# General Pathology Objectives
## 2004-2005*

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*Under review as part of a project to develop a comprehensive set of national guidelines for second year pathology students.

**Topic number refers to MCA topic designation in the GRIPE question banks.
11 - PATHOLOGY AS A SPECIALTY

The student will be able to:

1. Define and use in proper context:
   - accuracy
   - analytic variable
   - anatomic pathology
   - autopsy
   - biopsy
   - clinical pathology
   - coefficient of variation
   - exfoliative cytology
   - false negative
   - false positive
   - fine needle aspiration
   - frozen section
   - histopathology
   - incidence
   - monitoring test
   - necropsy
   - pathologists
   - postanalytic variable
   - predictive value
   - reference range
   - sensitivity
   - specificity
   - specimen
   - standard deviation
   - true negative
   - true positive
   - turnaround time

2. Describe the activities of pathologists, including subdivisions of anatomic and clinical pathology (laboratory medicine).

3. Outline appropriate uses of:
   - clinical laboratories
   - necropsies (autopsies)
   - surgical pathology
   - frozen sections
   - cytopathology

4. State the individual responsible for authorizing a necropsy (autopsy) when death is due to natural causes, as well as when it occurs under unnatural circumstances.

5. Discuss relationships between:
   - pathology and basic sciences
   - pathology and clinical sciences

6. Calculate sensitivity and specificity from a 2 X 2 table

7. Compare and contrast precision and accuracy

8. Discuss development of "normal range", including reference group method, prognosis/treatment derived, threshold value, and therapeutic drug reference range.

9. Compare and contrast preanalytical, analytical, and postanalytical variables in laboratory testing, and give examples of each

10. Discuss the effects of sample handling on laboratory results, including turnaround time, type of tube used for blood collection, timing of collection, transport, and storage
12 - GENERAL ASPECTS OF DISEASE

*The student will be able to:*

1. Define and use in proper context:
   - brain death
   - diagnosis
   - differential diagnosis
   - disease
   - etiology
   - exacerbation
   - factitious
   - functional
   - abnormality
   - iatrogenic
   - idiopathic
   - lesion
   - morphology
   - mortality rate
   - natural history
   - nosocomial
   - pathogenesis
   - pathognomonic
   - prognosis
   - psychosomatic
   - remission
   - sign
   - somatic death
   - structural
   - abnormality
   - symptom
   - syndrome

2. Distinguish between disease and non-disease.

3. Outline a classification of causes of disease, basic responses of the body to injury, and manifestations of disease; and classify common examples in each category.

4. State the three most common causes of death in this country.
21 – CELL INJURY AND NECROSIS

The students will be able to:

1. Define and use in proper context:
   - agenesis
   - cellular swelling (hydropic change)
   - anthracosis
   - dysplasia
   - aplasia
   - hyperplasia
   - apoptosis
   - hypertrophy
   - atrophy
   - heat-shock protein
   - autolysis
   - hypoplasia
   - autophagy
   - karyolysis
   - bilirubin
   - karyorrhexis
   - cellular swelling (hyalin)
   - hyaline
   - lipofuscin
   - melanin
   - neoplasia
   - metaplasia
   - pyknosis
   - steatosis

2. Compare cell and tissue adaptation, reversible cell injury, and irreversible cell injury (cell death) on the basis of:
   - etiology
   - pathogenesis
   - morphologic appearance (ultrastructural and histologic)

3. Compare and contrast cell death and somatic death, on the basis of:
   - causes
   - pathogenesis
   - histologic appearance

4. Outline the relationships between:
   - biochemical
   - light microscopic
   - ultrastructural
   - changes in the processes of cell injury and death

5. Compare:
   - coagulative (coagulation) necrosis
   - liquefactive (liquefaction) necrosis
   - gangrenous necrosis
   - caseous necrosis
   - fat necrosis
   - fibrinoid necrosis
   - apoptosis

   in terms of:
   - common sites or tissues involved and reasons for this
   - common causes or causative mechanisms
   - gross and microscopic appearance
   - types and extent of healing

6. Compare and contrast the following types of cell injury:
   - reperfusion
   - free radical-induced
   - chemical
   - in terms of biochemical and molecular mechanisms
7. List the types of subcellular alterations that can occur in cell injury, with respect to the following organelles:
   - lysosomes
   - endoplasmic reticulum
   - mitochondria
   - cytoskeleton

8. Discuss the significance of intracellular accumulations of:
   - lipids
   - proteins
   - glycogen
   - pigments (exogenous and endogenous)

9. Compare fatty change (steatosis) and fatty infiltration on the basis of:
   - causes
   - pathogenesis
   - organs commonly involved
   - histologic appearances

10. Compare dystrophic and metastatic calcification in terms of:
    - definition
    - etiology and pathogenesis
    - morphologic appearance
    - sites and associated diseases
    - clinical significance
22 - INFLAMMATION

The student will be able to:

1. Define and use in proper context:
   - abscess
   - emigration
   - inflammation
   - resolution
   - autocrine
   - endocrine
   - margination
   - serosanguineous
   - cellulitis
   - erosion
   - paracrine
   - serous
   - chemotaxis
   - exudate
   - phagocytosis
   - suppurative
   - cytokine
   - fibrinous
   - purulent
   - transudate
   - edema
   - granulation tissue
   - pus
   - ulcer
   - effusion
   - granuloma
   - pyogenic

2. Describe the classic vascular changes and cellular events of the inflammatory reaction.

3. Discuss the five cardinal signs of inflammation in terms of pathogenesis and underlying morphologic changes.

4. Discuss the following chemical mediators of inflammation, in terms of origin (cells vs. plasma) and chief in vivo functions:
   - vasoactive amines
   - nitric oxide
   - proteases of clotting, kinin, complement systems
   - lysosomal granule contents
   - arachidonic acid metabolites
   - oxygen-derived free radicals
   - platelet activating factor
   - neuropeptides
   - cytokines/chemokines

5. Discuss each of the following in terms of the associated type of inflammation and their role therein:
   - platelets
   - lymphocytes
   - giant cells
   - mast cells/basophils
   - plasma cells
   - fibroblasts
   - neutrophils
   - eosinophils
   - cell adhesion molecules
   - endothelial cells
   - monocytes/macrophages/histiocytes

6. Describe the steps involved in the isolation and destruction of an infectious agent by polymorphonuclear leukocytes (neutrophils). Describe important related extracellular and intracellular factors.

7. Compare and contrast acute, chronic, and granulomatous inflammation in terms of:
   - etiology
   - pathogenesis
   - histologic appearance
   - laboratory findings
   - characteristic cells involved
   - outcome
   - systemic effects

8. Compare and contrast resolution and organization with respect to the termination of an inflammatory response.

9. Compare and contrast lymphangitis and lymphadenitis, in terms of:
   - etiology
   - pathogenesis
   - morphology
   - clinical features and course

10. Develop and utilize the nomenclature used to describe inflammation in the various tissues and organs.
23 - HEALING AND REPAIR

The student will be able to:

1. Define and use in proper context:
   - angiogenesis (neovascularization)
   - cicatrix
   - contact inhibition
   - contracture
   - dehiscence
   - fibrosis (fibroplasia)
   - granulation tissue
   - haptotaxis
   - keloid
   - organization
   - regeneration
   - repair
   - scar
   - stricture

2. Describe the cell cycle and define the single-lettered abbreviations (M, G₀, G₁, S, G₂).

3. Distinguish between labile, stable, and permanent cells, and place each of the following cell/tissue types into the appropriate category:
   - hematopoietic
   - muscular (smooth, skeletal, cardiac)
   - glandular parenchymal
   - neuronal
   - epithelial
   - glial
   - osseous and chondroid
   - connective

4. Discuss the basic aspects of collagen synthesis, degradation, and function, and state the tissue(s) in which collagen types I-IV are predominantly localized.

5. Discuss basement membranes with regard to morphology, composition, and function.

6. Compare and contrast:
   - resolution
   - regeneration
   - repair
   - organization

   in terms of:
   - type of antecedent injury
   - tissue involved
   - cellular response
   - time course
   - ultimate outcome
   - classic/common examples of each

7. State the role of each of the following components of the extracellular matrix:
   - collagen
   - laminin
   - elastin
   - integrin
   - fibrilllin
   - matricellular proteins
   - fibronectin
   - proteoglycans
   - hyaluronin

8. Describe how cells are attached to the extracellular matrix, and how these attachments may alter cell gene expression.

9. Describe the four steps of tissue repair, including the cell types and growth factors involved, and the approximate timetable for the tissue repair process.

10. Describe angiogenesis with regard to the time course and biochemical factors (growth factors, enzymes, etc.).
11. Discuss the role of each of the following in the repair reaction:
   - cell migration
   - integrins
   - growth factors

12. Describe the role of each of the following in the process of wound healing:
   - myofibroblasts
   - endothelial cells
   - fibroblasts
   - macrophages
   - collagen

13. Compare healing by first intention (primary union) and second intention (secondary union) in terms of time, sequence of events, morphologic changes, and final outcome.

14. Describe the local and systemic factors that influence wound healing, stating whether each of these influences accelerates or retards the rate of healing.

15. List the complications of wound healing.
**24 - GROWTH DISTURBANCES AND NEOPLASIA**

The student will be able to:

1. Define and use in proper context:
   - adenoma
   - desmoplasia
   - metastasis
   - sarcoma
   - anaplasia
   - DNA repair gene
   - microinvasion
   - scirrhous
   - angiogenesis
   - dysplasia
   - mixed tumor
   - serous
   - aplasia
   - endophytic
   - mucinous
   - stage
   - atrophy
   - exophytic
   - neoplasia
   - tumor
   - benign
   - grade
   - occult malignancy
   - tumor associated antigen
   - borderline malignancy
   - hamartoma
   - oncogene
   - tumor marker
   - cachexia
   - heterotopia
   - oncogenic
   - tumor specific antigen
   - cancer
   - hyperplasia
   - oncology
   - tumor suppressor gene
   - carcinoid
   - hypertrophy
   - papilloma
   - carcinogen
   - hypoplasia
   - paraneoplastic syndrome
   - carcinoma
   - in situ
   - parenchyma
   - carcinosarcoma
   - initiation
   - Philadelphia chromosome
   - choristoma
   - intraepithelial
   - pleomorphism
   - contact inhibition
   - invasion
   - point mutation
   - cystadenoma
   - leukoplakia
   - polyp
   - cystadenocarcinomas
   - low malignant potential
   - premalignant
   - differentiation
   - malignant
   - prognosis
   - dermoid
   - medullary
   - progression
   - desmoid
   - metaplasia
   - promotion
   - protooncogene

2. Discuss the following:
   - anaplasia
   - hyperplasia
   - aplasia
   - hypoplasia
   - atrophy
   - metaplasia
   - dysplasia
   - neoplasia
   - hypertrophy

   in terms of:
   - etiology
   - pathogenesis
   - morphology
   - functional sequelae
   - specific examples

3. Outline the classification and nomenclature for benign and malignant neoplasms, using appropriate prefixes and suffixes and indicating specific exceptions to rules of nomenclature.

4. Compare and contrast the following in terms of tissue of origin, gross and microscopic features, and mode of spread:
   - normal vs. neoplastic tissue
   - adenoma vs. carcinoma
   - carcinoma vs. sarcoma

5. List the general cytologic, biochemical, antigenic, metabolic, karyotypic, and molecular genetic changes found in neoplastic cells.

6. List the most common sites of origin of:
• adenocarcinoma
• squamous cell carcinoma
• melanoma
• cystadenoma
• adenoma
• papilloma

7. Compare and contrast grading vs. staging of neoplastic disease, in terms of:
   general principles
   clinical significance

8. Cite local and general mechanisms which are believed to affect the rate of tumor growth.

9. Discuss how tumor growth rates can be evaluated using mitotic rate and cell proliferation markers.

10. List four major pathways by which neoplasms spread.

11. Discuss metastasis of malignant neoplasms, in terms of:
    • molecular genetics
    • cellular adhesion
    • mechanisms of invasion of extracellular matrix
    • mechanisms of vascular dissemination and homing of tumor cells
    • tissues and organs in which metastases are:
      o common
      o uncommon
    and cite possible reasons for lack of metastases in some instances when cancer cells are spilled into the blood stream.

12. Describe carcinogenesis, in terms of:
    • initiation and neoplastic progression
    • sequence of gene mutations
    • tumor stemline and sidelines

13. Evaluate critically the role of each of the following in the development of human cancer, citing general significance and at least one specific neoplasm associated with each:
    physical agents               genetic diseases
    chemical agents               genetic predispositions
    infectious agents             hormones
    chronic inflammatory conditions immune response
    benign tumors

14. Match the following agents or conditions with neoplasms for which there has been a suggested relationship:
    cyclophosphamide                hepatitis B and C viruses
    circumcision                    Epstein-Barr virus
    tobacco                         human papillomavirus (HPV)
    smoked fish                     human immunodeficiency virus (HIV)
    aniline dyes                    human T cell leukemia/lymphoma virus, type 1 (HTLV-1)
    aflatoxin                       ultraviolet radiation
    asbestos                        ionizing radiation
    benzene                         radon
    2-naphthylamine                 heredity
    vinyl chloride                  hormonal imbalance
    Helicobacter pylori
15. Discuss precancerous lesions (incipient malignancies), in terms of:
   - definition
   - etiology
   - pathogenesis/growth kinetics
   - common examples

16. Describe the metaplasia → dysplasia → carcinoma-in-situ → invasive carcinoma sequence.

17. Discuss, compare, and contrast the following theories of origin of neoplasia:
   - multifactorial theory
   - genetic mutations
   - viral oncogene
   - epigenetic theory
   - immune-surveillance dysfunction
   - monoclonal origin
   - field origin

18. List the DNA viruses which have been linked to tumor formation in man and animals.

19. List the connections between viruses and tumors in terms of:
   - epidemiology
   - interactions of virus proteins with cell regulatory proteins
   - modulation of the host immune system

20. Contrast the mechanisms of neoplasm formation by DNA viruses with those by RNA viruses.

21. Discuss the relationship between protooncogenes and oncogenes, as well as the relationship between cellular oncogenes and viral oncogenes.

22. Compare and contrast protooncogenes and tumor suppressor genes, in terms of genotypic vs. phenotypic expression.

23. Explain the concept of recessive cancer gene.

24. Describe the following cancer-susceptibility syndromes:
   - ataxia-telangiectasia
   - Bloom syndrome
   - xeroderma pigmentosum
   - hereditary nonpolyposis colon cancer
   - Fanconi anemia
   - Li-Fraumeni syndrome
   - Cowden syndrome
   - familial adenomatous polyposis coli
   - von Hippel-Lindau disease

   in terms of:
   - genetic abnormality
   - mechanisms of oncogenesis
   - clinical features
   - associated neoplasms

25. Describe the following genes:
   - APC
   - DCC
   - p53
   - Rb
   - bel-2
   - ras
   - myc
   - c-erb B2
   - BRCA

   in terms of:
   - chromosomal location
   - mechanisms of oncogenesis
   - associated neoplasms

26. Discuss the following chromosomal translocations:
   - t(8;14)
- t(9;22)
  in terms of:
  - mechanisms of oncogenesis
  - associated neoplasms

27. Discuss dose dependency in chemical carcinogenesis.

28. Explain the carcinogenic effect of irradiation.

29. Cite evidence for estrogens as carcinogens.

30. Describe the body's immune system and its role in the development of neoplasms, and explain the following concepts:
   - anti-tumor immunity
   - immunologic surveillance

31. Discuss the different types of escape mechanisms utilized by neoplasms to evade the immunosurveillance system of an immunocompetent host.

32. Discuss tumor specific antigens and tumor related antigens, in terms of:
   - their presence on normal cells
   - their importance in anti-tumor immunity

33. Compare tumors transmitted by:
   - dominant inheritance
   - recessive inheritance
   on the basis of:
   - examples
   - incidence

34. Compare and contrast:
   - acquired cancer-causing genetic mutations
   - germline cancer-causing genetic mutations

35. Describe the indications, advantages, and disadvantages of the following diagnostic procedures and laboratory tests used to diagnose, and monitor the progression of, neoplasms:
   **Imaging**
   - conventional radiography
   - computed tomography (CT)
   - magnetic resonance imaging (MRI)
   - ultrasound
   - nuclear medicine
   - positron emission tomography (PET)
   **Histologic**
   - needle biopsy
   - open biopsy
   - frozen section
   - immunohistochemistry
   - electron microscopy
   **Cytologic**
   - exfoliative cytology
   - fine needle aspiration (FNA) cytology
   **Biochemical**
   - tumor markers
   **Molecular**
36. List the secretions or other fluids which are examined by cytologic means in the diagnosis of malignancy.

37. List the organs in which cytology plays an important role in cancer case findings.

38. Discuss the epidemiology of malignant neoplasms, in terms of:
   - incidence
   - prevalence
   - geographic associations
   - environmental factors
   - genetic factors
   - carcinogens
   - changing incidence
   - preneoplastic disorders
   - age associations

39. Discuss the following cancers:
   - carcinoma of: lymphomas
     - large bowel leukemias
     - breast bone cancer
     - lung skin cancers (squamous, basal cell, melanoma)
     - prostate brain tumors
     - bladder sarcoma in general
     - endometrium carcinoma in general
     - stomach squamous cell carcinoma
     - pancreas adenocarcinomas
     - cervix
     - ovary
   - in terms of:
     - relative frequency
     - relative fatality ratio
     - relative age and sex frequency
     - effects of medical care and age on incidence and mortality

40. For both males and females, list in descending order:
   - the five most common cancers
   - the five most common causes of cancer death

41. List the relative incidence of, and mortality due to, cancer for each sex and decade.

42. Discuss the mechanism by which neoplasms produce each of the following, listing neoplasms that are commonly associated with each effect:
   - anemia jaundice
   - ischemiaobesity masculinization
   - fever episodic flushing
   - leukocytosis hypercalcemia
   - leukopenia hemorrhage
   - infection thrombophlebitis
   - obstruction endocrine effects
   - pain fracture
   - itching

43. Match each of the following public health measures with appropriate neoplasms in which the measure may be of some use:
   - cytologic examination routine x-rays
   - avoidance of ionizing radiation self-examination
avoidance of excessive sunlight  routine laboratory studies
avoidance of tobacco     routine physical examination
cancer genetic studies

44. Cite examples of variations in types of neoplasms and incidence of neoplasms related to:
   • geographic location
   • age
   • sex
   • race
   • occupation
   • socioeconomic status

45. Cite at least three neoplasms that produce the same hormones as the organ from which the tumor arises.

46. Cite at least three examples of paraneoplastic syndromes.

47. Match each of the following tumor markers with the specific neoplasm(s) with which it is associated:
   • human chorionic gonadotrophin (HCG)
   • calcitonin
   • catecholamines
   • α-fetoprotein (AFP)

48. Contrast the effects of benign and malignant tumors on the host.

49. List the common signs and symptoms of malignancy.

50. List the common causes of death from cancer.
25 – GENETIC AND DEVELOPMENTAL DISORDERS

The student will be able to:

1. Define and use in proper context:
   - agenesis
   - aneuploid
   - aplasia
   - autosomal
   - balanced polymorphism
   - Barr body
   - buccal smear
   - carrier
   - chromosome
   - codon
   - congenital abnormality
   - congenital disease
   - deformation
   - deletion
   - developmental anomaly
   - diploid
   - DNA
   - dominant
   - double minute
   - dysmorphogenesis
   - embryonic period
   - embryopathy
   - euploid
   - expressivity
   - familial disease
   - fetal period
   - fragile site
   - fragile X syndrome
   - gene
   - genetic disease
   - genetic heterogeneity
   - genotype
   - homogeneously stained chromatin
   - inversion
   - karyotype
   - Laurence–D雷nce synd
   - linkage
   - Lyon hypothesis
   - malformation
   - meiosis
   - monosomy
   - mRNA
   - multifactorial inheritance
   - mutation
   - neonatal
   - nondisjunction
   - non-disjunction
   - operator gene
   - operon
   - genetic disease
   - organogenesis
   - penetrance
   - perinatal
   - phenotype
   - pleiotropy
   - polysomy
   - recessive
   - regulatory gene
   - replication
   - RNA
   - RNA transcript
   - sex-linked
   - structural gene
   - teratogenesis
   - transcription
   - translation
   - translocation
   - trisomy
   - tRNA

2. List at least three common congenital anomalies that involve each of the following organ systems:
   - general
   - soft tissues
   - bone

3. Provide at least three examples of:
   - causes
   - pathogenetic mechanisms
   - disturbed function
   for the development of congenital malformations

4. Discuss the following abnormalities:
   - anencephaly
   - bile duct atresia
   - cleft palate
   - atresia small intestine
   - atrial septal defect
   - diaphragmatic hernia
   - hypospadias
   - polycystic kidney
   - umbilical hernia
   - bifid uterus

in terms of:
   - cause
5. Identify factors which influence the type and extent of congenital anomalies produced by teratogenic agents.

6. List a maternal therapeutic agent which has been implicated in each of the following malformations:
   - phocomelia
   - goiter
   - clear cell carcinoma of the cervix

7. Describe the morphologic features of the embryopathies associated with ingestion of the following substances during pregnancy:
   - alcohol
   - hydantoin

8. Discuss the possible influence on oogenesis and spermatogenesis of maternal and paternal exposure to toxic agents.

9. Discuss five common genetic abnormalities in terms of:
   - pathogenesis
   - common feature
   - classification
   - examples

10. List three examples of each of the following types of genetic diseases:
    - simple (autosomal) dominant
    - simple (autosomal) recessive
    - sex-linked recessive
    - multifactorial inheritance

11. Given a family history, construct a pedigree using proper diagramming technique.

12. Given the mode of inheritance or a family history involving a disease with classic Mendelian inheritance, predict the likelihood of various phenotypes and genotypes in family members.

13. Discuss the use of chromatin (Barr) body identification in the recognition and diagnosis of chromosome disorders.

14. Compare chromosome analysis (karyotyping) and Barr body count (buccal smear) in terms of:
    - basic steps in performance of test
    - appropriateness in various types of clinical situations
    - costs and time involved
    - accuracy

15. Outline pathogenetic mechanisms of importance in the production of:
    - mutations
    - acquired congenital anomalies
    - nondisjunction
16. Discuss chromosomal abnormalities in terms of:
   • pathogenesis
   • classification
   • specific features of the more common examples

17. List probable causes and examples of mutation and acquired congenital anomalies.

18. Given photographs of karyotypes, determine the abnormalities in sex or autosomal chromosomes.

19. Distinguish on the basis of clinical signs and symptoms among:
   - trisomy 21 (Down) syndrome
   - trisomy 13 (D) syndrome
   - trisomy 18 (E) syndrome
   - Turner syndrome
   - Klinefelter syndrome
   - triple X female
   - double Y male

   and determine the sex and recognize the disease in each case from a photograph of a karyotype thereof.

20. Compare translocation and mosaic types of Down syndrome on the basis of:
   • karyotype
   • maternal factors
   • inheritance


22. Compare rubella infection and thalidomide ingestion in pregnant women in terms of epidemiology and developmental effects on the embryo and fetus.

23. Discuss the usefulness of the following laboratory tests in regard to genetic disorders and congenital malformations:
   • amniotic fluid analysis
   • tissue culture
   • buccal smear
   • chromosomal analysis

24. Discuss the following lysosomal storage diseases:
   • Tay-Sachs disease
   • Niemann-Pick disease
   • Gaucher disease
   • mucopolysaccharidoses
   • glycogen storage diseases

   in terms of:
   o enzyme deficiency
   o accumulating metabolite
   o key phenotypic features

25. Outline the pathogenesis of abnormalities in:
   - rubella syndrome
   - adrenogenital syndrome
   - alcoholic embryopathy
   - midgut volvulus
   - congenital small intestinal atresia
   - congenital cerebral palsy
   - aganglionosis

26. Discuss the various biochemical consequences of single gene defects.

27. Discuss the various methods of molecular hybridization in DNA probe analysis.
28. Outline the basic principles of recombinant DNA techniques and their applications in the detection of genetic diseases.
31-PHYSICAL INJURY

The student will be able to:

1. Define and use in proper context:
   - abrasion
   - acute radiation syndrome
   - avulsion
   - caisson disease
   - carcinogen
   - contusion
   - flashover
   - fouling
   - frostbite
   - full thickness burn
   - gray (Gy)
   - gunshot wound
   - heat cramps
   - heat exhaustion
   - heat stroke
   - hyperthermia
   - hypobaropathy
   - hypothermia
   - incision
   - injury
   - laceration
   - malignant hyperthermia
   - mutagen
   - partial thickness burn
   - puncture wound
   - rad
   - radon
   - rem
   - rule of nine
   - stab wound
   - stippling
   - the bends
   - the chokes
   - the staggers
   - unfairness
   - yaw

2. Compare and contrast:
   - abrasion
   - avulsion
   - contusion
   - incision
   - laceration
   - puncture wound
   - stab wound
   - puncture wound

   in terms of:
   - type of force (blunt vs. sharp) responsible
   - mechanism of production

3. Discuss, with specific examples, the ways in which clinical/gross and microscopic examination of injuries can aid in the following determinations:
   - antemortem vs. postmortem injury
   - age of antemortem injuries
   - instrument responsible for injury/death
   - including, for gunshot and shotgun wounds:
     - entrance vs. exit wound
     - range of fire

4. Describe the effects of the following characteristics of bullets, on the appearance and clinical effects of gunshot wounds:
   - mass
   - shape
   - deformation
   - fragmentation
   - yaw
   - velocity

5. Compare and contrast partial-thickness vs. full-thickness burns, in terms of:
   - morphology
   - systemic consequences
   - complications

6. Discuss hyperthermic reactions and hypothermic reactions, in terms of:
   - mechanisms
   - clinical manifestations
   - prognosis

7. Discuss the effects of electrical injuries in terms of:
   - resistance of tissue and voltage.
   - thermal vs. non-thermal effects
8. Discuss radiation injury in terms of:
   - sources of radiation
   - molecular effects
   - cellular effects
   - growth/developmental abnormalities
   - major morphologic changes [acute (early) vs. delayed (late)] in:
     - blood vessels
     - gastrointestinal tract
     - skin
     - hematopoietic/lymphoid tissues
     - heart
     - central nervous system
     - lungs

9. Discuss the following syndromes associated with whole-body exposure to ionizing radiation:
   - hematopoietic (bone marrow) syndrome
   - gastrointestinal syndrome
   - central nervous system (brain) syndrome

   in terms of:
   - etiologic radiation dose
   - pathogenesis
   - clinical manifestations
   - time to death

10. List the clinicopathologic effects on the human fetus of in utero exposure to ionizing radiation, and discuss these in terms of dosage and timing of radiation required

11. List the adverse effects of:
   - microwave radiation
   - electromagnetic fields
   - ultrasound

12. Discuss the following types of atmospheric pressure-related injury:
   - high altitude illness
   - blast (air vs. immersion) injury
   - air/gas embolism
   - decompression disease

   in terms of:
   - mechanisms
   - clinicopathologic manifestations
32 - CHEMICAL AND DRUG INJURY

The student will be able to:

1. Define and use in proper context:
   - adverse drug reaction
   - alcoholism
   - amphbole
   - analgesic nephropathy
   - anthracosis
   - asbestos
   - asbestosis
   - bagassosis
   - berylliosis
   - bioaccumulation
   - bioaerosol
   - biologic effective dose
   - biotransformation
   - bird-fancier’s lung
   - byssinosis
   - Caplan syndrome
   - chrysotile
   - cirrhosis
   - drug
   - drug abuse
   - drug-abuser's lung
   - emphysema
   - environmental health
   - environmental pathology
   - farmer's lung
   - fatty change
   - ferruginous body
   - fetal alcohol syndrome
   - fetal tobacco syndrome
   - illicit ("street") drug
   - lead line
   - Mallory body
   - mesothelioma
   - mycotoxin
   - nodule
   - ozone
   - pack-year
   - passive (sidestream) smoking
   - photochemical oxidant smog
   - phytotoxin
   - pleural plaque
   - pneumoconioses
   - pollutant
   - progressive massive fibrosis
   - reducing smog
   - salicylism
   - silicois
   - silo-filler’s disease
   - synergism
   - toxicity
   - toxicology
   - track mark
   - tumor initiator
   - tumor promoter

2. Discuss the following:
   - ozone
   - nitrogen dioxide
   - sulfur dioxide
   - acid aerosols
   - bioaerosols
   - carbon monoxide
   - cyanide
   - asbestos
   - in terms of:
     - role in indoor vs. outdoor air pollution
     - clinicopathologic effects

3. List the various substances found in cigarette smoke and their health effects.

4. Discuss the effects of:
   - active tobacco smoke
   - passive (sidestream) tobacco smoke
   - smokeless tobacco
   - in terms of:
     - magnitude of problem
     - resultant diseases

5. Outline the basic pathogenesis of pneumoconioses.

6. Compare and contrast the following pneumoconioses:
   - coal workers' pneumoconiosis
   - silicosis
   - asbestosis
   - berylliosis
   - in terms of:
     - types of occupational exposure
     - pathogenesis
7. Compare coal workers’ pneumoconiosis with simple asymptomatic anthracosis.

8. Discuss Caplan syndrome in relation to coal workers' pneumoconiosis, asbestosis, and silicosis.

9. Give examples of different forms of silica and differentiate between silicoproteinosis and classic nodular silicosis.

10. Describe the ways in which the following factors influence chemical injuries:
    - route of absorption
    - route of excretion
    - rate of excretion
    - biotransformation
    - bioaccumulation
    - physical properties of chemical
    - age of patient
    - nutritional status of patient
    - drug interactions

11. Compare and contrast toxic reactions to the following:
    - ethanol
    - methanol
    - ethylene glycol
    - cocaine
    - amphetamines
    - narcotics
    - hallucinogens
    - carbon monoxide
    - cyanide
    - hydrocarbons
    - lye
    - vinyl chloride
    - lead
    - mercury
    - organochlorine
    - insecticides
    - organophosphate
    - insecticides
    in terms of:
    - population(s) at risk
    - relative frequency
    - mechanism(s)
    - clinicopathologic manifestations
    - complications

12. Discuss ethanol in terms of:
    - effects ethanol on society
    - blood alcohol levels and their effects
    - metabolism and systemic effects of:
      - acute alcohol ingestion
      - chronic ethanol abuse

13. Discuss the following:
    - fetal alcohol syndrome
    - association of ethanol with cancer

14. Compare and contrast the two major types of adverse drug reactions (ADRs), in terms of:
    - mechanisms
    - agents most frequently implicated in each

15. Compare and contrast adverse reactions due to:
    - estrogens
    - oral contraceptives (OCPs)
    - salicylates
    - acetaminophen
    - antineoplasticss
    - immunosuppressives
    - antimicrobials
    in terms of:
    - relative frequency
    - mechanism(s)
    - clinicopathologic manifestations
33 - INFECTIOUS DISEASES

The student will be able to:

1. Define and use in proper context:
   - acid-fast stain
   - acquired immunodeficiency syndrome (AIDS)
   - bacillary angiomatosis
   - bacteremia
   - bacterium
   - botulism
   - carbuncle
   - carrier
   - cellulitis
   - chancre
   - chlamydia
   - chorioamnionitis
   - coinfection
   - condyloma acuminatum
   - condyloma latum
   - Councilman body
   - Cowdry type A inclusion
   - culture
   - cutaneous larva migrans
   - cyst
   - dermatophyte
   - diarrhea
   - dysentery
   - ectoparasite
   - encephalitis
   - encephalomyelitis
   - endemic
   - endocarditis
   - endoscopy
   - enteritis
   - epidemic
   - erysipelas
   - exotoxin
   - FTA-ABS
   - furuncle
   - gametocyte
   - gas gangrene
   - Ghon complex
   - Gram stain
   - Guarnieri body
   - gumma
   - helminth
   - hydatid
   - hypha
   - impetigo
   - inclusion body
   - incubation period
   - infection
   - infestation
   - koiocytosis
   - lepra cell
   - leprosy
   - lockjaw
   - lymphadenopathy
   - mad cow disease
   - meningitis (leptomeningitis)
   - merozoite
   - mold
   - molluscum body
   - mycelium
   - myctoma
   - mycobacterium
   - mycoplasma
   - myocarditis
   - Negri body
   - normal flora
   - oocyst
   - opportunistic infection
   - oral hairy leukoplakia
   - pandemic
   - parasite
   - pathogen
   - pathogenic
   - pelvic inflammatory disease
   - plague
   - pleocytosis
   - pneumonia
   - poliomyelitis
   - primary atypical pneumonia
   - prion
   - prion protein (PrP)
   - prodrome
   - progressive multifocal leukoencephalopathy
   - protozoan
   - pseudohypha
   - pseudomembranous colitis
   - purified protein derivative (PPD)
   - papid plasma reagen (RPR)
   - rickettsia
   - saprophyte
   - schizont
   - sepsis
   - septicemia
   - severe acute respiratory syndrome (SARS)
   - spherule
   - spongiform encephalopathy
   - sulfur granule
   - superinfection
   - swimmer's itch
   - tabes dorsalis
   - tetanus
   - toxemia
   - toxin
   - trench fever
   - trophozoite
   - tubercle
   - Tzanck smear
   - VDRL
   - vector
   - venereal
   - vertical transmission
   - viremia
   - virus
   - visceral larva migrans
   - xanthochromia
   - yeast
   - zoonosis

2. List and describe the different mechanisms of host barriers to infectious diseases
3. List host factors that predispose to infection
4. List three general ways in which infectious agents damage tissues
5. Discuss the different mechanisms of dissemination and transmission of microbial organisms.
6. Discuss the different mechanisms of bacterial-induced cellular and tissue injury including mechanisms of adhesions, exotoxins, and endotoxins.

7. Compare endotoxins and exotoxins on the basis of:
   - sources
   - effects
   - immunologic response

8. Discuss the specific mechanisms by which viruses enter host cells, replicate, and kill host cells.

9. Explain the events by which viruses may cause cell lysis or destruction in a permissive versus persistent infection.

10. Describe mechanisms by which infectious agents can evade the immune system.

11. Discuss the significance of:
    - pyogenic inflammation
    - granulomatous inflammation
    - caseous necrosis
    - gangrene
    - liquefactive necrosis
    in terms of:
    - possible causative agents
    - mechanism of reaction
    - morphologic features

12. Identify granulomatous inflammation and enumerate special stains needed to differentiate infectious etiologies thereof.

13. Compare and contrast the following types of infectious diseases:
    - bacterial
    - mycobacterial
    - fungal
    - rickettsial
    - viral
    - protozoan
    - helminthic
    - prion
    in terms of:
    - immunologic reactions
    - laboratory tests
    - histologic reaction
    - organ and tissue distribution

14. Compare and contrast respiratory infections due to the following agents:
    - rhinovirus
    - respiratory syncitial virus (RSV)
    - influenza virus
    - hantavirus
    - SARS-associated coronavirus (SARS-CoV)
    - pyogenic bacteria
    - Mycoplasma pneumoniae
    - Histoplasma capsulatum
    - Coccidiodes immitis
    - Blastomyces dermatitidis
    - Pneumocystis carinii
    - Legionella pneumophila
    in terms of:
    - characteristics of etiologic agent
    - epidemiology
    - agent and host factors related to transmission, invasion, survival, growth
    - pathogenesis
    - morphologic features
    - radiologic features
    - clinical features
    - laboratory findings
15. Compare and contrast gastrointestinal infections due to the following agents:
   - viral enteric pathogens
   - Shigella
   - Campylobacter
   - Yersinia
   - Salmonella
   - Escherichia coli
   - Vibrio cholerae
   - Clostridium difficile
   - Entamoeba histolytica
   - Giardia lamblia
   - Cryptosporidium parvum

   in terms of:
   - characteristics of etiologic agent, including toxin activity
   - epidemiology
   - agent and host factors related to transmission, invasion, and growth
   - region of gut affected
   - pathogenesis
   - morphologic features
   - clinical features
   - laboratory findings

16. Compare, contrast, and be discuss sexually transmitted diseases due to:
   - human immunodeficiency virus (HIV) 1 and 2
   - herpes simplex virus (HSV) 1 and 2
   - human herpes virus (HHV) 6 and 8
   - human papilloma virus (HPV)

   with regard to:
   - natural history
   - pathogenesis
   - morphology
   - clinical features and prognosis

17. Differentiate the oncogenic potential of the following types of HPV:
   - 6
   - 11
   - 16
   - 18

18. List extragenital pathologic processes produced by human papillomavirus

19. Describe genital molluscum contagiosum infection, in terms of:
   - etiologic organism
   - location of lesions
   - morphology
   - clinical consequences

20. Compare and contrast the following sexually transmitted diseases:
   - syphilis
   - gonorrhea
   - granuloma inguinale
   - chlamydial infections
   - chancroid
   - herpes simplex virus (HSV) infection
   - bacterial vaginosis
   - trichomoniasis
   - condylomata acuminata
   - crab louse infestation

   in terms of:
   - differences in males and females
   - etiologic agent
   - epidemiology
   - site and appearance of lesions
   - basic tissue response
   - clinical course
   - complications and prognosis
   - diagnostic procedure

21. Discuss staphylococcal infections with regard to:
22. Discuss streptococcal infections with regard to:
   - species (groups) causing disease
   - pathogenesis
   - syndromes
   - morphology

23. Compare and contrast streptococcal and staphylococcal infections, in terms of:
   - epidemiology
   - body sites involved
   - tissue reaction
   - clinical features
   - laboratory findings

24. Discuss Pseudomonas infections with regard to
   - associated conditions
   - pathogenesis
   - syndromes
   - morphology

25. Compare and contrast anaerobic infections caused by Clostridia with those caused by non-spore-forming anaerobes, in terms of:
   - characteristics of etiologic agent
   - epidemiology
   - agent and host factors related to transmission, invasion, growth, survival
   - pathogenesis
   - morphologic features
   - clinical features
   - laboratory findings

26. Discuss listeriosis in terms of:
   - etiology/morphology of the organism
   - epidemiology
   - food products linked to the disease
   - pathogenesis
   - morphologic changes in organs commonly involved
   - clinical presentation and course
   - methods of diagnosis

27. Compare and contrast actinomycosis and nocardiosis, in terms of:
   - epidemiology
   - etiology
   - pathogenesis
   - morphologic features of organism, including Gram and acid-fast staining reactions
   - tissue changes in organs commonly involved
   - clinical presentation
   - methods of diagnosis
   - clinical course

28. Compare and contrast the following infections:
   - measles (rubeola)
   - rubella
   - mumps
• poliovirus infection
• varicella-zoster infection

in terms of:
  o etiologic agent
  o epidemiology
  o agent and host factors related to transmission, invasion, survival, growth
  o pathogenesis
  o morphology/organs involved
  o clinical features in children and adults
  o laboratory findings

29. Compare and contrast whooping cough and diphtheria, in with regard to:
• etiologic organism
• epidemiology
• pathogenesis
• morphology
• clinical presentation

30. Discuss cytomegalic inclusion disease (CID) with regards to:
• etiologic organism
• modes of transmission
• associated conditions
• morphology
• clinical presentation

31. Compare and contrast the following fungal diseases:
    candidiasis
    blastomycosis
    cryptococcosis
    aspergillosis
    histoplasmosis
    mucormycosis
    sporotrichosis
    dermatophytosis

in terms of:
  name and morphology of etiologic organisms
  associated conditions
  syndromes
  pathogenesis

32. Discuss:
• *Pneumocystis carinii* infections
• cryptosporidial intestinal infections
• *Toxoplasma gondii* infections

in terms of:
  o associated conditions
  o inflammatory response
  o pathogenesis
  o morphology
  o clinical features

33. Discuss:
    plague
    tularemia
    anthrax
    cat-scratch disease
    Lyme disease
    relapsing fever
    rickettsial infections
    arboviral encephalitides
    Colorado tick fever
    dengue fever
    yellow fever
    viral hemorrhagic fevers
babesiosis in terms of:
  - etiologic organisms
  - vectors of transmission
  - morphology of lesions
  - clinical syndromes
  - diagnostic tests

malaria

34. Compare and contrast lepromatous leprosy and tuberculoid leprosy, in terms of:
- epidemiology
- etiology
- epidemiology
- pathogenesis
- location/morphology of lesions
- prognosis

35. Name the etiologic agent and vector of transmission responsible for each of the following:
- typhus fever rickettsialpox
- scrub typhus Q fever
- Rocky Mountain spotted fever ehrlichiosis

36. Discuss the following chlamydial diseases:
- trachoma
- inclusion conjunctivitis
- lymphogranuloma verereum (LGV)
- non-gonococcal urethritis
- ornithosis

in terms of:
  - etiologic organisms
  - epidemiology
  - pathogenesis
  - clinical features
  - morphologic features
  - diagnostic tests

37. Compare and contrast the following diseases:
- leishmaniasis lymphatic filariasis
- African trypanosomiasis oncocerciasis
- schistosomiasis loiasis
- Chagas disease

in terms of:
- epidemiology
- associated conditions
- etiologic organisms
- vectors of transmission
- pathogenesis
- syndromes
- morphology/organs
- involved
- laboratory findings

38. Discuss the following helminthic diseases:
- hookworm disease schistosomiasis
- trichinellosis lymphatic filariasis
- cysticercosis onchocerciasis
- hydatid disease

in terms of:
  - etiologic organisms
  - risk factors
39. Discuss the pathogenetic pathway of the infection of B lymphocytes by Epstein-Barr Virus (EBV) including the lytic phase and latent (cellular immortalization) phase. Compare the disease processes in each phase.

40. Compare and contrast the immune response to an EBV infection in an immunocompetent patient vs. that in an immunodeficient patient.

41. Using serological testing, differentiate between a patient with subclinical EBV infection, acute infectious mononucleosis, previous infection, reactivated infection, Burkitt lymphoma and nasopharyngeal carcinoma. Describe antibody reactions in immunodeficient patients exposed to Epstein-Barr Virus.

42. Discuss the following disorders:
   - Burkitt lymphoma
   - nasopharyngeal carcinoma
   in terms of:
     - epidemiology
     - pathogenesis
     - serologic findings
     - relationship to EBV

43. Compare and contrast the following central nervous system (CNS) infections:
   - acute meningitis (leptomeningitis)
   - aseptic meningitis
   - chronic meningitis
   - encephalitis
   - cerebritis
   - neurosyphilis
   in terms of:
     - etiologic agents
     - pathogenesis
     - morphology (gross and microscopic)
     - clinical presentation
     - methods of diagnosis
     - findings in cerebrospinal fluid

44. Discuss CNS abscesses and subdural empyema in terms of
   - pathogenesis,
   - etiologic agents
   - morphologic features

45. Discuss the following viral encephalitides:
   - rabies
   - arbovirus infections
   - herpes simplex virus infection
   - cytomegalovirus infection
   - papavovirus infection
   - subacute sclerosing panencephalitis
   in terms of:
     - etiopathogenesis
     - clinical features
     - morphologic features
46. List three common arbovirus infections of the CNS in the United States
47. Discuss the following types of spongiform encephalopathy caused by prions:
   - kuru
   - Creutzfeldt-Jakob disease (CJD)
   - variant CJD
   - Gerstmann-Sträusmann-Scheinker syndrome
   - fatal familial insomnia
   in terms of:
     - epidemiology
     - pathogenesis
     - clinical features
     - morphology
48. Discuss the following human immunodeficiency virus (HIV) infections of the CNS:
   - HIV meningoencephalitis (AIDS dementia)
   - vacuolar myelopathy
   in terms of:
     - pathogenesis
     - morphologic features
     - clinical manifestations
49. Discuss the following CNS complications of acquired immunodeficiency syndrome (AIDS):
   - toxoplasmosis
   - progressive multifocal leukoencephalopathy (PML)
   - primary CNS lymphoma
   in terms of:
     - etiologic agents
     - pathogenesis
     - morphologic features
     - clinical manifestations
50. Discuss human immunodeficiency virus (HIV) infections, in terms of:
    - characteristics of the etiologic agent
    - epidemiology
    - agent and host factors related to transmission, invasion, survival, and growth
    - pathogenesis
    - morphologic features
    - clinical course and complications
    - laboratory findings
51. List the most frequent infectious and neoplastic complications of acquired immunodeficiency syndrome (AIDS)
52. Discuss infectious diseases in patients with the following types of congenital primary immunodeficiency syndromes:
    - X-linked agammaglobulinemia (Bruton)  DiGeorge syndrome
    - common variable immunodeficiency  severe combined immunodeficiency disease
    - IgA deficiency  Wiskott-Aldrich syndrome
    - hyper IgM syndrome
    in terms of etiologic organisms and pathogenesis.
53. Discuss septicemia in terms of:
GRIPE General Pathology Objectives

Infectious Diseases

associated conditions clinical presentation
etiologic organisms laboratory diagnosis
pathogenesis clinical coarse
complications prognosis

54. Compare and contrast the acute and subacute forms of infectious endocarditis, in terms of:
- epidemiology
- etiologic organisms
- associated conditions
- pathogenesis
- clinical presentation
- clinical coarse
- prognosis

55. Discuss viral myocarditis in terms of:
- etiologic organisms
- pathogenesis
- morphology
- clinical presentation
- clinical course

56. Discuss infectious diseases to which burn patients are predisposed, in terms of etiologic organisms and pathogenesis

57. Discuss infectious diseases to which patients with diabetes mellitus are predisposed, in terms of etiologic organisms and pathogenesis

58. Compare and contrast hepatitis caused by the following viruses:
- hepatitis A virus (HAV)
- hepatitis B virus (HBV)
- hepatitis C virus (HCV)
- hepatitis D (delta) virus (HDV)
- hepatitis E virus (HEV)
- hepatitis G virus (es) (HGV)
- cytomegalovirus (CMV)
- Epstein-Barr virus (EBV)
in terms of:
- biological characteristics of virus
- nomenclature of antigens and antibodies
- epidemiology
- pathogenesis
- clinical presentation
- laboratory findings
- serologic findings at various stages in course of disease
- clinical features and complications, including propensity for chronicity
- carrier state
- differentiation from alcoholic and drug induced hepatitides

59. Compare and contrast acute, chronic, and xanthogranulomatous pyelonephritis with regard to:
- clinical presentation
- laboratory findings
- associated conditions
- etiology and pathogenesis
- morphology
- clinical course and prognosis

60. Compare hematogenous and ascending pyelonephritis in terms of pathogenesis and usual bacterial etiology.

61. Compare obstructive and reflux types of chronic pyelonephritis with regard to:
- pathogenesis
- morphology
- clinical course.
62. Discuss the following genitourinary infectious processes:
   • acute cystitis
   • xanthogranulomatous cystitis
   • malacoplakia
   in terms of:
     o etiology
     o pathogenesis
     o morphology
     o clinical features

63. Discuss prostatitis in terms of:
   o etiologic organisms
   o morphology
   o clinical features

64. Discuss post-streptococcal glomerulonephritis in terms of:
   o pathogenesis
   o clinical presentation,
   o morphology,
   o laboratory diagnosis
   o course/prognosis

65. Discuss the different mechanisms producing increased susceptibility of sickle cell patients to infections.

66. Discuss infections to which sickle cell disease patients are prone, in terms of:
   o etiologic agents
   o complications caused by the infectious agents sickle cell patients are predisposed to.

67. Discuss the utilization of blood cultures in the diagnosis of infectious diseases in terms of:
   o indications
   o quantity of blood cultures
   o timing of specimens
   o technique
   o false negative/false positive results.

68. Discuss the utilization of the following techniques in the diagnosis of upper and lower respiratory tract infections:
   • throat culture
   • sputum culture
   • tracheal aspirate
   • bronchoalveolar lavage (BAL)
   in terms of:
     o indications
     o techniques
     o adequacy of specimens
     o special procedures
     o interpretation of results

69. Discuss the utilization of urine cultures in the diagnosis of infectious diseases of the genitourinary tract in terms of:
   o indications,
   o technique
   o interpretation of results
70. Discuss the utilization of feces in the diagnosis of infectious diseases of the gastrointestinal tract in terms of:
   - indications
   - special procedures
   - technique
   - interpretation of results

71. List the types of specimen used in the diagnosis of:
   - wound infections
   - abscesses
   - skin lesions (vesicles, pustules)
   - body fluids other than CSF

72. Describe appropriate uses of the following techniques in the diagnosis of infectious diseases:
   - direct smear
   - KOH preparation
   - cytologic examination
   - histologic examination
   - Gram stain
   - silver stain
   - acid-fast stain
   - immunohistochemistry
   - electron microscopy
   - culture

73. Enumerate the methods for diagnosing viral infections
34 - IMMUNOPATHOLOGY

The student will be able to:

1. Define and use in proper context:
   - acute cellular rejection
   - acute necrotizing vasculitis
   - acute serum sickness
   - acute vascular rejection
   - allergen
   - amyloid
   - anaphylaxis
   - anergy
   - antibody
   - antibody-dependent cell mediated cytotoxicity
   - antibody-mediated cellular dysfunction
   - antigen
   - anti-nuclear antibodies (ANA)
   - antiphospholipid antibody syndrome
   - Arthus reaction
   - atopy
   - autoimmune hemolytic anemia
   - autoimmunity
   - cellular rejection (cell mediated)
   - central and peripheral tolerance
   - chronic transplant rejection
   - complement-dependent reaction
   - contact dermatitis
   - CREST syndrome
   - discoid and butterfly rash
   - drug induced lupus erythematosus
   - endothelitis
   - epithelioid macrophage
   - erythroblastosis fetalis
   - graft arteriosclerosis
   - graft-versus-host disease
   - granuloma
   - hematoxylin body
   - histamine
   - human leukocyte antigen (HLA) complex
   - humoral rejection
   - hyperacute rejection
   - hypercoagulable state
   - hypersensitivity reaction
   - immunity
   - immunologic tolerance
   - keratoconjunctivitis sicca
   - LE cell
   - lupus anticoagulant
   - Mikulicz syndrome
   - onion skin lesions
   - opsonization
   - pemphigus vulgaris
   - phagocytosis
   - post transplantation lymphoproliferative process
   - proliferative arteritis
   - rheumatoid factor
   - self tolerance
   - sicca syndrome
   - transthyretin
   - tubulitis
   - wire loop lesions
   - xerostomia
   - β₂-microglobulin
   - β-amyloid protein

2. Compare and contrast the four (4) types of immunologically mediated (hypersensitivity) disorders, in terms of:
   - terminology
   - definition
   - stimulating antigens
   - pathogenesis
   - mediators involved
   - cells involved
   - examples
   - morphologic features
   - clinical features
   - tissues involved

3. Compare and contrast the following types of type II hypersensitivity reaction:
   - complement dependent
   - antibody dependent cell mediated cytotoxicity
   - antibody mediated cellular dysfunction

   in terms of:
   - pathogenesis
   - examples
   - clinical features

4. Compare and contrast acute serum sickness and Arthus reaction, in terms of:
5. Compare and contrast delayed-type hypersensitivity and T cell-mediated cytotoxicity in terms of:
   - definitions
   - pathogenesis
   - morphology
   - resultant clinical features

6. Compare and contrast the following types of transplant rejection:
   - hyperacute rejection
   - acute rejection
   - chronic rejection
   in terms of:
   - etiology
   - pathogenesis
   - general morphology

7. Discuss bone marrow transplantation in terms of:
   - indications
   - acute and chronic graft vs. host disease
   - pathogenesis
   - clinical presentation
   - complications.

8. Compare and contrast renal, heart and liver transplants in terms of general morphology of hyperacute rejection, acute rejection and chronic rejection, and other complications.

9. Define immunologic tolerance and discuss different mechanisms of a tolerant state.

10. Discuss different mechanisms by which immune tolerance is lost in the general pathogenesis of autoimmune diseases.

11. Discuss the pathogenesis of autoimmune diseases in terms of genetic factors and effects of microbial agents.

12. Discuss the following disorders:
   - systemic lupus erythematosus (SLE)
   - discoid lupus erythematosus (DLE)
   - drug-induced lupus erythematosis
   - Sjögren syndrome
   - systemic sclerosis (scleroderma)
   - CREST syndrome
   - dermatomyositis
   - polymyositis
   in terms of:
   - incidence and prevalence
   - pathogenesis
   - genetic factors
   - laboratory diagnosis
   - age and sex association
   - morphology
   - clinical criteria for
   - clinical course
   - diagnosis
   - prognosis
   - etiology
   - associated disorders

13. Compare and contrast the five patterns (classes) of lupus nephritis, in terms of:
   - terminology
14. Correlate each of the following patterns of immunofluorescent staining for antinuclear antibodies with the specific antibody represented by each, and disease(s) associated with each:
   - homogeneous (diffuse)
   - rim (peripheral)
   - speckled
   - nucleolar

15. Match each of the following autoantibodies with the major autoimmune disease(s) with which it is associated:
   - antinuclear (ANA)
   - anti-Smith (Sm)
   - anti-double-stranded DNA
   - antiphospholipid
   - antihistone
   - anti-SS-A (Ro) and anti-SS-B (La)
   - anti-Scl-70
   - anticentromere
   - anti-nuclear RNP
   - anti-Jo-1

16. Compare and contrast the following immune deficiency syndromes:
   - X-linked agammaglobulinemia of Bruton
   - common variable immunodeficiency
   - DiGeorge syndrome (thymic hypoplasia)
   - severe combined immunodeficiency syndrome
   - Wiskott-Aldrich syndrome
   - C2 deficiencies
   - deficiency of C1 inhibitor (hereditary angioedema)
   - chronic granulomatous disease
   - myeloperoxidase deficiency

   in terms of:
   - genetics
   - etiology
   - pathogenesis
   - immunologic defect
   - morphology
   - clinical features
   - methods of diagnosis
   - therapeutic approach
   - complications and prognosis

17. Discuss secondary immunodeficiency syndromes in terms of etiologies.

18. Discuss acquired immunodeficiency syndrome (AIDS), in terms of:
   - definition and diagnostic criteria
   - incidence
   - epidemiology
   - risk factors
   - etiology
   - pathogenesis
   - immunologic defects
   - laboratory testing
   - associated infections and neoplasms
   - morphology
   - therapeutic approaches
   - complications and prognosis
35 – HEMODYNAMIC DISORDERS

The student will be able to:

1. Define and use in proper context:
   - hemostasis
   - coagulation
   - clot
   - thrombosis
   - thrombus
   - thrombocytopenia
   - thrombocytosis
   - thrombophlebitis
   - phlebothrombosis
   - embolism
   - embolus
   - lines of Zahn
   - organization
   - recanalization
   - infarct
   - pale
   - red
   - bland
   - septic
   - von Willebrand factor
   - idiopathic thrombocytopenic purpura (ITP)
   - thrombotic thromocytopenic purpura (TTP)
   - hemorrhage
   - occult bleeding
   - hemosiderin
   - petechia
   - ecchymoses
   - purpura
   - hematoma
   - epistaxis
   - hemoptysis
   - hematocleria
   - melena
   - hematuria
   - hemotherox
   - hemopericardium
   - fibrinolysis
   - hypofibrinolysis
   - thrombolysis
   - international normalized ratio (INR)
   - interntional sensitivity index (ISI)
   - factor V Leiden
   - hemophilia A
   - hemophilia B (Christmas disease)
   - hemostasis
   - coagulation
   - clot
   - thrombosis
   - thrombus
   - thrombocytopenia
   - thrombocytosis
   - thrombophlebitis
   - phlebothrombosis
   - embolism
   - embolus
   - lines of Zahn
   - organization
   - recanalization
   - infarct
   - pale
   - red
   - bland
   - septic
   - von Willebrand factor
   - idiopathic thrombocytopenic purpura (ITP)
   - thrombotic thromocytopenic purpura (TTP)
   - hemorrhage
   - occult bleeding
   - hemosiderin
   - petechia
   - ecchymoses
   - purpura
   - hematoma
   - epistaxis
   - hemoptysis
   - hematocleria
   - melena
   - hematuria
   - hemotherox
   - hemopericardium
   - fibrinolysis
   - hypofibrinolysis
   - thrombolysis
   - international normalized ratio (INR)
   - interntional sensitivity index (ISI)
   - factor V Leiden
   - hemophilia A
   - hemophilia B (Christmas disease)
   - fibrin degradation products (FDP)
   - d-dimer
   - hypercoagulable state
   - Virchow's triad
   - Trousseau syndrome
   - tissue plasminogen activator (tPA)
   - stasis
   - shock
   - reversible
   - irreversible
   - hyperemia
   - congestion
   - congestive heart failure
   - edema
   - inflammatory
   - noninflammatory
   - renal
   - lymphedema
   - anasarca
   - effusion
   - ascites
   - exudate
   - transudate

2. Outline the process of normal hemostasis, in terms of:
   - intrinsic pathway
   - extrinsic pathway
   - final common pathway
   - fibrin formation and fibrinolysis
   - protein C/protein S pathway
   - role of platelets
   - role of vascular integrity
   - events in dissolution of a thrombus
   - describing the role and interaction of each element involved in the process

3. Compare acute and chronic hemorrhage in terms of:
   - common causes
   - clinical manifestations
   - compensatory mechanisms

4. Describe thrombi in terms of:
   - types of thrombotic material
   - factors conditioning the development of thrombi
   - possible fate of thrombi

5. Distinguish between venous thrombi and arterial thrombi on the basis of:
   - etiologic and precipitating factors
6. Compare the following types of emboli:
   - arterial thrombotic
   - venous thrombotic
   - paradoxical
   - fat
   - bone marrow
   in terms of:
     - defining morphologic features
     - etiologic/precipitating factors
     - common sites of occurrence
     - type and size of vessels involved
     - complications
     - fate of lesion
     - organs commonly involved
     - common clinical manifestations

7. Compare and contrast arterial and venous infarcts on the basis of:
   - location
   - pathogenesis
   - morphology
   - clinical manifestations

8. Describe the morphologic appearance and natural history of infarcts of:
   - heart
   - kidney
   - lung
   - spleen
   - bowel
   - brain

9. Define, state the significance of, and identify on a peripheral blood smear each of the following:
   - platelet
   - giant platelet

10. Discuss thrombocytopoiesis in terms of:
    - morphology of megakaryocytes
    - fate of megakaryocytes
    - life span of platelets
    - factors which influence thrombocytopoiesis
    - abnormal morphologic forms of platelets and megakaryocytes

11. Discuss thrombocytopenia in terms of:
    - differential diagnosis
    - clinical features
    - bone marrow morphology and
    - laboratory features

12. Compare and contrast bleeding due to:
    - vascular defect (localized or generalized)
    - platelet defect
    - coagulation defect
    in terms of:
      - etiologic/precipitating factors
      - common sites of occurrence
      - organs commonly involved
      - type and size of vessels involved
13. Discuss thrombocytosis in terms of diagnosis and differential diagnosis

14. Outline the process for stepwise evaluation of a:
   - bleeding patient
   - patient with suspected platelet disorder
   - patient with suspected hypercoagulability

15. Compare and contrast the following disorders of platelets:
   - Glanzmann thrombasthenia
   - Chediak-Higashi syndrome
   - Bernard-Soulier disease
   - Hermansky-Pudlak syndrome
   - gray platelet syndrome
   - von Willebrand disease
   - HIV-associated thrombocytopenia
   - drug-induced thrombocytopenia

   in terms of:
   - definition
   - genetics
   - laboratory features including platelet aggregation patterns
   - clinical features

16. Categorize and discuss acquired disorders of platelet function in terms of etiology and pathogenesis.

17. Compare and contrast:
   - idiopathic thrombocytopenic purpura (ITP)
   - thrombotic thrombocytopenic purpura (TTP)
   - hemolytic-uremic syndrome (HUS)

   in terms of:
   - etiology
   - pathogenesis
   - clinical features
   - morphologic findings
   - clinicopathologic diagnosis

18. List and discuss the laboratory diagnostic procedures used to approach patients with:
   - bleeding disorders
   - thrombotic disorders

19. Compare and contrast bleeding disorders due to:
   - factor VII deficiency (hemophilia A)
   - factor IX deficiency (hemophilia B)
   - factor XI deficiency (hemophilia C)
   - von Willebrand disease
   - vitamin K deficiency
   - liver disease

   in terms of:
   - etiology (including genetics as appropriate)
   - pathogenesis
   - clinical presentation
   - laboratory diagnosis
   - clinical course

20. Discuss coagulopathies associated with systemic lupus erythematosus in terms of:
   - clinical presentation
21. Discuss disseminated intravascular coagulopathy (DIC) in terms of:
   o etiologies
   o pathogenesis
   o morphologic features
   o clinical presentation and course
   o laboratory diagnosis
   o complications and prognosis

22. Define the hypercoagulable state in terms of Virchow's triad

23. Describe the mechanism(s) by which the following affect hemostasis:
   o aspirin
   o coumadin (warfarin)
   o heparin
   and discuss the methods by which each is monitored

24. Describe the following stages of shock:
   • non-progressive (compensated)
   • progressive (decompensated)
   • irreversible
   in terms of:
   o pathophysiology
   o morphologic changes
   o prognosis

25. Compare and contrast the following types of shock:
   neurogenic                   septic
   normovolemic                cardiogenic
   hypovolemic                 anaphylactic
   hemorrhagic

   in terms of:
   o pathogenic mechanism
   o common causes
   o structural changes
   o functional changes
   o clinical features and prognosis

26. List the morphologic changes and functional effects of shock on:
   • lungs
   • kidneys
   • adrenals
   • brain
   • gastrointestinal tract

27. Compare and contrast:
   • respiratory acidosis
   • respiratory alkalosis
   • metabolic acidosis
   • metabolic alkalosis

   in terms of:
   o etiologies
   o pathophysiology
28. Compare:
   - right, left, and combined heart failure
   - acute and chronic heart failure
   in terms of:
     - pathogenic mechanisms
     - common causes
     - morphologic features
     - clinical manifestations

29. Compare and contrast active hyperemia and passive congestion, in terms of:
   - mechanisms of development
   - clinically important examples

30. Describe chronic passive congestion of:
   - lungs
   - liver
   - kidneys
   - spleen
   in terms of:
     - morphologic features
     - functional alterations

31. Discuss the pathogenesis of edema, giving examples associated with the following mechanisms:
   - altered plasma oncotic pressure
   - inflammation
   - venous obstruction/stasis
   - lymphatic obstruction
   and classify each in terms of localized vs. generalized

31. Compare edema of:
   - subcutaneous tissue
   - lungs
   - brain
   - kidneys
   on the basis of:
     - pathogenesis
     - morphologic changes
     - clinical effects
36 - METABOLIC DISORDERS

The student will be able to:

1. Define and use in proper context:
   - acute phase reactant
   - apolipoprotein
   - Bence-Jones protein
   - beta-gamma (β−γ) bridging
   - cholesterol
   - chylomicron
   - cryoglobulin
   - electrophoresis
   - gammopathy
   - high density lipoprotein (HDL)
   - immunofixation
   - isoelectric point
   - lecithin:cholesterol acyltransferase (LCAT)
   - low density lipoprotein (LDL)
   - MGUS
   - monoclonal (M) protein
   - oligoclonal band
   - paraprotein
   - prealbumin
   - total protein
   - triglyceride
   - very low density lipoprotein (VLDL)

2. Describe the major zones found in serum/urine/cerebrospinal fluid protein electrophoresis, and the major protein constituents of each zone.

3. Discuss the following conditions:
   - inflammation (acute, chronic)
   - nephrotic syndrome
   - cirrhosis
   - protein-losing enteropathy
   - hypoalbuminemia
   - α-1-antitrypsin deficiency
   - Tangier disease
   - hypo/agammaglobulinemia
   - cryoglobulinemia
   - polyclonal gammopathy
   - monoclonal gammopathy
   - light chain disease
   - multiple myeloma
   - Waldenström macroglobulinemia
   - in terms of:
     - pathogenesis
     - results expected on the following lab tests:
       - serum and urine albumin
       - serum and urine total protein
       - serum and urine protein electrophoresis
       - urine Bence-Jones protein

4. List common benign and malignant causes of monoclonal proteins

5. Discuss multiple sclerosis in terms of:
   - pathogenesis
   - results expected on cerebrospinal fluid electrophoresis

6. List the causes of:
   - hypoalbuminemia
   - hyperlipoproteinemia
   - hyperglycemia
   - hypoglycemia

7. Compare and contrast the genetic hyperlipoproteinemias, in terms of:
   - electrophoretic phenotype
   - genetic defect
   - increased lipoprotein class(es)
   - increased lipid class(es)
   - relative frequency
GRIPE General Pathology Objectives Metabolic Disorders

8. Discuss the significance of:
   - decreased HDL
   - increased LDL
   - elevated chylomicrons
   - markedly decreased cholesterol
   - LCAT deficiencies
   - lipoprotein lipase deficiencies
   - apolipoprotein deficiencies

9. Describe the proposed relationships between dietary lipids, serum lipids, and atherosclerosis.

10. Discuss the pathogenesis of fatty change of the liver and list diseases associated with this finding.

11. Describe normal insulin physiology in terms of:
   - glycogen formation
   - nucleic acid synthesis
   - protein synthesis
   - regulation of blood glucose levels

12. Describe insulin receptor concentration, and list conditions of decreased insulin receptor concentration.

13. List tissues for which glucose transport requires insulin as well as those for which glucose transport does not require insulin.

14. Define and use in proper context:
   - diabetes mellitus
   - insulin resistance
   - insulin
   - resistin
   - C-peptide
   - ketosis
   - primary diabetes
   - ketoacidosis
   - secondary diabetes
   - hyperosmolar nonketotic coma
   - prediabetes
   - microangiopathy
   - latent diabetes
   - hypoglycemia
   - gestational diabetes
   - metabolic syndrome (syndrome X)
   - “bronze” diabetes
   - Somogyi phenomenon
   - hyperglycemia
   - Whipple triad
   - hyperglycemia
   - microalbuminuria
   - impaired glucose tolerance
   - polyuria
   - glycosuria
   - polydipsia
   - insulitis
   - polyphagia
   - hyperinsulinemia
   - amylin (islet amyloid polypeptide, IAPP)
   - glycation (glycosylation)
   - glycosylated (glycated) hemoglobin
   - maturity-onset diabetes of the young (MODY)

15. Define diabetes mellitus and list the distinguishing features of type 1 and type 2 diabetes in terms of:
   - etiology and pathogenesis
   - role of inheritance and environmental factors
   - age and frequency
   - mode of onset
   - clinical and morphologic manifestations
   - insulin and glucose levels
   - insulin requirements
16. Describe the following lesions that may be found in diabetics:
- insulitis
- amylin deposition
- atherosclerosis
- diabetic microangiopathy
- pyelonephritis
- diffuse glomerulosclerosis
- nodular (intercapillary) glomerulosclerosis (Kimmelstiel-Wilson disease)

in terms of:
- pathogenesis
- morphologic appearance
- prevalence in diabetes
- relationship to severity and duration of diabetes
- specificity for diabetes
- relationship to serious manifestations of the disease
- prevention and treatment

17. Compare the incidence and distribution of micro- and macroangiopathy in diabetes.

18. Discuss diabetes mellitus in pregnancy in the context of:
- its incidence
- its effect on the mother
- its effect on the fetus and neonate

19. List diseases or conditions in which diabetes occurs as a secondary or accompanying phenomenon.

20. Discuss methods of screening patients for, and monitoring patients with, diabetes mellitus and impaired glucose tolerance., stating appropriate usage of the following laboratory tests:
- blood glucose concentration
- blood insulin concentration
- urine glucose concentration
- ketone bodies
- glucose tolerance test
- glycosylated hemoglobin level
- urine protein concentration

21. Discuss the relationship of diabetes mellitus to hypercholesterolemia, hypertiglyceridemia, and pregnancy (gestational diabetes)

22. Describe tests used to diagnose reactive hypoglycemia

23. Define and use in proper context:
- gout
- pseudogout
- tophus

24. Outline the sequence of pathogenetic biochemical and morphologic changes in gout

25. Compare and contrast:
- acute and chronic gout
- primary and secondary gout

in terms of:
- age and sex incidence
- etiology
- pathogenesis
26. Define and use in proper context:
   - amyloid
   - β-pleat
   - transthyretin
   - β2-microglobulin
   - β-amyloid protein
   - amyloid precursor protein (APP)

27. Describe amyloid in terms of:
   - distribution (organ and architecture)
   - gross appearance
   - microscopic and ultrastructural appearance
   - tinctorial properties

28. Compare and contrast the following:
   - immunocyte dyscrasias with amyloidosis (primary amyloidosis)
   - reactive systemic (secondary) amyloidosis
   - hemodialysis-associated amyloidosis
   - heredofamilial amyloidosis
   - localized amyloidosis
   - amyloid of aging
   - senile cerebral amyloidosis
   - endocrine amyloid
   - isolated atrial amyloidosis

in terms of:
   - chemical nature of amyloid involved
     major fibril protein
     chemically related precursor protein
   - etiology and pathogenesis
   - immunologic abnormalities
   - distribution of amyloid
   - associated diseases or conditions
   - clinical features
   - methods of diagnosis
37- MINERALS AND PIGMENTS

The student will be able to:

1. Define and use in proper context:
   • dystrophic calcification
   • metastatic calcification
   • hemosiderosis
   • hemochromatosis

2. Compare and contrast dystrophic and metastatic calcification, in terms of:
   • pathogenesis
   • location of lesions
   • associated diseases

3. List the mechanisms of iron deficiency and serum ferritin excess, along with common examples, and predict effects on serum iron and iron binding capacity

4. Compare and contrast hemosiderosis and hemochromatosis on the basis of:
   • etiology
   • pathogenesis
   • effects

5. Describe the major sites and steps of hemoglobin degradation

6. Indicate laboratory tests that would help determine the diagnosis and severity of each of the following:
   • hemolytic anemia
   • hepatocellular disease
   • partial bile duct obstruction
   • complete bile duct obstruction

7. Distinguish features of the following pigments:
   • carbon
   • lipofuscin
   • melanin
   • hemosiderin
   • hematoidin
   • bilirubin
   on the basis of:
   o color of pigment in routine (H and E-stained) sections
   o staining characteristics of pigment with special stain(s) used for identification
   o exogenous vs. endogenous origin
   o mechanism of deposition in tissue
   o common site(s) of deposition
   o diseases associated with each
38 – NUTRITIONAL DISEASES

The student will be able to:

1. Define and use in proper context:
   - anorexia nervosa  kwashiorkor  scurvy
   - Bitot spot  malnutrition  secondary (conditional)
   - body mass index  marasmus  malnutrition
   - (BMI)  obesity  somatic protein compartment
   - bulimia  osteomalacia  starvation
   - cachexia  osteopenia  trace element
   - cheilosis  pellagra  undernutrition
   - craniotabes  pernicious anemia  visceral protein compartment
   - dry beriberi  Pickwickian syndrome  vitamin
   - exophthalmia  pigeon breast deformity  Wernicke-Korsakoff
   - flag sign  primary malnutrition  syndrome
   - frontal bossing  protein-energy (protein-calorie) malnutrition (PEM)  wet beriberi
   - glove dermatitis  rachitic rosary  xerophthalmia
   - Harrison groove  rickets
   - keratomalacia

2. List the five main categories of nutritional disorders

3. List the five major causes of undernutrition in the United States

4. Compare and contrast the following types of protein-energy malnutrition:
   - marasmus
   - kwashiorkor
   - secondary protein-energy malnutrition

   with regard to:
   - etiology and pathogenesis
   - effects on protein stores
   - physical findings
   - laboratory findings
   - morphologic features

5. List the fat-soluble vitamins and the function of each, and discuss deficiency states of each with regard to:
   - nomenclature
   - incidence
   - morphologic changes
   - clinical findings

6. List the water-soluble vitamins and the function of each, and discuss deficiency states of each with regard to:
   - nomenclature
   - incidence
   - morphologic changes
   - clinical findings

7. Compare and contrast deficiency of folate vs. that of vitamin B₁₂, with regard to:
   - incidence
   - etiology
   - hematopoietic manifestations
   - neuropathologic manifestations
   - laboratory findings
   - clinical features
8. Compare and contrast the skeletal changes of vitamin D deficiency with those of vitamin C deficiency, with regard to pathogenesis and morphology

9. List the principle morphologic and clinical manifestations of toxicity due to:
   - vitamin A
   - vitamin D

10. List the morphologic changes and clinical manifestations caused by deficiency of:
    - calcium
    - phosphorus

11. Discuss the following trace elements:
    - magnesium
    - zinc
    - selenium
    - fluoride
    - iron
    - iodine
    - copper
    with regard to:
        - function
        - clinicopathologic manifestations of deficiencies thereof

12. Compare and contrast deficiency states resulting from:
    - loss of pancreatic function
    - celiac sprue
    - ileal disease
    - bile duct disease/obstruction
    - gastric dysfunction
    with regard to:
        - specific etiologic entities
        - pathogenesis
        - clinicopathologic manifestations

13. Describe the effects of malnutrition on cellular and humoral immunity

14. Compare and contrast:
    - anorexia nervosa
    - bulimia
    in terms of:
        - pathophysiologic manifestations
        - clinical findings
        - complications

15. Discuss obesity in terms of:
    - epidemiology
    - clinical measurements
    - etiology
    - genetics
    - types of obesity
    - complications

16. Discuss the effects of diet on the pathogenesis of:
    - atherosclerosis
    - diabetes mellitus
    - hypertension
    - colonic diverticulosis
    - aging
    - neoplasia

17. Describe clinical laboratory measurements helpful in making a nutritional assessment of a hospitalized patient
39 - AGING

The student should be able to:

1. Define and use in proper context:
   - aging
   - senescence
   - glycation
   - progeria

2. List the postulated actions in the various “wear and tear” and genome-based theories of aging.

3. List cellular alterations which occur with aging.

4. Discuss the changes which occur in the following with aging:
   - immune system
   - musculoskeletal system
   - skin/hair
   - genitourinary tract
   - cardiovascular system
   - central nervous system

5. Contrast the incidence of neoplasms above and below the age of 55.

6. List the changes in body composition with aging.

7. List four reasons for the increased incidence of adverse drug reactions in the elderly.
51 - FORENSIC PATHOLOGY

The student will be able to:

1. Define and use in proper context:
   
   abrasion         decomposition         livor mortis         rigor mortis
   accident         drowning             manner of death      shotgun wound
   adipocere        electrocution        mechanism of death   stab wound
   alg mortis       forensic             medical exam         sudden death
   asphyxia         forensic pathology   medicolegal masquerade sudden infant death
   avulsion         gunshot wound        mummification        syndrome (SIDS)
   cause of death   homicide             overdose             suicide
   certification of death incision (incised) patterned injury therapeutic misadventure
   chain of custody wound                  pronouncement of death toxicity
   contusion        injury               puncture wound      toxicology
   coroner          laceration           putrefaction         wound

2. Given the circumstances of death and the postmortem findings, correctly complete a death certificate.

3. List the five types of manner of death.

4. State the types of death which should be reported to the coroner/medical examiner

5. Discuss the role of each of the following in the medicolegal investigation of death:
   
   • investigation of circumstances
   • scene investigation
   • necropsy (autopsy)
   • radiologic examination
   • chemical/toxicologic studies

6. Discuss forensic toxicology, in terms of:
   
   • appropriate specimens for a toxicologic screen
   • appropriate specimens for quantitation of a toxic substance
   • principles of interpretation of:
     screening analyses
     quantitative analyses

7. Discuss, with specific examples, the ways in which clinical/gross and microscopic examination of injuries can aid in the following determinations:
   
   • antemortem vs. postmortem injury
   • age of antemortem injuries
   • instrument responsible for injury

   including, for gunshot wounds:

   entrance vs. exit wounds
   range of fire

8. Compare and contrast partial thickness burns vs. full-thickness burns, in terms of:
   
   • Definitions
   • Morphology
   • systemic consequences
   • complications

9. Discuss electrical injuries in terms of factors determining effect of electric current, as well as thermal vs. non-thermal effects on tissue.
10. Discuss sudden infant death syndrome (SIDS) in terms of:
   o defining features
   o epidemiology
   o morphology
   o pathogenesis

11. List the most frequent causes of death from natural disease seen by coroners/medical examiners
56 – BLOOD BANK AND IMMUNOHEMATOLOGY

The student will be able to:

1. Define and use in proper context:

   alloantibody
   allogeneic
   American Association of Blood Banks (AABB)
   antibody panel
   antibody screen
   antiglobulin (Coombs) test
     direct (DAT)
     indirect (IAT)
   apheresis
   autoantibody
   autologous transfusion
   cold agglutinin
   crossmatch
   ΔOD 450
   directed donors transfusion
   elution
   erythroblastosis fetalis
   exchange transfusion
   graft-versus-host (GVH) disease
   hemapheresis
   hemochromatosis
   hemolytic disease of the newborn (HDN)
   hemosiderosis
   hydrops fetalis
   immunohematology
   intraoperative salvage
   kernicterus
   leukapheresis
   Liley curve
   massive blood transfusion
   neocytes
   percutaneous umbilical blood sampling (PUBS)
   plasmapheresis
   residual risk
   Rhogam
   transfusion reaction
   transfusion related acute lung injury (TRALI)
   type and crossmatch
   type and screen

2. Discuss basic qualifications of a potential blood donor including reasons for deferral and routine laboratory tests performed on donor blood.

3. Describe the methods by which whole blood is collected and processed into the following components:
   - packed red blood cells (RBCs)
   - additive solution packed RBCs
   - fresh-frozen plasma (FFP)
   - platelets
   - cryoprecipitate

4. Describe how ABO and Rh antigens are formed, including the genetic bases thereof

5. Describe the basic identification procedures, incidence, and inheritance of the ABO and Rh blood groups

6. Compare and contrast the precursor substance which forms the backbone of the Lewis antigens with the precursor of the ABH antigens

7. Discuss the following blood group systems:
   - Lewis
   - Duffy
   - Kidd
   - Kell

   in terms of:
   - importance of transfusion history
   - modes of acquisition of antibodies
   - clinical significance of antibodies
   - transfusion reactions
   - hemolytic disease of newborn (HDN)
8. Describe the methods used for the following procedures, along with approximate time required to complete:

- ABO forward type
- ABO reverse type
- Rh type
- Antibody screen
- Antibody identification panel
- Crossmatch
- Direct antiglobulin test (DAT)

and determine compatible units by ABO-Rh with recipients based on ABO-Rh type.

9. Discuss routine pre-transfusion compatibility testing in terms of:
   - Significance of positive antibody screens
   - Clinical significance of common alloantibodies

10. Discuss alternatives to the standard crossmatch, and clinical situations in which they may be indicated.

11. Discuss the philosophy behind changing ABO and Rh blood types in an emergency.

12. Given a patient's clinical condition and results of complete blood count and coagulation tests:
   - Determine if transfusion is indicated
   - Select proper component
   - Calculate amount needed
   - State proper methods of checking, handling, and administering a transfusion.

13. List the hazards and late complications of blood transfusion.

14. Compare and contrast the following blood products:

| Packed RBCs | Fresh frozen plasma (FFP) |
| Frozen RBCs | Cryoprecipitate |
| Washed RBCs | Albumin |
| Leukocyte reduced RBCs | Immune serum globulin |
| Granulocytes | Rh immunoglobulin |
| Platelets | Factor VIII concentrate |
| Neocytes | Factor IX concentrate |

in terms of:

- Contents
- Volume
- Usual dose
- Shelf life
- Relative cost
- Storage conditions
- Clinical indications for transfusion
- Expected post-transfusion hematologic effects from one unit
- Optimum post-transfusion time for laboratory assessment of effect of transfusion
- Complications of transfusion

15. Compare and contrast IgG and IgM alloantibodies produced in response to RBC transfusion in terms of:
   - Relative size
   - Ability to cause direct agglutination, in vitro
   - Ability to cross placenta and cause HDN
   - Likelihood of causing:
     - Intravascular hemolysis
     - Extravascular hemolysis
   - Usual thermal range (room vs. body temperature)

16. Compare and contrast the following types of transfusion reactions:

| Acute hemolytic | Anaphylactoid |
| Delayed hemolytic | Transfusion-related acute lung injury (TRALI) |
| Febrile nonhemolytic | Bacterial contamination |
| Allergic (urticarial) | Fluid overload |
in terms of: 

- incidence
- etiology
- pathogenesis
- methods of detection

clinical presentation
laboratory work-up of suspected reaction
treatment of suspected/confirmed reaction
prevention

17. Discuss the transmission, via transfusion, of the following infectious agents

- *Treponema pallidum*
- hepatitis B virus (HBV)
- hepatitis C virus (HCV)
- human immunodeficiency virus (HIV)
- human T cell lymphotropic virus (HTLV)
- cytomegalovirus (CMV)
- West Nile virus (WNV)
- prions

in terms of:
- risk
- blood product(s) implicated
- prevention

18. Discuss therapeutic apheresis in terms of AABB guidelines categorizing:

- effectiveness
- indications
- general technique
- complications

19. Compare and contrast autologous transfusions and directed donor transfusions in terms of:

- indications
- presurgical blood donation procedures
- reasons for deferral of donors/donated blood

20. Discuss the intraoperative salvage of RBCs in terms of:

- indications and contraindications
- general technique
- expected results

21. Discuss massive blood transfusions in terms of:

- indications
- complications and treatment thereof

22. Discuss neonatal transfusions, including:

- percutaneous umbilical blood sampling (PUBS)
- exchange transfusion

in terms of:
- unique characteristics of transfusion of neonates as opposed to adults
- indications for each of the above procedures

23. Discuss hemolytic disease of the newborn (HDN) in terms of:

etiology
pathogenesis
detection
morphologic features
clinical manifestations
laboratory findings
treatment
prevention

24. Outline the principles of paternity testing.