



# AMERICAN DENTAL BOARD OF ANESTHESIOLOGY

## Written Examination Content Outline

### BASIC SCIENCES

#### I. Anatomy

##### A. Head and Oral Cavity

1. Nasal Anatomy
2. Oral anatomy for local anesthesia
3. Nerve supply of the face and head

##### B. Neck:

1. Airway anatomy
  - (a) Hypopharynx
  - (b) Larynx
  - (c) Cartilages
    - i. Tracheotomy site
    - ii. Cricothyroid membrane
  - (d) Innervation
2. Internal & external jugular veins
3. Thoracic duct, carotid & vertebral arteries
4. Stellate ganglion
5. Cervical spine landmarks
  - (a) Vertebra prominens,
  - (b) Chassaignac's tubercle

##### C. Chest: Pulmonary lobes, cardiac landmarks, subclavian vein

##### D. Extremities: Relationship of bones, nerves, and arteries

##### E. General human anatomy

##### F. Pediatric vs. adult comparison

#### II. Radiologic Anatomy

##### A. Chest Radiograph

##### B. Head & Neck radiograph/CT/MRI including fascial space infections

### III. Physics

#### A. Gas Properties

1. Gas Laws
  - a) Pressure
  - b) Temperature
  - c) Volume
2. Partition coefficients
3. Vapor pressure
4. Flows

#### B. Gas storage

1. Cylinder types
2. Cylinder sizes
3. Cylinder pressures/volumes
4. Cylinder colors

### IV. Physiology

#### A. Basic

1. Body Fluid
2. Membranes

#### B. Cardiac

1. Electrocardiogram
2. Cardiac Cycle

#### C. Circulatory

1. Fluids

#### D. Endocrinology

1. Metabolism
2. Adrenal
3. Pituitary

#### E. Gastrointestinal

1. Digestion

#### F. Hemostasis

#### G. Hepatic

1. Blood supply
2. Functions
3. Cytochrome p-450 system

## H. Neural

1. Synapse
2. Autonomic
3. Peripheral
4. CNS & Spinal

## I. Renal

1. Functions
2. Hormone Activity

## J. Respiration

1. Acid-base balance
2. Oxygen delivery systems
  - a) Carbon monoxide poisoning
  - b) Methemoglobinemia
3. Pulmonary function
  - a) Volumes and capacities
4. Gas transport between lung and tissue
5. Regulation of respiration
6. Oxyhemoglobin dissociation curve

## K. Temperature Regulation

## L. Fluids

1. Surface tension
2. Pressure
  - a) Osmotic
  - b) Oncotic

## V. STATISTICS

- A. Sample and Population
- B. Probability
- C. Mean, Median, and Mode
- D. Standard Deviation and Error
- E. T-Test
- F. Chi-Square
- G. Non-parametric tests
- H. Regression Analysis/Correlation
- I. Analysis of Variance
- J. Power Analysis
- K. Meta-Analysis
- L. Confidence Limits, Odds Ratio & Risk Ratio

# PATHOPHYSIOLOGY AND CLINICAL MEDICINE

Including Anesthetic Implications

## I. Pathophysiology

### A. Basic

1. Inflammation
2. Third spacing

### B. Immunity

1. Type I hypersensitivity (anaphylactic type)
2. Type II antibody - dependent hypersensitivity
3. Type III Immune complex - mediated
4. Type IV Cell mediated hypersensitivity

### C. Tumors

1. Treatment modalities
2. Implications for anesthesia

### D. Cardiovascular

1. Cardiomyopathy
2. Conduction defects, including pacemakers
3. Congenital heart disease
  - a) Aortic stenosis
  - b) Atrial septal defect
  - c) Coarctation of the aorta
  - d) Patent ductus arteriosus
  - e) Pulmonic stenosis
  - f) Transposition of the great vessels
  - g) Tetralogy of Fallot
  - h) Ventricular septal defect
4. Cor Pulmonale
5. Congestive heart failure
  - a) Right sided
  - b) Left sided
  - c) Biventricular
6. Hypertensive heart disease
7. Infective endocarditis

8. Hypertension

- a) Essential
- b) Secondary

9. Ischemic heart disease

- a) Angina pectoris
- b) Myocardial infarction
- c) Sudden cardiac death
- d) Atherosclerotic heart disease

10. Pericardial disease

11. Peripheral vascular disease

E. Endocrine

1. Thyroid

- a) Hyperthyroidism
- b) Hypothyroidism

2. Adrenal Cortex

- a) Primary hypoadrenalism
- b) Secondary hypoadrenalism
- c) Hyperadrenalism

3. Adrenal Medulla

- a) Pheochromocytoma

4. Diabetes Mellitus

5. Diabetes Insipidous

6. Pituitary disease

F. Hematology and Coagulation

1. Red Cell Disorders

- a) Increased red cell destruction
  - (1) Sickle cell anemia
  - (2) Thalassemia
  - (3) Hemolytic anemia
  - (4) G6PD Deficiency

b) Anemias

- (1) Iron deficiency anemia
- (2) Megaloblastic anemia
- (3) Normocytic-normochromic anemia
- (3) Aplastic anemias

c) Polycythemias

2. White Cell Disorders

- a) Lymphomas
- b) Leukemias
- c) Neutropenias

3. Hemorrhagic Diatheses

- a) Blood vessel wall disorders
- b) Platelet disorders
  - i. Thrombocytopenia
  - ii. Von Willebrand's disease
  - iii. Renal related
- c) Coagulation disorders
  - (1) Factor VIII deficiency
  - (2) Factor IX deficiency
  - (3) Other Factors and Protein Deficiencies
- d) Therapeutic anticoagulation
- e) Disseminated intravascular coagulation

G. Pulmonary

1. Acute Respiratory Failure
2. Chronic Obstructive Pulmonary Disease (COPD)
  - a) Chronic bronchitis
  - b) Emphysema
3. Restrictive Lung Disease
4. Pulmonary Embolus
5. Pulmonary Infection
6. Adult Respiratory Distress Syndrome (ARDS)

7. Miscellaneous

- a) Pleural Effusion
- b) Hemothorax
- c) Pneumothorax

H. Gastrointestinal

1. Esophagus

- a) Atresia and Stenosis
- b) Hiatal hernia
- c) Esophagitis

2. Stomach

- a) Pyloric Stenosis
- b) Gastritis
- c) Ulcers

3. Bowel

- a) Inflammatory Bowel Disease

I. Renal

1. Glomerular Disease

2. Hypertension

- a) Essential
- b) Secondary

3. Nephrotic Syndrome

4. Chronic Renal Failure

5. Acute Tubular Necrosis

6. Dialysis

J. Head and Neck

1. Vocal cord polyps

2. Ludwig's angina and other spreading facial/pharyngeal infections

3. Congenital anomalies

K. Musculoskeletal

1. Bones

2. Joints

- a) Arthritis

3. Muscle
  - a) Atrophy
  - b) Dystrophy
  - c) Myasthenia Gravis

#### L. Liver

1. Jaundice
2. Hepatitis
3. Cirrhosis
4. Failure

#### M. Nervous System

1. Infections
  - a) Meningitis
  - b) Encephalitis
2. Degenerative
  - a) Alzheimer's Disease
  - b) Parkinsonism
  - c) Multiple Sclerosis
3. Epilepsy; including vagal nerve stimulators

#### N. Vascular

1. Atherosclerosis
2. Aneurysms
3. Thrombophlebitis

#### O. Pain

1. Pain Neuorphysiology
  - a) Gate theory (Melzack and Wall)
  - b) Pattern theory
  - c) Current concepts

### II. Clinical Medicine

#### A. Clinical Laboratory Tests

1. Complete blood count & differential
2. Electrolytes
3. Urinalysis
4. Blood glucose
5. Coagulation



6. Renal function tests
7. Liver function tests
8. Drug plasma levels

B. Cardiology

1. Electrocardiogram
2. Cardiac catheterization
3. Angioplasty

C. Pulmonology

1. Spirometry
2. Pulmonary function

III. Psychology

- A. Origins of dental fears
- B. Dental fears and phobias
- C. Pharmacologic management
- D. Non-Pharmacologic management
  1. Hypnosis
  2. Relaxation techniques
  3. Desensitization
  4. Distraction

IV. Addiction

- A. Physiology and pharmacology
- B. Patient addiction: anesthetic implications
- C. Addiction among health care workers and anesthesiologists

# ANESTHESIA DELIVERY SYSTEMS AND MONITORING

## I. Anesthesia Equipment

### A. Anesthesia Machines

1. Machine standards
2. Gas delivery system (to machine)
3. Vaporizers
  - a) Copper-Kettle type
  - b) Tec-Type
  - c) Effect of ambient conditions
4. Ventilators
5. CO<sub>2</sub> absorbers
6. Breathing circuits
  - a) Mapleson A-F
  - b) Circle system
  - c) Bain/Jackson-Reese
  - d) High pressure jet ventilation
  - e) Heat loss & airway humidification and heating devices
  - f) Bag-valve-mask devices
  - g) O<sub>2</sub> powered breathing devices

## II. Monitoring

- A. Precordial stethoscope
- B. Electrocardioscope
- C. Non-invasive blood pressure
- D. Pulse oximeter
- E. Capnometer
- F. Temperature
- G. In-line oxygen sensor
- H. Volatile gas sampling
- I. Invasive monitoring
  1. Arterial
  2. Central venous
  3. Pulmonary artery monitoring
- J. Nerve stimulators
- K. Airway pressure

# CLINICAL ANESTHESIOLOGY

## I. Pharmacology

For all agents, the following topics are covered, if applicable:

### Pharmacokinetics and Pharmacodynamics

- a. Protein Binding
- b. pKa
- c. Ionization
- d. Tissue uptake
- e. Compartmentalization and exponential models
- f. Tolerance and tachyphylaxis
- g. Termination of action
- h. Elimination & biotransformation
- i. Context-sensitive half-time
- j. Impact of renal disease
- k. Impact of hepatic disease
- l. Effects of hepatic blood flow
- m. Enzyme induction and inhibition
- n. Drug Interactions
- o. Alternative and herbal medicines interactions
- p. Drug-Drug binding
- q. Effect on circulation
- r. Effect on respiration
- s. Effect on other organs
- t. Indications and contraindications
- u. Side effects and toxicity
- v. Pregnancy effects
- w. Pharmacogenetics

### DRUG CATEGORIES

#### A. Analgesics

1. Non-opioid
  - i. NSAID
  - ii. Acetaminophen
  - iii. Others: alpha-2 agonists, NMDA receptor antagonists
2. Opioid
  - i. Agonist
  - ii. Agonist-antagonist
  - iii. Antagonist

## B. Autonomic Nervous System Drugs

1. Sympathetic Agonists and Antagonists
2. Parasympathetic Agonists and Antagonists
3. Vasodilators
4. Drugs acting on the renin-angiotensin system

## C. General Anesthetics: Potent Inhalation Agents & Nitrous Oxide, including:

1. Partition coefficients
2. Minimum alveolar concentration (MAC)
3. Factors affecting MAC
4. Uptake and distribution of inhalation agents
5. Uptake and elimination curves
6. Concentration effect
7. Second gas effect
8. Nitrous oxide and closed spaces
9. Trace concentrations & OR pollution
10. Comparative pharmacodynamics
11. Malignant hyperthermia

## D. General Anesthetics: IV Agents

1. Barbiturates
2. Propofol
3. Etomidate
4. Ketamine

## E. Local Anesthetics

1. Esters
2. Amides

## F. Muscle Relaxants

1. Depolarizing
  - i. including Malignant hyperthermia
2. Non-depolarizing

## G. Reversal Agents

## H. Sedative Agents: IV Agents

1. Benzodiazepines
2. Alpha-2 agonists
3. Scopolamine

## I. Emergency Drugs

## II. Clinical Anesthesia

### A. Local Anesthesia

### B. Sedation

1. Enteral
2. Inhalational
3. Parenteral

### C. General Anesthesia

1. Ambulatory
2. Pediatric
  - a) Induction Techniques
  - b) Anesthetic effects different from adults
  - c) Effects of congenital diseases and syndromes
3. Stages and signs of anesthesia
4. Awareness under anesthesia

### D. Preoperative

1. Consultation
2. History and Physical
3. Lab testing
4. Sedative premedication

### E. Intraoperative

1. Fluid Management
2. General Anesthetic techniques
  - a) Intravenous: bolus
  - b) Intravenous: continuous infusion
  - c) Inhalation
3. Monitoring
4. Patient positioning
5. Airway Management
  - a) Nasal cannula
  - b) Nasal hood
  - c) Full face mask
  - d) Laryngeal mask airway
  - e) Orotracheal intubation
  - f) Nasotracheal intubation
  - g) Awake intubation
  - h) Combitube

- i) Pediatric airway management
- j) ASA difficult airway algorithm
- k) Airway adjuncts

#### F. Post-Operative Care

- 1. Pain management
- 2. Recovery criteria
- 3. Discharge criteria

#### G. Pain Management

- 1. Acute
- 2. Chronic

#### H. Morbidity and Mortality

#### I. Treatment Records

### III. Complications

#### A. Emergencies

- 1. Allergic reaction
- 2. Anaphylaxis
- 3. Angina
- 4. Aspiration / emesis
- 5. Bronchospasm
- 6. Cardiac arrest
- 7. Cerebrovascular accident
- 8. Dysrhythmias
- 9. Esophageal intubation
- 10. Hypertension
- 11. Hyperventilation
- 12. Hypoglycemia
- 13. Hypotension
- 14. Hypoventilation
- 15. Larygospasm
- 16. Malignant hyperthermia
- 17. Myocardia infarction
- 18. Pulmonary edema
- 19. Pulmonary embolus
- 20. Seizures

21. Syncope

22. Trauma

#### B. Adverse Effects

1. Emergence dysphoria

2. Epistaxis

3. Hematoma

4. Hepatic dysfunction

5. Hypothermia

6. Hyperthermia

7. Myalgias

8. Nausea-vomiting

9. Post-extubation stridor/croup

10. Prolonged muscle weakness and pseudocholinesterase deficiency

11. Prolonged recovery

12. Sore throat

13. Thrombophlebitis

#### C. ACLS/PALS Protocols

1. Arrhythmia recognition

2. Drugs

3. Airway management

4. Defibrillation

5. Pacing

6. Intravenous techniques

#### D. Miscellaneous

1. Airway Fires

2. Laser Safety

3. Venous air embolism

4. Surgical air embolism

### IV. Legal Considerations

#### A. Patient Care

1. Guidelines of practice

a) ADA Guidelines

b) ASA Guidelines

- c) ASA Guidelines for the non-anesthesiologist
- d) American College of Cardiology/American Heart Association Guidelines for Perioperative Cardiovascular Evaluation
- e) AAPD Guidelines

- 2. Pre-operative evaluation
- 3. Informed consent
- 4. Anesthesia record
- 5. Monitoring
- 6. Patient recovery and discharge
- 7. Post-operative instructions

B. Equipment maintenance

C. Liability Insurance

D. Risk Management

