzyme synthesis.
10. Compare mechanisms of cell injury (reversible and irreversible) and cell death (necrosis, apoptosis).

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**Course Outcome(s):**

Evaluate the pathophysiology of disease of the following body systems: cardiovascular, central/peripheral nervous system, genitourinary, gastrointestinal, hepatobiliary, musculoskeletal, endocrine, respiratory, and dermatological.

**Objective(s):**

1. Evaluate the pathophysiology of vascular diseases including the diagnostic instruments and tests used to screen for and detect diseases of the cardiovascular system.
2. Describe the most common congenital anomalies of the cardiovascular system.
3. Describe common physical signs and symptoms that indicate cardiovascular disease.
4. Evaluate the types of trauma and physical injury as well as the resulting burden of the sequelae due to trauma.
5. Evaluate peripheral nervous system diseases including focal and generalized neurological deficits.
6. Evaluate the pathophysiology and treatment for conditions of the female reproductive system.
7. Evaluate the pathophysiology and treatment of conditions commonly encountered in pregnancy.
8. Evaluate the pathophysiology of diseases and dysfunction of the male genital tract.
9. Evaluate the pathophysiology of diseases and dysfunction of the renal system.
10. Evaluate the syndromes related to excess or deficiency of endocrine hormones including the role of laboratory analysis.
11. Evaluate the pathophysiology of adult and pediatric diseases of the respiratory system.
12. Evaluate the pathophysiology of musculoskeletal diseases in the adult and pediatric population.
13. Evaluate the pathophysiology of diseases of the gastrointestinal system.
14. Evaluate the pathophysiology of diseases and disorders of the dermatological system.

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**Course Outcome(s):**

Integrate physiology and pathology to describe disease processes of body systems including diagnosis, treatment, morbidity, and mortality as well as prevention.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. Relate incidence, prevalence, morbidity, mortality, prevention, risk-factors for diseases of the following body systems: cardiovascular, central/peripheral nervous system, genitourinary, gastrointestinal, hepatobiliary, musculoskeletal, endocrine, respiratory, and dermatological.
2. Develop local public health strategies for the prevention of acute and chronic health problems in vulnerable populations such as the uninsured and the under-insured.

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**Methods of Evaluation:**

1. Examinations
2. Quizzes
3. Clinical case study evaluations and analysis

**Course Content Outline:**

1. General Concepts of Disease: Principles of Diagnosis
  - a. Descriptive terms for disease
    - i. Lesions
    - ii. Organic disease
    - iii. Functional disease
    - iv. Symptomatic disease
    - v. Asymptomatic disease

- vi. Etiology
- vii. Pathogenesis/pathology
- b. Major categories of human disease
  - i. Acute disease
  - ii. Chronic disease
- c. The process of making a diagnosis
  - i. Patient history
  - ii. Physical examination
  - iii. Diagnostic tests/procedures
  - iv. Assessment/Differential Diagnosis
- d. The process of treating a disease
- 2. Cellular Injury and Dysfunction
  - a. Normal cellular/tissue/organ organization
    - i. Cell division
      - 1. Mitosis
      - 2. Meiosis
      - 3. Protein/enzyme synthesis
  - b. Cellular aging
  - c. Cellular adaptations to environmental change
    - i. Atrophy
    - ii. Hypertrophy
    - iii. Hyperplasia
    - iv. Metaplasia
    - v. Dysplasia
    - vi. Increased enzyme synthesis
  - d. Cellular accumulations
    - i. Amyloid
    - ii. Iron
    - iii. Fat
  - e. Cellular injury mechanisms
    - i. Reversible injury
    - ii. Irreversible injury
  - f. Cell death
    - i. Necrosis
    - ii. Apoptosis
- 3. Inflammation
  - a. Acute inflammation components
    - i. Fluid findings
    - ii. Inflammatory cells
    - iii. Resolution
  - b. Chronic inflammation components
    - i. Fluid findings
    - ii. Inflammatory cells
    - iii. Resolution
  - c. Clinical components of inflammation
    - i. Fluid findings
      - 1. Serous exudate
      - 2. Purulent exudate
      - 3. Fibrinous exudate
      - 4. Hemorrhagic exudate
      - 5. Transudate mechanisms
  - d. Chemical mediators of inflammation
    - i. Cytokines
    - ii. Chemokines
    - iii. Plasma and cellular mediators
      - 1. Complement system
      - 2. Human leukocyte antigen system
  - e. Clinical outcomes of an inflammatory reaction

- i. Healing/repair
  - ii. Fibrosis
- f. Harmful effects of inflammation in infection
  - i. Autoimmune disorders
  - ii. Immunodeficiency diseases
    - 1. T-cell and B-cell disorders
    - 2. Common variable immunodeficiency
    - 3. Severe combined immunodeficiency
  - iii. Acquired immunodeficiency syndrome
  - iv. Connective tissue diseases
    - 1. Systemic lupus erythematosus
    - 2. Progressive systemic sclerosis
    - 3. Sjogren syndrome
    - 4. Polymyositis/dermatomyositis
    - 5. Prevention
      - a. Immunomodulating agents
    - 6. Hypersensitivity diseases
      - a. Type 1
      - b. Type 2
      - c. Type 3
      - d. Type 4
- 4. Hereditary/Congenital/Developmental Diseases
  - a. Modes of transmission of genetic diseases
    - i. Autosomal dominant
    - ii. Autosomal recessive
    - iii. Sex-linked
    - iv. Mitochondrial
    - v. Multifactorial inheritance
  - b. Congenital malformations
    - i. Incidence
    - ii. Effects
  - c. Genetic abnormalities
    - i. Chromosomal defects
      - 1. Sex chromosome defects
        - a. Klinefelter syndrome
        - b. Turner syndrome
        - c. XYY/XXX
      - 2. Autosomal chromosomal defects
        - a. Trinucleotide repeats
        - b. Fragile X
      - 3. Aneuploidy
      - 4. Trisomies (21, 15, and 18)
      - 5. Polyploidy
      - 6. Deletions
        - a. Cri du chat
      - 7. Inversions/translocations
    - ii. Genomic imprinting disorders
      - i. Prader-Willi syndrome
      - ii. Angelman syndrome
  - d. Intrauterine injuries
    - i. Etiology
    - ii. Pathophysiology
  - e. Autosomal dominant disorders
    - i. Polycystic kidney disease (adult)
    - ii. Familial hypercholesterolemia
    - iii. Marfan syndrome
    - iv. Neurofibromatosis (Type 1 and 2)
  - f. Autosomal recessive disorders

- i. Tay-Sachs disease
  - ii. Gaucher disease
  - iii. Phenylketonuria
  - iv. Cystic fibrosis
- h. X-linked disorders
  - i. Hemophilias
- i. Laboratory testing
  - i. Amniocentesis
  - ii. Chorionic villus sampling
- 5. Nutritional Disorders
  - a. Malnutrition
    - i. Marasmus
    - ii. Kwashiorkor
  - iii. Vitamin deficiencies/excesses
    - 1. Water-soluble vitamin disorders
    - 2. Fat-soluble vitamin disorders
  - b. Eating disorders
    - i. Anorexia nervosa
    - ii. Bulimia nervosa
    - iii. Obesity
- 6. Infectious Disease Disorders
  - a. Bacterial diseases
    - i. Pyogenic bacterial infections
      - 1. Staphylococcal infections
      - 2. Streptococcal infections
      - 3. Gram-negative enteric bacterial infections
        - a. Escherichia coli
      - 4. Neisseria infection
      - 5. Legionella infection
    - ii. Bacterial infections mediated by exotoxins
      - 1. Clostridium infections
      - 2. Vibrio infections
      - 3. Anthrax
    - iii. Zoonotic bacterial infections
      - 1. Lyme disease
      - 2. Salmonellosis
      - 3. Plague
      - 4. Tularemia
      - 5. Brucellosis
    - iv. Other important bacterial infections
      - 1. Mycobacterium infections
      - 2. Whooping cough
      - 3. Haemophilus influenzae
      - 4. Diphtheria
  - b. Rickettsial infections
    - i. Rocky mountain spotted fever
  - c. Viral infections
    - i. Viral diseases of childhood
      - 1. Measles
      - 2. Mumps rotavirus
      - 3. Varicella zoster
      - 4. Polio
      - 5. Epstein-Barr viral diseases
    - ii. Upper respiratory tract infection
      - 1. Influenza
      - 2. Rhinoviral infections
    - iii. Viral infections of the skin and mucous membranes
      - 1. Human papilloma virus
    - iv. Other viral infections

1. Rabies
  2. Cytomegalovirus
  - v. Emerging viral diseases
    1. Epidemic/pandemic
      - a. Influenza
      - b. Ebola
      - c. SARS-CoV-2
  - vi. Fungal infection
    1. Histoplasmosis
    2. Coccidioidomycosis
    3. Blastomycosis
    4. Cryptococcosis
    5. Candida
    6. Aspergillus
    7. Mucor
    8. Pneumocystis
  - vii. Protozoal diseases
    1. Toxoplasmosis
    2. Cryptosporidium
    3. Malaria
    4. Giardia
    5. Amebiasis
    6. Trypanosomiasis
    7. Leishmaniasis
    8. Cryptosporidiosis
  - viii. Helminth infections
    1. Pinworms
    2. Trichinosis
    3. Schistosomiasis
    4. Trichuriasis
    5. Cysticercosis
    6. Echinococcosis
    7. Ascariasis
    8. Filariasis
  - ix. Prion protein infections
    1. Creutzfeldt-Jakob disease
  - x. Spirochete diseases
    1. Syphilis
7. Neoplastic Pathophysiology
- a. Cell cycle genetics
    - i. Proto-oncogenes
    - ii. Oncogenes
    - iii. Tumor suppressor genes
  - b. Cell population types and behavior
    - i. Labile
    - ii. Stable
    - iii. Permanent
  - c. Hyperplasia
  - d. Dysplasia
  - e. Neoplasms
  - f. Hypertrophy
  - g. Benign tumors
  - h. Malignancy
    - i. Transformation
    - ii. Metastasis
    - iii. Staging and prognosis
    - iv. Treatment strategies
  - i. Risk factors and development of cancer

- i. Screening
  - ii. Prevention
- j. Types of cancers
  - i. Carcinoma
  - ii. Sarcoma
  - iii. Age-related cancers
  - iv. Manifestations of cancers
- 8. Hematological Pathophysiology
  - a. Red cell disorders
    - i. Anemia
    - ii. Polycythemia
  - b. White cell disorders
    - i. Leukopenia
    - ii. Leukocytosis
    - iii. Leukemia
    - iv. Lymphoma
  - c. Platelet disorders
    - i. Thrombocytopenia
    - ii. Thrombocytosis
- 9. Body Fluid Disorders
  - a. Disorders of body pH
  - b. Disorders of fluid balance
    - i. Edema
    - ii. Shock states
      - 1. Cardiogenic shock
      - 2. Hemorrhagic shock
      - 3. Distributive shock
        - a. Sepsis
        - b. Neurogenic
  - c. Thrombosis
    - i. Venous thrombosis
      - 1. Pulmonary embolism
      - 2. Deep-vein thrombosis
    - ii. Arterial thrombosis
  - d. Clotting disorders
    - i. Hemostasis disorders
- 10. Female Reproductive System Disorders
  - a. Etiology
    - i. Menstrual cycle disorders
      - 1. Dysfunctional uterine bleeding
      - 2. Peri-menopause disorders
      - 3. Menopause disorders
    - ii. Clinical testing
      - 1. Normal and abnormal Pap smears/cytology
      - 2. Colposcopy
      - 3. Cone biopsy
      - 4. Dilation and curettage/laparoscopy/laparotomy
      - 5. Ultrasound
    - iii. Female genital dermatological disorders
      - 1. Vaginal itching
      - 2. Vulvar itching
    - iv. Endometriosis
    - v. Polycystic ovarian syndrome/obesity
    - vi. Sexually transmitted diseases
      - 1. Gonorrhea
      - 2. Syphilis
      - 3. Trichomonas
      - 4. Bacterial vaginosis
      - 5. Chlamydia
    - vii. Neoplasms of the female genital tract

1. Ovarian cancer
    2. Uterine cancer
    3. Leiomyoma
    4. Cervical cancer
  - b. Pathophysiology of pregnancy
    - i. Ectopic pregnancy
    - ii. Abortion
      1. Spontaneous abortion
      2. Elective abortion
    - iii. Abnormal placentation
      1. Placental abruption
    - iv. Preeclampsia and Eclampsia
    - v. Gestational trophoblastic disease
  - c. Infertility
11. Breast Pathology
  - a. Benign diseases
    - i. Fibrocystic breast disease
    - ii. Fibroadenoma
    - iii. Phyllodes tumor
    - iv. Mastitis
  - b. Malignant breast disease
    - i. In-situ tumors
    - ii. Invasive tumors
    - iii. Screening and mammography
12. Male Reproductive System Disorders
  - a. Developmental disorders
    - i. Cryptorchidism
    - ii. Hypospadias
    - iii. Hernia
    - iv. Hydrocele
    - v. Varicocele
  - b. Inflammatory disorders
    - i. Phimosis
    - ii. Paraphimosis
    - iii. Balanitis
    - iv. Epididymitis
    - v. Prostatitis
    - vi. Orchitis
  - vii. Sexually transmitted diseases
    1. Gonorrhea
    2. Syphilis
    3. Chlamydia
  - c. Testicular torsion
  - d. Hyperplastic/neoplastic disorders
    - i. Benign prostatic hypertrophy
    - ii. Prostatic cancer
    - iii. Testicular cancer
    - iv. Penile cancer
13. Dermatological pathology
  - a. Skin structure
    - i. Epidermis
    - ii. Dermis
  - b. Primary skin lesions
  - c. Secondary skin lesions
  - d. Benign skin disorders
    - i. Psoriasis
    - ii. Urticaria
  - e. Malignant skin disorders



- i. Basal cell carcinoma
  - ii. Squamous cell carcinoma
  - iii. Melanoma
- 14. Gastrointestinal and Aerodigestive Pathophysiology
  - a. Upper gastrointestinal tract
    - i. Oral and upper respiratory tract pathology
      - 1. Cleft lip and cleft palate
      - 2. Malocclusion
      - 3. Dental caries
      - 4. Gingivitis
      - 5. Herpes stomatitis
      - 6. Upper respiratory/pharyngeal infection
      - 7. Sinusitis
      - 8. Allergic rhinitis
      - 9. Pleomorphic adenoma
    - 10. Carcinomas
      - a. Leukoplakia
      - b. Squamous Cell
      - c. Mucoepidermoid carcinoma
  - ii. Lower gastrointestinal tract disorders
    - 1. Genetic/developmental diseases
      - a. Hirschsprung disease
      - b. Meckel diverticulum
      - c. Esophageal atresia
      - d. Pyloric stenosis
      - e. Congenital diaphragmatic hernia
      - f. Imperforate anus
      - g. Fistula formation
    - 2. Inflammatory/degenerative disorders
      - a. Reflux esophagitis/hiatal hernia
      - b. Barrett esophagus
      - c. Gastritis
      - d. Peptic ulcer
      - e. Malabsorption syndromes
      - f. Infectious diarrhea and food poisoning
      - g. Hernia
      - h. Appendicitis
      - i. Inflammatory bowel disease
      - j. Pseudomembranous colitis
      - k. Colonic diverticulitis/diverticulosis
      - l. Colonic polyps
    - m. Hemorrhoids
    - n. Spontaneous bacterial peritonitis
    - o. Carcinoma of colon/rectum
  - 3. Liver, gallbladder, and pancreas
    - a. Genetic/developmental diseases
      - i. Biliary atresia
      - ii. Cystic fibrosis of the pancreas
    - b. Inflammatory/degenerative diseases
      - i. Viral hepatitis
      - ii. Chemical liver injury
      - iii. Steatosis/steatohepatitis
      - iv. Autoimmune hepatitis
      - v. Primary biliary cholangitis
      - vi. Primary sclerosing cholangitis
      - vii. Cholelithiasis/cholecystitis
      - viii. Pancreatitis
    - c. Neoplastic diseases

- i. Hepatocellular carcinoma
- ii. Pancreatic cancer
- iii. Cholangiocarcinoma
- d. Cirrhosis/portal hypertension

15. Endocrine Pathology

- a. Etiology
  - i. Pituitary
    - 1. Adrenocorticotrophic hormone excess
    - 2. Adrenocorticotrophic hormone deficiency
    - 3. Antidiuretic hormone excess
    - 4. Antidiuretic hormone deficiency
    - 5. Thyroid stimulating hormone excess/deficiency
  - ii. Thyroid hormone
    - 1. Thyroid hormone excess
    - 2. Thyroid hormone deficiency
    - 3. Calcitonin excess/deficiency
  - iii. Parathyroid pathology
    - 1. Parathyroid hormone excess/deficiency
  - iv. Adrenal pathology
    - 1. Addison' disease
    - 2. Cushing syndrome
  - v. Pancreatic islets of Langerhans pathology
    - 1. Diabetes mellitus
  - vi. Neoplastic endocrine disorders
    - 1. Pheochromocytoma
    - 2. Insulinoma
    - 3. Multiple endocrine neoplasia
    - 4. Pancreatic neuroendocrine tumor
    - 5. Adenoma
    - 6. Thyroid carcinoma
    - 7. Adrenal carcinoma
    - 8. Paraneoplastic syndrome(s)

16. Renal Pathology

- a. Symptoms
  - i. Urinary frequency
  - ii. Dysuria
  - iii. Nocturia
  - iv. Hematuria
  - v. Anuria
  - vi. Oliguria
  - vii. Urinary urgency
- b. Physical and laboratory examination of renal disease
  - i. Urinalysis
  - ii. Urine cytology
  - iii. Radiological studies
- c. Glomerular diseases
  - i. Nephrotic/nephritic syndrome
  - ii. Systemic lupus erythematosus
  - iii. Amyloidosis
- d. Infectious diseases
  - i. Upper urinary tract infection
  - ii. Lower urinary tract infection
- e. Renal calculi
- f. End-stage renal failure
  - i. Hemodialysis
- g. Neoplastic diseases
  - i. Renal dysplasia
  - ii. Renal cell carcinoma
  - iii. Polycystic kidney disease

- iv. Transitional cell carcinoma
- v. Urothelial carcinoma of the bladder
- 17. Respiratory System Pathology
  - a. Respiratory disorders of acid-base balance
    - i. Hypercapnia
    - ii. Hyperventilation
    - iii. Compensated respiratory disorders
  - b. Upper respiratory infections
    - i. Influenza
    - ii. Group A streptococcal pharyngitis
    - iii. Tonsillitis
    - iv. Laryngitis
    - v. Otitis media
    - vi. Croup
    - vii. Allergic rhinitis
  - c. Obstructive lung disorders
    - i. Asthma
    - ii. Emphysema
    - iii. Bronchiectasis
  - d. Restrictive lung disorders
    - i. Pneumonia
    - ii. Cystic fibrosis
    - iii. Tuberculosis
    - iv. Atelectasis
  - e. Traumatic restrictive lung disorders
    - i. Pneumothorax
    - ii. Hemothorax
  - f. Lung diseases of infancy and childhood
    - i. Hyaline membrane disease
    - ii. Diaphragmatic hernia
    - iii. Alpha-1-antitrypsin deficiency
  - g. Acute respiratory distress syndrome
    - i. Infections
    - ii. Trauma
    - iii. Aspiration/inhalation
    - iv. Iatrogenic
  - h. Pulmonary embolism
    - i. Sarcoidosis
  - j. Chronic diffuse interstitial disease
    - i. Pneumoconiosis
    - ii. Silicosis
  - k. Pulmonary neoplasms
    - i. Lung cancer
  - l. Respiratory failure
- 18. Cardiovascular Pathology
  - a. Congenital anomalies
    - i. Cyanotic
    - ii. Acyanotic
    - iii. Combined
    - iv. Lymphangioma
    - v. Hemangioma
  - b. Acquired heart disease
    - i. Atherosclerosis
      - 1. Arteriosclerosis
      - 2. Arteriolosclerosis
      - 3. Angina
      - 4. Myocardial infarction
      - 5. Cardiac tamponade
    - ii. Hypertension

1. Essential
    2. Secondary
  - c. Infective myocarditis
  - d. Cardiomyopathy
    - i. Restrictive
    - ii. Obstructive
  - e. Thrombophlebitis
  - f. Varicose veins
  - g. Cardiac death
  - h. Rheumatic heart disease
  - i. Congestive heart failure
    - i. Right heart failure-cor pulmonale
    - ii. Left heart failure
    - iii. Biventricular failure
  - j. Heart transplantation
19. Central and Peripheral Nervous System Disorders
- a. Peripheral nervous system diseases
    - i. Hereditary motor disorders
    - ii. Sensory neuropathies
    - iii. Amyotrophic lateral sclerosis
    - iv. Myasthenia gravis
    - v. Guillain-Barre syndrome
    - vi. Diabetic neuropathy
    - vii. Radiculopathy disorders
  - b. Central nervous system disorders
    - i. Cerebrovascular accident
    - ii. Traumatic brain injury
    - iii. Epilepsy
    - iv. Encephalitis
    - v. Paresthesia
    - vi. Dysesthesia
    - vii. Cerebral herniation
    - viii. Congenital malformation
      - ix. Hydrocephalus
      - x. Anencephaly
      - xi. Cerebral palsy
    - xii. Congenital malformation
    - xiii. Meningomyelocele
    - xiv. Spina bifida
    - xv. Multiple sclerosis
    - xvi. Meningitis
    - xvii. Encephalitis
  - c. Degenerative diseases
    - i. Dementia
    - ii. Huntington's
    - iii. Parkinson's disease
  - d. Traumatic
    - i. Concussion/contusion
    - ii. Traumatic brain injury
    - iii. Epidural hematoma
    - iv. Subdural hematoma
    - v. Elevated intracranial pressure
  - e. Special senses
    - i. Hearing disorders
      1. Otosclerosis
      2. Vertigo
      3. Endolymphatic hydrops
      4. Conductive hearing loss

5. Sensory hearing loss
6. Presbycusis
- ii. Eye disorders
  1. Strabismus
  2. Cataract
  3. Glaucoma
  4. Hypertensive retinopathy
  5. Macular degeneration
  6. Diabetic retinopathy
  7. Hyperopia
  8. Presbyopia
  9. Astigmatism
  10. Retinoblastoma
  11. Malignant melanoma
- iii. Loss of taste and smell
  1. Anosmia
- f. Central and peripheral nervous system neoplasms
- g. Testing for central and peripheral nervous system disorders
20. Traumatic and physical Injury
  - a. Mechanical injuries
    - i. Missile wounds
    - ii. Major body trauma
    - iii. Abdominal injury
    - iv. Chest injury
    - v. Spinal injury
  - b. Thermal and electrical injury
    - i. Frostbite
    - ii. Heat injury
  - iii. Radiation injury
    1. X-rays
    2. Solar rays
    3. Gamma rays
    4. Electrical burns
    5. Thermal burns
21. Musculoskeletal Pathophysiology
  - a. Pathophysiology of joints and muscles
    - i. Bone pathology
      1. Neoplasms of bone
      2. Fractures
        - a. Pathological
        - b. Osteoporosis
        - c. Osteomalacia
      3. Genetic abnormalities
        - a. Achondroplasia
        - b. Brittle bone disease
    - ii. Joint pathology
      1. Arthritis
    - iii. Muscle pathology
      1. Muscular dystrophies
      2. Degenerative muscle diseases

## Resources

Loeffler, A. G. (2018) *Introduction to human disease: Pathophysiology for health professionals*, Jones & Bartlett Learning.

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(2023) *Robbins & Kumar basic pathology (11th ed.)*, Elsevier Inc.

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(2021) *Robbins & Cotran pathologic basis of disease (10th ed.)*, Elsevier Inc.

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Strayer, D. S., Rubin, E., Saffitz, J. E. & Schiller, A. L. (Eds.). (2015) *Rubin's pathology: Clinicopathologic foundations of disease (7th ed.)*, Wolters Kluwer.

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Reisner, E. G. & Reisner, H. M. (2020) *Crowley's an introduction to human disease pathology and pathophysiology correlations (11th ed.)*, Jones and Bartlett Learning.

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Alfrey, A. (2024) *Goljan rapid review pathology (6th ed.)*, Elsevier.

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Sens, M. A. & Hughes, R. (2021) *Diagnostic pathology: Forensic autopsy*, Elsevier Inc.

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## Resources Other

Clinical Cases

## Instructional Services

### OAN Number:

Transfer Assurance Guide OHL019

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