FPGEE Study Guide

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National Association of Boards of Pharmacy reg. no. 1,162,334
NABP reg. no. 1,160,482
Foreign Pharmacy Graduate Equivalency Examination reg. no. 2,270,607
FPGEC reg. no. 2,113,836
FPGEE reg. no. 2,337,295

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FPGE Blueprint

The Foreign Pharmacy Graduate Equivalency Examination® (FPGEE®) is based on a nationally uniform content blueprint. The blueprint provides important information about the topics covered on the examination and the knowledge you are expected to demonstrate while taking the FPGEE.

The FPGEE is uniformly developed, administered, and scored under policies and procedures developed by NABP's Advisory Committee on Examinations and approved by NABP's Executive Committee. The content of the FPGEE is approved by practitioners and educators from around the country through their service as Examination Review Committee members and item writers.

All candidates are tested on their mastery as outlined in the FPGEE Blueprint. The FPGEE Blueprint provides an outline of the topics covered on the examination. It offers important information about the knowledge, judgment, and skills you are expected to demonstrate. A strong understanding of the Blueprint will aid in your preparation to take the examination.

The following FPGEE Blueprint provides important information about the topics covered on the examination and the knowledge you are expected to demonstrate while taking the FPGEE. A strong understanding of the Blueprint will aid in your preparation to take the examination.

Note: Information concerning the format of the FPGEE will be provided in writing along with future examination dates.

I. General Sciences (15%) 
A. Biology  
1. Basic principles of living matter  
2. Chemical basis of life  
3. Cellular basis of plant and animal life  
4. Morphology (including cell structure)  
5. Genetics (including DNA/RNA information transfer)  
B. Anatomy and physiology  
1. Gross body structures and functions  
2. Circulatory and cardiovascular systems  
3. Hematologic, hepatic, and lymphatic systems  
4. Gastrointestinal system  
5. Urinary system  
6. Respiratory system  
7. Endocrine system  
8. Reproductive system  
9. Nervous system  
10. Musculoskeletal system  
11. Dermatological system  
12. Eye, ear, nose, and throat  

C. Pathogenic microbiology  
1. Classification of microbiological disease agents  
2. Characteristics and activities of microbiological disease agents  
3. Etiology of infectious disease (viruses, bacteria, algae, protozoa, ameba, fungi, rickettsia, parasites, etc)  
4. Pathogenic mechanism and host reaction  
5. Infection control  

D. Immunology  
1. Organization of the immune system  
2. Cells of the immune system  
3. Cytokines  
4. Immunoglobulins  
5. Complement system  
6. Autoimmune disorders  
7. Methods of evading the immune system  
8. Active and passive immunizations  
9. Monoclonal antibodies  
10. Vaccine technologies  
11. Immunosuppressants  
12. Immunostimulants  
13. Adverse immune reactions  

E. General chemistry  
1. Nomenclature (IUPAC)  
2. Atomic and molecular structure (including physical forces of interaction)  
3. States of matter (gases, liquids, solids)  
4. Stoichiometry  
5. Ionization and pH (not including buffers)  
6. Chemical equilibrium and reactivity  
7. Chemical thermodynamics  
8. Chemical and instrumental analysis  
9. Nuclear chemistry (radioactivity)  

F. Organic chemistry  
1. Nomenclature (IUPAC)  
2. Molecular structures, bonding, resonance, tautomerism, stereochemistry
3. Functional group chemistry
4. Classes of compounds (structure and characteristics)
5. Types of reactions and reaction mechanisms (reduction, oxidation, addition, elimination, hydrolysis, substitution, etc)
6. Stoichiometry

G. Biochemistry
1. Descriptive chemistry, metabolic and biochemical roles, biosynthesis, biodegradation, and nomenclature
2. Intermediary metabolism
3. Metabolic diseases
4. Nutrition biochemistry (vitamins, minerals, essential fatty and amino acids, etc)
5. Enzyme kinetics

II. Pharmaceutical Sciences (30%)

A. Fundamentals of drug action
1. Dose response relationships
2. Absorption, distribution, and elimination
3. Metabolism
4. Adverse reactions (toxicity, side effects, abuse, etc)

B. Interaction of drugs with biological systems
1. Relationship of chemical structure to biochemical mechanism of action
2. Stereochemical factors
3. Structure-activity relationships within a series of drugs
4. Drug design strategies and development (Prodrugs, isosteres, drug latentiation, etc)
5. Active medicinals from natural sources

C. Mechanism/Site of Action
1. Rationale for use of a drug (mechanistic, indication, and use)
2. Dosage regimen
3. Precautions, including contraindications and toxicity (patient age, weight, gender, disease factors, dosage schedule and pharmacokinetic factors, effects of other drugs, foods, and environmental factors, incompatible combinations)

D. Pharmakinetics
1. Basic concepts and principles
2. Bioequivalence and bioavailability
3. Pharmacokinetic models and quantification of absorption, distribution, and elimination
4. Multi-dose regimens
5. Linear and nonlinear pharmacokinetics
6. Functions and graphs

E. Kinetic phenomena
1. Decomposition mechanisms (hydrolysis, oxidation, racemization, decarboxylation, photochemical, etc)
2. Reaction kinetics (0, 1, 2 – order, rate law expressions, etc)
3. pH effects on stability (acid and base catalysis)
4. Stability prediction (including Arrhenius Law)
5. Incompatibilities
6. Diffusion

F. Solubility
1. Functional group effect on solubility
2. Factors affecting solubility and dissolution rate
3. Surfactants and micelles

G. Equilibria
1. Basicity and acidity (including buffers)
2. Partitioning phenomena
3. Complexation
4. Protein binding
5. Adsorption-desorption processes
6. Incompatibilities
7. Colligative properties

H. Dosage forms (traditional and novel)
1. Rationale for use
2. Characterization of the bulk drug (including micromeritics)
3. Preparation, processing, and function (including excipients)
4. Tests and criteria of performance
5. Definitions and nomenclature
6. Routes of administration

I. Pharmaceutical calculations
1. Metrology
2. Calculation of drug dosage from appropriate data
3. Calculation of moles, millimoles, milliequivalents, and milliosmols
4. Isotonicity calculations
5. Density, specific gravity, dilution, and concentration calculations

J. Pharmaceutical dispensing
1. Verification and interpretation of prescriptions
2. Performance of packaging and labeling functions
3. Extemporaneous compounding
4. Patient advising

K. Biotechnology
1. Principles
2. Methodologies
3. Products

III. Biomedical/Clinical Sciences (35%)

A. Epidemiology
1. Basic concepts of epidemiology (incidence, prevalence, risk ratio, etc)
2. Age-related disorders (pediatrics, geriatrics, etc)
3. Health promotion and disease prevention (risk factors for development of disease, vaccination schedules in normal hosts, post-exposure vaccinations/prophylaxis, wellness and self-care, etc)

B. Pathophysiology
1. Pathophysiologic alterations of disease (physical assessment, laboratory tests and home diagnostics, disease diagnosis, signs and symptoms of disease, etiology, etc)
2. Disease process (course of disease, prognosis, non-drug treatment, etc)
3. Drug-induced diseases

C. Clinical pharmacology and therapeutics
1. Rational pharmacologic treatment of disease (drug of choice, rationale for selection, etc)
2. Monitoring of drug therapy (parameters of efficacy, parameters of toxicity, etc)
3. Adverse drug reactions (hypersensitivity reactions, dose-related reactions, prevention, etc)
4. Drug interactions
5. Individualization of drug dosage (clinical pharmacokinetics, drug dosage in renal failure – dialysis, etc)

D. Clinical toxicology
1. Etiology

E. Clinical nutrition
1. Nutrition-related disorders (obesity, protein/calorie malnutrition, drug-nutrient interactions, etc)
2. Nutrition support (oral supplements, enteral nutrition, parenteral nutrition, etc)

F. Literature evaluation
1. Drug information resources (computer applications; primary, secondary, and tertiary literature, etc)
2. Clinical trial design (hypothesis testing, randomization, sampling, blinding, etc)
3. Statistical tests (descriptive statistics, parametric tests, non-parametric tests, etc)

IV. Economic, Social, and Administrative Sciences (20%)

A. Health care economics
1. Health care costs (systems and pharmaceuticals)
2. Trends
3. Payment and reimbursement
4. Supply and demand (health care services, medicines/drug products, economic modeling, etc)
5. Economic evaluation of medicines and therapy (quality of life, outcomes [therapeutic/clinical/humanistic/cost], pharmacoconomic analyses, DUE/DUR programs, etc)

B. Ethics/Jurisprudence
1. Jurisdiction: state vs federal
2. Statutes and regulations
3. Regulatory agencies – federal and state (FDA, Public Health, DEA, FTC, HCFA, etc)
4. Ethical principles and practice applications

C. Health care systems
1. Delivery of care/organizations
2. Private and public programs (Medicare/Medicaid, insurance)
3. Types of non-pharmacist providers and their roles
4. Drug development process

D. Communication and information technology
1. Patient consultation
2. Health care professional communications
3. Barriers to communication
4. Information systems

E. Management
1. Financial management
2. Personnel management
3. Marketing management
4. Organization

F. Marketing
1. Health care professionals (influencing market)
2. Services
3. Advertising
4. Industry
5. Products

G. Professional practice settings, trends, and activities
1. Practice and practice interfaces (institutional, community based, educational/academic, pharmaceutical industry, government, professional organizations, etc)
2. Trends (manpower/practice patterns, movements, issues, etc)
3. Practice activities of pharmacists
H. Social/Behavioral
   1. Socialization/professionalism (development of professional identity, role conflict – internal and external, agents of socialization, effects of socialization in pharmacy, etc)
   2. Illness/Behavior (models describing illness/behavior, health belief models, effect of illness on significant others, strategies of intervention, self-care, etc)
   3. Compliance (personal perception of illness, reinforcements, compliance measures, variables affecting compliance, patient education, compliance programs, etc)
   4. Factors affecting drug use – legitimate and illicit (peer pressure, cultural considerations, environmental considerations, economic/income considerations, legal and political considerations, patient demographics, etc)
Sample Questions

The following questions are typical of those found on the FPGEE. However, their overall difficulty is not necessarily representative of the overall difficulty of the actual examination, nor do they provide a complete overview of the content of the entire 300-item examination. The questions are organized by the four major content areas of the examination. Figures in parentheses indicate the percentage of items that are covered by that area. For example, 15% of the 300 items on the examination relate to Area I, General Sciences. An answer key is provided on page 24.

I. General Sciences (15%)

1. Which of the following statements about pernicious anemia is true?
   A. It occurs only in adults.
   B. It is caused by a deficiency of intrinsic factor.
   C. It is caused by insufficient iron absorption.
   D. The best treatment is oral vitamin B\textsubscript{12}.

2. Which of the following structures can enable a cell to synthesize different products simultaneously within different regions of the cytoplasm?
   A. Golgi bodies
   B. Endoplasmic reticulum
   C. Mitochondria
   D. Lysosomes

3. When the equation below is balanced, how many moles of O\textsubscript{2} are needed to consume 1 mole of C\textsubscript{4}H\textsubscript{8}O\textsubscript{2}?
   \[ C_4H_8O_2 + O_2 \rightarrow CO_2 + H_2O \]
   A. 3
   B. 5
   C. 6
   D. 10

4. Infectious mononucleosis is associated with:
   I. heterophil antibody formation.
   II. Epstein-Barr virus.
   III. coxsackievirus type A.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

5. The ratio of ionized to non-ionized mercaptan in a solution is 10:1. The mercaptan has a pK\textsubscript{a} of 7.6. What is the pH of the solution?
   A. 6.6
   B. 7.6
   C. 8.6
   D. 8.9

6. If enantiomorphs are considered to be different compounds and if any one-hydrogen atom is replaced with a chlorine atom, the compound below will produce how many monochloro derivatives?

   \[
   \begin{array}{c}
   \text{CH}_3 \\
   \text{CH}_3 \text{– CH – CH}_2 \text{ – C – CH}_3 \\
   \text{CH}_3 \text{ – CH}_2 \text{ – C – CH}_3 \\
   \end{array}
   \]
   A. 4
   B. 5
   C. 6
   D. 7

7. What is the preferred IUPAC system name of the compound shown below?

   \[
   \begin{array}{c}
   \text{Br} \\
   \text{CH}_3 \\
   \text{CH}_3 \\
   \end{array}
   \]
   A. 1-Bromo-3-methylcyclohexene
   B. 2-Bromo-6-methylcyclohexene
   C. 1-Methyl-3-bromo-2-cyclohexene
   D. 3-Methylcyclohexene bromide

8. Essential amino acids include which of the following?
   I. Methionine
   II. Lysine
   III. Leucine
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

9. How many milligrams of silver nitrate would be required to prepare 60 mL of a 0.4% w/v solution?
10. Which of the following molecules should have the largest dipole moment?
A. Cl \(\text{C=C} \text{H}\)
B. Cl \(\text{C=C} \text{Cl}\)
C. H\(_3\)C \(\text{C=C} \text{H}\)
D. Cl \(\text{C=C} \text{H}\)

11. The anticodon is found in which of the following?
A. Ribosomal RNA
B. Messenger RNA
C. Transfer RNA
D. DNA

12. Dietary fiber consists primarily of:
A. lipids.
B. proteins.
C. minerals.
D. carbohydrates.

13. An acidic solution should result when 1 L of water is added to 0.1 mole of:
A. sodium chloride.
B. ammonium chloride.
C. phenobarbital sodium.
D. potassium bicarbonate.

14. In glucose 6-phosphate dehydrogenase deficiencies, hemolysis may be caused by:
A. a level of NADPH inadequate to maintain the required level of reduced glutathione in the erythrocyte.
B. an inadequate level of hydrogen peroxide in the erythrocyte membrane.
C. an accumulation of NADPH, which causes the level of hydrogen peroxide in the erythrocyte to be reduced.
D. the diversion of glucose 6-phosphate into the glycolytic pathway.

15. What two immunoglobulins normally are active in the respiratory secretions?
A. IgA and IgE
B. IgA and IgM
C. IgD and IgM
D. IgG and IgM

16. Which of the following statements about the body’s potassium is FALSE?
A. Acidosis elevates the level of serum potassium.
B. When body mass is reduced, body potassium is reduced.
C. Most body potassium is found within the intracellular compartment.
D. Administration of glucose and insulin causes hyperkalemia.

17. The most common organisms isolated from intra-abdominal infections are:
A. Escherichia coli and Bacteroides fragilis.
B. Escherichia coli and Staphylococcus aureus.
C. Pseudomonas aeruginosa and Bacteroides fragilis.
D. Pseudomonas aeruginosa and Staphylococcus aureus.

18. Which of the following is NOT considered an immune-complex disease in humans?
A. Amyloidosis
B. Serum sickness
C. Ampicillin skin rash
D. Post-streptococcal glomerulonephritis

19. Relative to other nodes, the SA node:
A. is located in the right atrium.
B. causes the strongest impulse formation.
C. has the greatest rate of impulse formation.
D. is completely independent of neural control.

20. Food poisoning can be caused by a species of:
A. Klebsiella.
B. Bacteroids.
C. Salmonella.
D. Pseudomonas.

21. Which of the following pairs of molecules would most likely exhibit a dipole-induced dipole interaction?
22. An aqueous alkaline solution is formed by:
   A. calcium chloride.
   B. cetylpyridinium chloride.
   C. atropine sulfate.
   D. cefazolin sodium.

II. Pharmaceutical Sciences (30%)  
23. An amine base that is not metabolized and has a pK_a of 7 will be reabsorbed from the renal tubules most quickly if the pH of the urine is adjusted to:
   A. 4.
   B. 6.
   C. 7.
   D. 8.

24. Which of the following compounds has the lowest numerical pK_a value?
   A. Phenol
   B. p-Nitrophenol
   C. p-Methoxyphenol
   D. p-Methylphenol

25. Which of the following substances is an inhibitory neurotransmitter?
   A. γ-Aminobutyric acid
   B. Norepinephrine
   C. Acetylcholine
   D. Serotonin

26. Which of the following diuretics works primarily by inhibiting sodium and chloride reabsorption in the ascending Henle’s loop?
   A. Spironolactone
   B. Chlorothiazide
   C. Furosemide
   D. Mannitol

27. Antihypertensives that act by stimulating α_2-receptors include:
   I. methyldopa.
   II. clonidine.
   III. hydralazine.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

28. Cimetidine exerts its pharmacologic action by:
   A. inhibiting renin secretion.
   B. stimulating α_2-adrenergic receptors.
   C. blocking the muscarinic receptors.
   D. blocking the H_2-receptors.

29. Which of the following statements about the absorption of drugs administered subcutaneously is FALSE?
   A. The SC route avoids first-pass metabolism in the liver.
   B. The absorption phase can be prolonged by injecting a suspension.
   C. Absorption is faster from SC injections than from IM injections.
   D. Substances that produce local vasoconstriction can be used to decrease the rate of SC drug absorption.

30. Which of the following statements about lyophilic colloidal dispersions is true?
   A. They tend to be more sensitive to the addition of electrolytes than lyophobic systems.
   B. They tend to be more viscous than lyophobic systems.
   C. They can be precipitated by prolonged dialysis.
   D. They separate rapidly.

31. The following question refers to the pH profile shown below.

```
log K_app

pH

slope = -1
slope = +1
```

From this pH profile, the pharmacist can determine that pilocarpine hydrolysis is:
   A. more susceptible to catalysis by OH^-
   B. more susceptible to catalysis by H^+
   C. equally susceptible to catalysis by H^+ and OH^-
   D. susceptible to buffer catalysis.

32. Which of the following is a bactericidal antitubercular drug that inhibits cell wall synthesis?
   A. Rifampin
   B. Isoniazid
33. Drugs undergoing the second phase of enzymatic transformations are usually converted from an active compound into an inactive compound by:
A. oxidation.
B. reduction.
C. hydrolysis.
D. conjugation.

34. The steroid shown below functions as:

A. an estrogenic hormone.
B. an androgenic hormone.
C. a mineralocorticoid.
D. a glucocorticoid.

35. The following two systems were prepared without a surfactant.

<table>
<thead>
<tr>
<th></th>
<th>System A</th>
<th>System B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of oil</td>
<td>20 mL</td>
<td>100 mL</td>
</tr>
<tr>
<td>Droplet radius</td>
<td>1 µ</td>
<td>1 µ</td>
</tr>
<tr>
<td>Interfacial tension</td>
<td>80 dyne/cm</td>
<td>80 dyne/cm</td>
</tr>
<tr>
<td>Volume of water</td>
<td>250 mL</td>
<td>250 mL</td>
</tr>
</tbody>
</table>

Which of the following statements about the thermodynamic stability of System A is true?
A. It is as stable as System B.
B. It is 5 times more stable than System B.
C. It is 10 times more stable than System B.
D. It is 25 times more stable than System B.

36. Six hours after 500 mg of a drug is administered by IV injection, a patient’s plasma concentration is 10 µg/mL. If the half-life (t_h) of this drug is four hours and the minimal effective concentration (MEC) is 2 µg/mL, how many hours after the first dose should a second dose be administered?
A. 4.0
B. 6.0
C. 15.4
D. 20.5

37. First-order half-life is equal to which of the following?
A. 1/k
B. k
C. t_h
D. 2k + 1

38. Which of the following statements about an injectable phenytoin preparation is true?
A. It will not be absorbed from IM sites.
B. It must not be administered by IV injection.
C. It must be solubilized in an acidic solution.
D. It precipitates after IM injection.

39. In the compound shown below, what are the relative basicities of the nitrogen atoms as numbered (strongest base first, weakest base last)?

A. 1 > 2 > 3
B. 2 > 3 > 1
C. 3 > 1 > 2
D. 3 > 2 > 1

40. If, at a constant ionic strength, the rate of hydrolysis of a compound is 10 times faster at a pH of 2 than at a pH of 3, the reaction is probably catalyzed by:
A. general acid.
B. general base.
C. specific acid.
D. specific base.

41. The half-life of a drug is 9 days. A single 0.5-mg dose of the drug yields an [AUC]∞ value of 408 ng h/mL. In nanograms per milliliter, what plasma level will result at steady state if this product is given once daily and is 77% bioavailable?
A. 5
B. 13
C. 17
D. 23

42. 5-(4-Hydroxyphenyl)-5-phenyl-2,4-imidazolidinedione is a major metabolite of:
A. phenytoin.
B. mephobarbital.
C. phenobarbital.
D. valproic acid.
43. The radioactive decay of radium has a rate constant of \(4.22 \times 10^{-4}\) per year. How many years will it take for 20% of the radium initially present to degrade? (The amount initially present can be specified as 100%).
   A. 230
   B. 529
   C. 1,000
   D. 3,815

44. Tetracycline must NOT be taken concurrently with antacids because:
   A. antacids destroy tetracycline in the stomach.
   B. antacids chelate tetracycline, thus reducing its absorption.
   C. antacids increase the risk of tetracycline-induced renal toxicity.
   D. the combined use of tetracycline and antacids causes an exothermic reaction that results in GI damage.

45. Which of the following drugs is a direct-acting cholinergic antagonist?
   A. Demecarium bromide
   B. Physostigmine
   C. Neostigmine
   D. Tolterodine

46. Which of the following surfactants is incompatible with bile salts?
   A. Polysorbate 80
   B. Potassium stearate
   C. Sodium lauryl sulfate
   D. Benzalkonium chloride

47. Which of the following lists of compounds is ranked according to expected ability to penetrate lipid membranes?
   A. Oxytetracycline > tetracycline > doxycycline
   B. Doxycycline > tetracycline > oxytetracycline
   C. Tetracycline > doxycycline > oxytetracycline
   D. Tetracycline = doxycycline > oxytetracycline

48. What two proteins are most commonly involved in plasma protein binding?
   A. Globulin and plasmin
   B. Globulin and albumin
   C. Fibrin and plasminogen
   D. Fibrin and plasmin

49. The major metabolic product that results from aromatic hydroxylation of toluene in humans is:
   A. o-hydroxytoluene.
   B. m-hydroxytoluene.
   C. p-hydroxytoluene.
   D. benzyl alcohol.

50. Drug oxidation is NOT likely to be prevented by:
   A. adding EDTA to the solution.
   B. adding ascorbic acid to the solution.
   C. removing CO\(_2\) from the solution.
   D. protecting the solution from light.

51. What effect do alkaline buffers have in commercial formulations of aspirin?
   A. They increase the rate of absorption of aspirin by alkalinizing the pH of the stomach contents.
   B. They have no effect on the rate of absorption of aspirin from the GI tract.
   C. They increase the rate of absorption of aspirin by increasing the pH immediately around the disintegrating aspirin particles and accelerating their dissolution.
   D. They reduce the rate of absorption of aspirin from the GI tract by converting aspirin to the less readily absorbed ionic form.

52. A solution initially contains methyl acetate (0.01 M) and sodium hydroxide (0.01 M). The solution is unbuffered and both reacting species are consumed. If the rate constant for this reaction at 25°C is 1.082 liters/(mole•min), how many minutes will it take for the concentration of methyl acetate to fall to 0.0090 M?
   A. 92.4
   B. 33.6
   C. 10.3
   D. 0.10

53. If the concentration of reactant A is doubled in a reaction that is third order in A, by what factor will the rate of reaction change?
   A. 2
   B. 3
   C. 6
   D. 8

54. Which of the following sulfonylurea oral hypoglycemics has the longest duration of action?
   A. Glyburide
   B. Tolbutamide
   C. Chlorpropanide
   D. Glipizide
55. True statements about tissue plasminogen activators include which of the following?
   I. They increase the conversion of fibrinogen to fibrin.
   II. They increase the extent of the formation of plasmin at the site of the fibrin clot.
   III. They are more selective than urokinase and streptokinase.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

56. A 24-hour urine sample is collected from a patient who has noninsulin-dependent diabetes mellitus (Type 2) and a stable creatinine level of 2 mg/dL. The sample shows a total volume of 1400 mL and a creatinine concentration of 100 mg/dL. In milliliters per minute, what is the approximate glomerular filtration rate for this patient?
   A. 50
   B. 75
   C. 100
   D. 200

57. Retroviral transduction is characterized by:
   A. uncoating of viral DNA.
   B. blockade of viral mRNA production.
   C. incorporation of viral RNA into the nucleus.
   D. expression of viral genes in dividing cells.

III. Biomedical/Clinical Sciences (35%)

58. Which of the following is a non-parametric test?
   A. Chi-square
   B. t-test
   C. F-test
   D. Analysis of variance

59. Which of the following drugs is indicated for the treatment of hyperphosphatemia associated with renal failure?
   A. Calcium carbonate.
   B. Sodium bicarbonate.
   C. Magnesium carbonate.
   D. Potassium chloride.

60. Which of the following statements about chronic renal failure is true?
   A. Protein binding of drugs is generally decreased.
   B. Peripheral sensitivity to insulin is enhanced.
   C. Oxidation and reduction reactions are enhanced.
   D. The blood-brain barrier is less permeable than in normal subjects.

61. Which of the following statements about acetaminophen-induced liver damage is true?
   A. It causes hepatic cholestasis.
   B. It usually produces jaundice and stupor within 24 hours of drug intake.
   C. It is likely to lead to chronic renal disease.
   D. It is lessened if N-acetyl-L-cysteine is given within 24 hours.

62. Which of the following parameters is elevated in uncomplicated primary hypothyroidism?
   A. Triiodothyronine ($T_3$)
   B. Thyroxine ($T_4$)
   C. Thyroxine-binding globulin (TBG)
   D. Thyroid-stimulating hormone (TSH)

63. Asthma is NOT characterized by:
   A. bronchospasm.
   B. shortness of breath.
   C. a prolonged inspiratory period.
   D. decreased forced expiratory volume.

64. Hypertension may be a risk factor in the development of:
   I. atherosclerosis.
   II. renal insufficiency.
   III. congestive heart failure.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

65. The initial effects of diazepam in treating status epilepticus diminish in a short time, because:
   A. the metabolic rate increases when the patient has a seizure.
   B. diazepam has minimal efficacy for status epilepticus.
   C. diazepam is redistributed to other tissues.
   D. diazepam is eliminated within hours.
66. A patient who has severe pneumocystis carinii pneumonia should be given corticosteroids and:
   A. trimethoprim - sulfamethoxazole.
   B. erythromycin.
   C. doxycycline.
   D. ciprofloxacin.

67. Which of the following sources does NOT include documentation from the primary literature?
   A. APhA Handbook of Non-prescription Drugs
   B. APhA Evaluation of Drug Interactions
   C. AHFS Drug Information
   D. Drugdex Information System

68. A 91-year-old nursing home patient has Alzheimer’s disease and congestive heart failure that is being treated with digoxin. The patient is now to be administered imipramine for depression. What is the best dose and regimen of imipramine for this patient?
   A. 10 mg bid initially, increased slowly into the therapeutic range
   B. 25 mg tid, increased to 50 mg tid in 1 week
   C. 75 mg at bedtime
   D. 150 mg at bedtime

69. A patient has been taking 30 U of Lente insulin every morning before breakfast. His blood glucose levels for the past several days have been nearly identical with the following pattern.

<table>
<thead>
<tr>
<th>Time</th>
<th>Blood Glucose Level</th>
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<tbody>
<tr>
<td>Fasting 7 AM</td>
<td>110 mg/100 mL</td>
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<tr>
<td>Prelunch 12 noon</td>
<td>270 mg/100 mL</td>
</tr>
<tr>
<td>Presupper 5 PM</td>
<td>180 mg/100 mL</td>
</tr>
<tr>
<td>Bedtime 10 PM</td>
<td>150 mg/100 mL</td>
</tr>
</tbody>
</table>

   The inadequate control of his blood glucose level should be corrected by:
   A. decreasing the Lente insulin to 20 U and recalibrating because of the suspected Somogyi effect.
   B. increasing the insulin to 45 U, monitoring closely for a day, and then increasing the insulin gradually as necessary.
   C. substituting an equivalent dose of insulin protamine zinc and following closely.
   D. adding 6 to 8 U of regular insulin to the Lente insulin and adjusting as necessary.

70. Dilated pupils, blurred vision, dry mouth, constipation, and tachycardia are symptomatic of poisoning by:
   A. a neuromuscular blocker.
   B. a cholinergic stimulant.
   C. an anticholinergic agent.
   D. an α-adrenergic stimulant.

71. Hypokalemia may develop during treatment of severe diabetic ketoacidosis as a result of:
   I. effective insulin therapy to increase utilization of glucose.
   II. dilution of body fluid with potassium-free solutions.
   III. correction of metabolic acidosis.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

72. Inflammation of the synovium is the primary tissue pathology for:
   A. gouty arthritis.
   B. rheumatoid arthritis.
   C. osteoarthritis.
   D. infectious arthritis.

73. Which of the following best exemplifies the null hypothesis?
   A. The effect of A is greater than that of B.
   B. The effect of A is different from that of B.
   C. The effect of A is no different from that of B.
   D. The effects of A and B are unpredictable.

74. Which of the following statements about ethylene glycol is true?
   A. It is a quick source of energy when ingested.
   B. It is an excellent nontoxic solvent for many drugs.
   C. It is associated with metabolic alkalosis when ingested.
   D. It is metabolized to oxalate and then precipitated in the kidneys as the calcium salt.
75. Which of the following drugs produces the highest incidence of anaphylactic reactions?
   A. Phenytoin
   B. Penicillin
   C. Chlorpromazine
   D. Digoxin

76. A sputum sample is taken from a patient who is compromised with leukopenia and has a pulmonary infection. A Gram’s stain would most likely show:
   A. many organisms and few white blood cells.
   B. many organisms and many white blood cells.
   C. few organisms and few white blood cells.
   D. few organisms and many white blood cells.

77. Acidic diuresis can appropriately be used in the treatment of poisoning with:
   I. phencyclidine.
   II. amphetamine.
   III. phenobarbital.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

78. In testing independence in a 3 x 2 contingency table, chi-square has how many degrees of freedom?
   A. 1
   B. 2
   C. 3
   D. 4

79. Patients with emphysema have difficulty breathing because:
   A. their diaphragms are fully and permanently expanded.
   B. air leaking into the pleural space causes lung collapse.
   C. recurrent episodes of pneumonia and fibrosis restrict lung expansion.
   D. blebs and air cysts in the lungs restrict the space into which normal lung tissue can expand.

80. Which of the following is NOT a predisposing factor to diabetes mellitus?
   A. Hypertension
   B. Obesity
   C. Pancreatitis
   D. Family history of diabetes

81. A circular area on the skin that is red, but not rough or raised, is most likely a:
   A. vesicle.
   B. pustule.
   C. macule.
   D. papule.

82. Which of the following is the usual source of the organisms that cause acute urinary tract infections?
   A. Bloodstream
   B. Left heart valve
   C. Upper respiratory tract
   D. Gastrointestinal tract

83. Loop diuretics may induce:
   A. metabolic acidosis.
   B. metabolic alkalosis.
   C. respiratory acidosis.
   D. respiratory alkalosis.

84. The neutrophil concentration at which a patient is considered severely neutropenic and generally without cellular defense mechanisms is:
   A. 5000/mm$^3$.
   B. 3000/mm$^3$.
   C. 1500/mm$^3$.
   D. 100/mm$^3$.

85. Which of the following symptoms of methanol toxicity is associated with a markedly increased anion gap?
   A. Metabolic acidosis with increased respirations
   B. Severe epigastric pain
   C. Abdominal rigidity
   D. CNS depression

86. Congestive heart failure does NOT result in:
   A. increased sodium retention by the kidneys.
   B. decreased delivery of blood to the kidneys.
   C. decreased release of renin and aldosterone.
   D. accumulation of fluids in the interstitial spaces.

87. During which of the following periods of pregnancy is a developing fetus most susceptible to drug-induced toxicity?
   A. First 8 weeks
   B. Second 8 weeks
C. Third 8 weeks
D. Final 8 weeks

88. Azathioprine-induced immunosuppression results from:
A. suppression of immunoglobulin production.
B. cytotoxic activity against proliferative cells.
C. suppression of the humoral immune system.
D. enhanced production of interleukin-2.

89. A random sample of the diastolic blood pressures of 100 patients revealed a mean of 85.6 mm Hg and a mode of 80.0 mm Hg. The frequency distribution of the sample was:
A. positively skewed.
B. negatively skewed.
C. normally distributed.
D. indeterminable from the data given.

90. The risk of deep venous thrombosis is increased by:
A. progressive atherosclerosis.
B. progressive blood stasis.
C. increased blood volume.
D. decreased renal function.

91. The incubation period for chickenpox is approximately:
A. 1 to 2 days.
B. 14 to 16 days.
C. 20 to 30 days.
D. 1 to 2 months.

92. Immunosuppression occurs when HIV destroys significant numbers of:
A. plasma cells.
B. erythrocytes.
C. lymphocytes.
D. thrombocytes.

93. Acute disseminated intravascular coagulation (DIC) is most commonly associated with:
A. respiratory failure.
B. acute renal failure.
C. myocardial infarction.
D. bacterial sepsis.

94. Which of the following drugs is most likely to cause the syndrome of inappropriate antidiuretic hormone (SIADH) in an elderly person?
A. Lithium
B. Phenytoin
C. Metoclopramide
D. Chlorpropamide

95. Which of the following findings on an electrocardiogram (EKG) would be observed in a patient receiving digoxin?
A. Prolongation of the QT interval
B. Prolongation of the PR interval
C. Symmetric peaking of the T waves
D. Widening of the QRS complex

96. In order to offset increased losses due to dialysis, daily supplementation is indicated for all of the following vitamins EXCEPT:
A. vitamin A.
B. vitamin C.
C. folic acid.
D. pyridoxine.

97. A patient who is receiving TPN is started on propofol by continuous infusion. Which of the following statements about the patient’s lipid emulsion requirements is true?
A. They will be decreased.
B. They will be unchanged.
C. They will be increased.
D. There is insufficient information to determine whether or how they will change.

IV. Economic, Social, and Administrative Sciences (20%)

98. Literature about the professional socialization of a student in a health profession suggests that:
A. the student is accepted by peers as a professional early in the educational program.
B. as the student achieves scholastic excellence, the faculty respects the student as a professional colleague.
C. the student’s identity as a professional person does not crystallize until the values and beliefs of the profession are internalized.
D. physicians easily confer the status of professional upon a student who provides sound advice.

99. An investigational new drug application must be submitted to the FDA prior to:
A. preclinical laboratory studies in animals.
B. Phase 1 of clinical studies.
C. Phase 2 of clinical studies, but after Phase 1.
D. Phase 3 of clinical studies, but after Phase 2.
100. Drug product selection is best described as:
   A. choosing a bioequivalent product from the same chemical class.
   B. choosing a bioequivalent drug within the same therapeutic class.
   C. identifying products for inclusion in the hospital formulary.
   D. prescribing therapy based on the physician’s diagnosis.

101. According to the Health Belief Model, a patient would be **LESS** likely to be compliant with drug therapy if the patient:
   A. believes that the disease is serious.
   B. believes that a prescribed drug is appropriate for the disease.
   C. receives a reminder that it is time for a drug refill.
   D. believes that a drug’s side effects exceed its benefits.

102. Adherence of elderly patients to their medication therapy may be affected by their:
   I. confusion about the purpose of the medication.
   II. failure to understand the desired effects of the medication.
   III. forgetting to take the medication.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

103. Good communication skills include:
   I. developing listening skills.
   II. evaluating nonverbal clues.
   III. asking open-ended questions.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

104. Cost-containment strategies of Health Maintenance Organizations do **NOT** include:
   A. freedom of choice in health care providers.
   B. use of nonphysician providers.
   C. emphasis on prevention.
   D. reduced hospitalization.

105. An individual who feels that a prescription medication is too costly is likely to try to save money by:
   I. not taking the medicine.
   II. reducing the number of doses taken each day.
   III. consulting another physician.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

106. The Diagnosis-Related Groups (DRGs) can be classified as what type of payment system?
   A. Projective
   B. Prospective
   C. Retrospective
   D. Introspective

107. To control health care costs, it is critical to increase:
   A. the manpower supply.
   B. insurance premiums.
   C. use of technology.
   D. operating efficiency.

108. Which of the following items would appear on a cash flow statement but **NOT** on an income statement?
   A. Debt payment
   B. Taxes and licenses
   C. Manager’s salary
   D. Interest

109. Attempts at cost containment are undermined when patients suffering from minor illnesses visit which of the following easily accessible health care facilities?
   A. Private physician’s office
   B. Outpatient office in a Health Maintenance Organization (HMO)
   C. Hospital emergency room
   D. Community health clinic

110. Which of the following statements about drugs classified as Schedule I substances is true?
   A. They have no potential for abuse.
   B. They have a significant potential for abuse.
   C. All of these substances are produced from natural sources.
   D. They are commonly used in medical treatment.
111. Federal law requires that the labels of OTC drugs bear the:
   A. generic names of the ingredients printed in a type at least half the size of the brand names.
   B. name and address of the manufacturer, packer, or distributor.
   C. patent numbers of all active ingredients.
   D. name of the pharmacy.

112. The federal Food and Drug Administration’s authority to regulate drug distribution comes from:
   A. the Department of Justice.
   B. the interstate commerce clause of the US Constitution.
   C. agreements established with state legislatures.
   D. a mandate of the Executive Office.

113. An item is reduced in price from $2 to $1 and the number of units sold is increased from 10 to 20. What is the coefficient of elasticity?
   A. 0.5
   B. 1.0
   C. 2.0
   D. 5.0

114. The best indicator of a pharmacy’s overall financial performance is the:
   A. acid test.
   B. net profit percentage.
   C. return-on-investment ratio.
   D. inventory-to-working-capital ratio.

115. The Poison Prevention Packaging Act includes regulations that:
   I. exempt nitroglycerin SL tablets from the safety cap requirement.
   II. glass containers may be reused when a prescription is refilled if a new safety cap is provided each time.
   III. plastic containers may be reused when a prescription is refilled.
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

116. Which of the following drugs may be found under the Schedule II classification?
   I. Cocaine
   II. Methylphenidate
   III. Methadone
   A. I only
   B. I and II only
   C. II and III only
   D. I, II, and III

117. Which of the following marketing research techniques would most likely produce generalizable results?
   A. Focus groups
   B. Self-administered questionnaires
   C. In-depth personal interviews
   D. Test marketing

118. One diagnosis and procedure coding system for hospital care is:
   A. UPC.
   B. NDC.
   C. ICD-9.
   D. PCS.

119. The inventory turnover rate is a measure of a pharmacy’s:
   A. efficiency.
   B. profitability.
   C. solvency.
   D. liquidity.

120. For a 100-tablet bottle of a drug, the actual wholesale price (AWP) is $10. The pharmacist charges AWP, less 10%, plus $2.50, so the patient pays:
   A. $10.25
   B. $10.50
   C. $11.50
   D. $12.50

121. Before designing the prescription department, a pharmacist maps the probability distribution of prescription demand and compiles data about the time required to complete all pharmaceutical services in a first come/first served mode. What model is employed?
   A. Staffing model
   B. Queuing model
   C. Work-sampling model
   D. Design model

122. Which of the following describes the FDA requirement that all promotional materials distributed for a prescription drug product include a prominently displayed review of the drug’s indications, contraindications, and side effects?
   A. Fair balance
   B. Full disclosure
   C. Brief summary
   D. Product labeling
### Answer Key

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<th>Area II</th>
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Textbooks Commonly Used in US Pharmacy Schools

The following is a suggested reading list. It does not claim to include all textbooks used in US pharmacy schools, but is a guide for your preparation.

Many of the books on this list have been published in more than one edition. Please consult a bookstore or a health sciences librarian for more detailed information.

Title/Author/Publisher

- *Biopharmaceutics and Clinical Pharmacokinetics* / 4th Edition/M. Gibaldi/Lippincott Williams & Wilkins
- *Clinical Pharmacokinetics* / 3rd Edition/Rowland and Tozer/Williams & Wilkins
- *Clinical Pharmacokinetics – Pocket Reference* / 2nd Edition/J. Murphy/American Society of Health-System Pharmacists
- *Communication Skills in Pharmacy Practice* / 3rd Edition/W. Tindall, R. Beardsley, C. Kimberlin/Williams & Wilkins
- *Drug Interaction Facts* / Facts and Comparisons/updated quarterly
- *Handbook of Basic Pharmacokinetics: Including Clinical Applications* / Ritschel/Drug Intelligence Publications
- *Pharmaceutical Calculations* / 10th Edition/M. Stoklosa and H. Ansel/Lippincott Williams & Wilkins
- *Pharmacology* / 3rd Edition/H. Rang/Harcourt Health Sciences Group
<table>
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<th>Title</th>
<th>Edition</th>
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<tr>
<td>Pharmacy and the US Health Care System</td>
<td>2nd</td>
<td>Fincham and A. Wertheimer/Haworth Press</td>
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<tr>
<td>Pharmacy Law Digest</td>
<td></td>
<td>Fink, et al/Facts and Comparisons/updated biannually</td>
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<tr>
<td>Physical Chemistry: Principles &amp; Applications in Biological Sciences</td>
<td>3rd</td>
<td>Tinoco, Jr and Wang/Prentice Hall</td>
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<td>Physical Pharmacy</td>
<td>4th</td>
<td>Martin and Bustamonte/Lippincott Williams and Wilkins</td>
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<td>Principles of Clinical Toxicology</td>
<td>3rd</td>
<td>Gossel &amp; Bricker/Lippincott-Raven</td>
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<td>Principles of Medicinal Chemistry</td>
<td>4th</td>
<td>Foye, et al/Lippincott Williams and Wilkins</td>
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<tr>
<td>Principles of Pharmacoeconomics</td>
<td>2nd</td>
<td>J. Lyle Bootman, et al/Harvey Whitney Books</td>
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<td>Principles of Pharmaceutical Marketing</td>
<td>3rd</td>
<td>Smith/Books on Demand</td>
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<td>Review of Medical Physiology</td>
<td>19th</td>
<td>Ganong/McGraw-Hill</td>
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<td>Robbins Pathologic Basis of Disease</td>
<td>6th</td>
<td>K. Cotran, et al/W.B. Saunders</td>
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<tr>
<td>Textbook of Biochemistry: With Clinical Correlations</td>
<td>4th</td>
<td>T.M. Devlin, ed./John Wiley &amp; Sons</td>
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<tr>
<td>Textbook of Therapeutics: Drug and Disease Management</td>
<td>7th</td>
<td>Herfindal and Gourley/Lippincott Williams and Wilkins</td>
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<td>Goodman and Gilman’s The Pharmacological Basis of Therapeutics</td>
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<td>USPDI Volume II – Advice for the Patient</td>
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<td>Heller, et al/US Pharmacopeial Convention, Inc./Updated annually</td>
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<td>Wilson and Gisvold’s Textbook of Organic Medicinal and Pharmaceutical Chemistry</td>
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Preamble and Mission Statement of the National Association of Boards of Pharmacy

Preamble

Given that medications are an integral part of disease management, medication therapies and their delivery systems are becoming more complex, technological enhancements have improved the capabilities for patient monitoring, and entities motivated by economic gain are eroding standards of care, there is greater potential harm to the public and a greater need for patients’ medication use to be managed by a licensed pharmacist and state regulatory agencies to aggressively enforce standards of care.

NABP Mission Statement

The National Association of Boards of Pharmacy (NABP) is the independent, international, and impartial Association that assists its member boards and jurisdictions in developing, implementing, and enforcing uniform standards for the purpose of protecting the public health.

NABP Member Boards of Pharmacy

Alabama State Board of Pharmacy
Alaska Board of Pharmacy
Arizona State Board of Pharmacy
Arkansas State Board of Pharmacy
California State Board of Pharmacy
Colorado State Board of Pharmacy
Connecticut Commission of Pharmacy
Delaware State Board of Pharmacy
District of Columbia Board of Pharmacy
Florida Board of Pharmacy
Georgia State Board of Pharmacy
Guam Board of Examiners for Pharmacy
Hawaii State Board of Pharmacy
Idaho Board of Pharmacy
Illinois Department of Financial and Professional Regulation, Division of Professional Regulation – State Board of Pharmacy
Indiana Board of Pharmacy
Iowa Board of Pharmacy Examiners
Kansas State Board of Pharmacy
Kentucky Board of Pharmacy
Louisiana Board of Pharmacy
Maine Board of Pharmacy
Maryland Board of Pharmacy
Massachusetts Board of Registration in Pharmacy
Michigan Board of Pharmacy
Minnesota Board of Pharmacy
Mississippi State Board of Pharmacy
Missouri Board of Pharmacy
Montana Board of Pharmacy
Nebraska Board of Pharmacy
Nevada State Board of Pharmacy
New Hampshire Board of Pharmacy
New Jersey Board of Pharmacy
New Mexico Board of Pharmacy
New York Board of Pharmacy
North Carolina Board of Pharmacy
North Dakota State Board of Pharmacy
Ohio State Board of Pharmacy
Oklahoma State Board of Pharmacy
Oregon State Board of Pharmacy
Pennsylvania State Board of Pharmacy
Puerto Rico Board of Pharmacy
Rhode Island Board of Pharmacy
South Carolina Department of Labor, Licensing, and Regulation – Board of Pharmacy
South Dakota State Board of Pharmacy
Tennessee Board of Pharmacy
Texas State Board of Pharmacy
Utah Board of Pharmacy
Vermont Board of Pharmacy
Virgin Islands Board of Pharmacy
Virginia Board of Pharmacy
Washington State Board of Pharmacy
West Virginia Board of Pharmacy
Wisconsin Pharmacy Examining Board
Wyoming State Board of Pharmacy

Australia:
Pharmacy Board of New South Wales*
Pharmacy Board of Victoria*

Canada:
Alberta College of Pharmacists*
College of Pharmacists of British Columbia*
Manitoba Pharmaceutical Association*
New Brunswick Pharmaceutical Society*
Nova Scotia Pharmaceutical Society*
Ontario College of Pharmacists*
Prince Edward Island Board of Pharmacy*
Quebec Order of Pharmacists*

New Zealand:
Pharmaceutical Society of New Zealand*

Africa:
South African Pharmacy Council*

* Associate Member