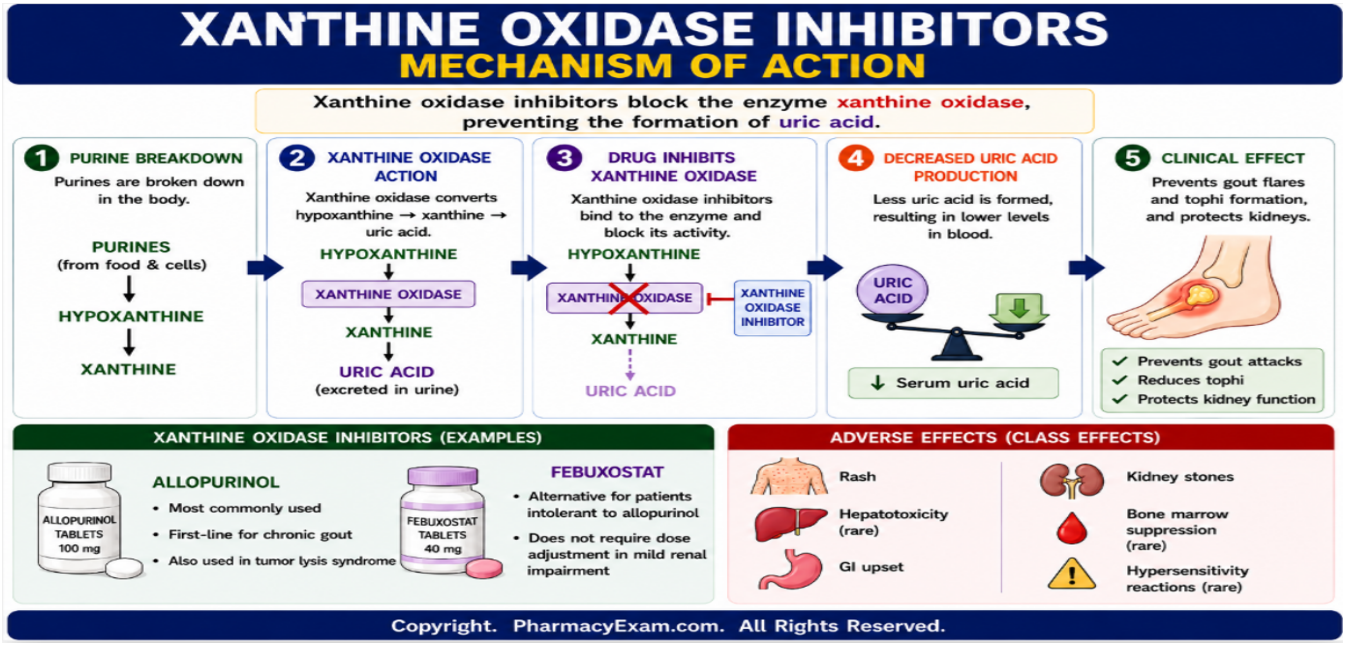
NAPLEX® REVIEW

Questions & Answers

2027 Premium Edition



NAPLEX Review

PREPARATION

Questions & Answers

By Manan Shroff 2027 Edition

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PHARMACYEXAM

NAPLEX® Questions And Answers Premium Edition

2027 EDITION

MANAN SHROFF, R.Ph.

Exam-Style Questions

Detailed Answers & Explanations

Covers Updated Blueprint

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PREFACE

The RxExam® NAPLEX® Questions and Answers: Premium Edition has been developed to provide pharmacy graduates with a comprehensive, clinically focused resource for NAPLEX® preparation. This edition contains 1,150 carefully selected practice questions with detailed explanations covering the major areas of knowledge and application expected of entry-level pharmacists.

This Premium Edition represents a significant evolution of our original question-and-answer review. In addition to practice questions, the book includes hundreds of full-color educational illustrations, drug monographs, tables, Key Points, and Exam Pearls designed to make complex concepts easier to understand, visualize, and remember. The goal is not simply to help students identify the correct answer, but to help them understand the underlying concept and apply that knowledge to similar questions.

The questions cover a broad range of clinically important topics, including pharmacotherapy, drug indications, mechanisms of action, dosing, adverse effects, contraindications, drug interactions, patient counseling, laboratory monitoring, medication safety, OTC medications, herbal products, sterile and nonsterile compounding, pharmaceutical calculations, biostatistics, and pharmacy ethics. Patient profiles and application-based questions are included throughout the book to reinforce clinical reasoning and decision-making.

Students are encouraged to read the complete explanation even when they answer a question correctly. Many explanations contain additional information that extends beyond the question itself and reinforces other high-yield concepts that may be useful during NAPLEX® preparation.

Special attention has also been given to areas that students often find challenging, including interpretation of laboratory values, pharmaceutical calculations, biostatistics, and compounding. Selected high-yield questions from these areas are included in this book, while students who need more extensive practice can use the additional specialized review materials and question banks available from PharmacyExam.com.

Pharmacy knowledge continues to evolve as new medications are introduced, treatment recommendations change, and professional standards are updated. This edition has been carefully reviewed with an emphasis on clinically relevant and contemporary pharmacy practice. Nevertheless, students should always recognize that successful NAPLEX® preparation requires understanding concepts rather than simply memorizing individual questions and answers.

My goal in preparing this book has remained the same: to provide pharmacy students with a practical, understandable, and comprehensive resource that helps them identify their weaknesses, strengthen their knowledge, and approach the NAPLEX® with greater confidence.

I sincerely hope that the time and effort invested in this Premium Edition will contribute to your success as you prepare for this important examination and begin the next stage of your professional career.

I wish you the very best of luck.
Manan H. Shroff
PharmacyExam.com

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Table of Contents

Questions

Chapter 1: PROFILE:1 8
Chapter 2: PROFILE:2 13
Chapter 3: PROFILE:3 19
Chapter 4: PROFILE:4 24
Chapter 5: PROFILE:5 30
Chapter 6: PROFILE:6 34
Chapter 7: PROFILE:7 38
Chapter 8: PROFILE:8 42
Chapter 9: PROFILE:9 47
Chapter 10: PROFILE:10 50
Chapter 11: PROFILE:11 54
Chapter 12: PROFILE:12 58
Chapter 13: PROFILE:13 62
Chapter 14: PROFILE:14 67
Chapter 15: PROFILE:15 72
Chapter 16: PROFILE:16 78
Chapter 17: PROFILE:17 83
Chapter 18: PROFILE:18 88
Chapter 19: PROFILE:19 93
Chapter 20: PROFILE:20 98
Chapter 21: PROFILE:21 103
Chapter 22: PROFILE:22 109
Chapter 23: PROFILE:23 114
Chapter 24: PROFILE:24 118
Chapter 25: PROFILE:25 121
Chapter 26: PROFILE:26 126
Chapter 27: PROFILE:27 130

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Chapter 28: PROFILE: 28 (Lab Values) 137
Chapter 29: OVER-THE-COUNTER PROFILE: 29 143
Chapter 30: OVER-THE-COUNTER PROFILE: 30 149
Chapter 31: IV PROFILE: 31 155
Chapter 32: IV PROFILE: 32 159
Chapter 33: HERBAL DRUG PROFILE 165
Chapter 34: STERILE COMPOUNDING 169
Chapter 35: PHARMACY STATISTICS 177
Chapter 36: PHARMACY ETHICS 181
Chapter 37: PHARMACEUTICAL CALCULATIONS 186

Answers & Explanations

Chapter 1: PROFILE:1 190
Chapter 2: PROFILE:2 220
Chapter 3: PROFILE:3 245
Chapter 4: PROFILE:4 266
Chapter 5: PROFILE:5 292
Chapter 6: PROFILE:6 310
Chapter 7: PROFILE:7 333
Chapter 8: PROFILE:8 349
Chapter 9: PROFILE:9 375
Chapter 10: PROFILE:10 389
Chapter 11: PROFILE:11 409
Chapter 12: PROFILE:12 426
Chapter 13: PROFILE:13 438
Chapter 14: PROFILE:14 460
Chapter 15: PROFILE:15 485
Chapter 16: PROFILE:16 505
Chapter 17: PROFILE:17 526
Chapter 18: PROFILE:18 549
Chapter 19: PROFILE:19 567

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Chapter 20: PROFILE:20 585
Chapter 21: PROFILE:21 605
Chapter 22: PROFILE:22 632
Chapter 23: PROFILE:23 653
Chapter 24: PROFILE:24 672
Chapter 25: PROFILE:25 684
Chapter 26: PROFILE:26 703
Chapter 27: PROFILE:27 717
Chapter 28: PROFILE: 28 (Lab Values) 740
Chapter 29: OVER-THE-COUNTER PROFILE: 29 761
Chapter 30: OVER-THE-COUNTER PROFILE: 30 778
Chapter 31: IV PROFILE: 31 797
Chapter 32: IV PROFILE: 32 810
Chapter 33: HERBAL DRUG PROFILE 829
Chapter 34: STERILE COMPOUNDING 843
Chapter 35: PHARMACY STATISTICS 874
Chapter 36: PHARMACY ETHICS 887
Chapter 37: PHARMACEUTICAL CALCULATIONS 895

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PROFILE:1

Name: Mr. Nathan Morris **Address:** 1324 Blueberry Blvd.

Height: 5'10" **Age:** 35 **Weight:** 110 lbs. **Sex:** Male **Allergy:** Sulfa

PRIMARY DIAGNOSIS:

1. CHF
2. Hypertension

SECONDARY DIAGNOSIS:

LAB RESULTS	DATE	LAB RESULTS	DATE
K+: 2.5meq/l	1/18		

RX No	DRUG NAME	PRESCRIBER	QTY	DATE	REFILLS
13201	HCTZ 25mg, 1/po/q.d.	Huss	30	1/10	5
13202	Norvasc 2.5mg, 1/po/q.d.	Huss	30	1/10	5
13203	Dacodyl 5mg, 1/po/hs.	Huss	30	1/10	5
13204	Lasix 20mg, 1/po/q.d.	Huss	30	1/10	5
13205	Corgard 80mg, 1/po/q.i.d.	Huss	120	1/11	1
13206	Valium 5mg, 1/po/hs.	Huss	30	1/11	1
13207	Lanoxin 0.25mg, 1/po/q.d.	Huss	30	1/11	5
13208	Toradol 10mg, 1/po/q.d.	Huss	5	1/21	0
13209	Catapres TTS 2, once weekly.	Huss	4	1/21	2
13210	Aldactone 25mg, 1/po/q.d.	Huss	30	1/28	5

PHARMACIST NOTES:

1. Patient is complaining about muscle cramps, weakness and tiredness.
2. Difficulty in stool excretion.
3. Allergy to sulfa products.

555. A 42-year-old patient with obesity is prescribed tirzepatide (Zepbound) for chronic weight management. Which of the following statements about tirzepatide is correct?

A. It acts exclusively as a GLP-1 receptor agonist.

B. The recommended starting dose is 10 mg subcutaneously once weekly.

C. It activates both GIP and GLP-1 receptors.

D. It should be administered orally on an empty stomach.

E. It may be combined with another GLP-1 receptor agonist to enhance weight loss.

556. What is the best time of day to take Livalo?

A. In the morning
B. In the afternoon
C. In the evening
D. At bedtime
E. At any time of day

557. A 58-year-old patient with hypertension controlled with lisinopril asks the pharmacist for an OTC product to treat nasal congestion associated with a cold. Which product should the pharmacist recommend that the patient avoid because it may increase blood pressure?

A. Saline nasal spray
B. Guaifenesin
C. Pseudoephedrine
D. Dextromethorphan
E. Cetirizine

558. Which of the following was an active ingredient in Robitussin A/C?

A. Pseudoephedrine
B. Dextromethorphan hydrobromide
C. Phenylpropanolamine
D. Codeine phosphate
E. Pyrilamine

559. Which of the following brand names refers to an intranasal antihistamine used to treat allergic rhinitis?

A. Zyrtec
B. Clarinex
C. Xyzal
D. Astepro
E. Claritin

560. Which of the following statements about Accolate are true?

I. The active ingredient in Accolate is zafirlukast.

II. It antagonizes cysteinyl leukotriene type 1 (CysLT1) receptors, thereby blocking the effects of slow-reacting substance of anaphylaxis (SRS-A).

III. It is not a bronchodilator and should not be used to treat acute asthma attacks.

A. I only
B. III only
C. I and II only
D. II and III only
E. All statements

561. A 54-year-old patient with type 2 diabetes mellitus reports increased thirst, frequent urination, fatigue, and blurred vision over the past several days. Which of the following laboratory abnormalities is most consistent with these symptoms?

A. Hyperglycemia
B. Hypoglycemia
C. Hypokalemia
D. Hyponatremia
E. Hypocalcemia

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1. A 64-year-old patient with symptomatic heart failure with reduced ejection fraction (HFrEF) has a left ventricular ejection fraction of 30%. The patient is receiving sacubitril/valsartan, carvedilol, and spironolactone, and renal function is adequate for additional therapy. Which medication should be considered to further reduce the risk of cardiovascular death and heart failure hospitalization?

A. Dapagliflozin
B. Diltiazem
C. Pioglitazone
D. Verapamil
E. Saxagliptin

2. Which medication should Nathan avoid because of his allergy?

A. Hydrochlorothiazide
B. Lanoxin
C. Dulcolax
D. Azatadine/pseudoephedrine
E. Diazepam

3. What is the active ingredient in Geodon?

A. Clozapine
B. Quetiapine
C. Molindone
D. Tolterodine
E. Ziprasidone

4. Hydrochlorothiazide causes all of the following EXCEPT:

A. Hypokalemia
B. Hypercalcemia
C. Hypouricemia
D. Hyperglycemia
E. Hyponatremia

5. Hydrochlorothiazide should be avoided with

I. Lanoxin
II. Lithium
III. Questran

A. I only
B. III only
C. I and II only
D. II and III only
E. All

6. Dry mouth, increased thirst, irregular heartbeat, muscle cramps, pain, nausea, and weakness are most consistent with toxicity from which medication?

A. Digitalis toxicity
B. Hydrochlorothiazide toxicity
C. Bisacodyl toxicity
D. Diazepam toxicity
E. Atropine toxicity

7. A normal serum potassium (K^+) concentration is:

A. 1 mEq/L
B. 1 to 2 mEq/L
C. 3.5 to 5 mEq/L
D. 10 mEq/L
E. 35 mEq/L

8. All of the following diuretics should generally be avoided in a patient with hypokalemia, **EXCEPT:**

A. Diulo
B. Zaroxolyn
C. Hygroton
D. Diuril
E. Aldactone

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16. Mr. Smith works at Good Care, where his primary responsibility is driving a vehicle to deliver medications to several nursing homes. Which of the following antihistamines is most appropriate for his runny nose and itchy eyes?

A. Claritin
B. Chlor-Trimeton
C. Benadryl
D. Dimetane
E. Unisom

17. Which of the following drugs requires refrigerated storage?

A. Ery-Tab
B. Prezista
C. Lucentis
D. Accolate
E. Z-Pak

18. Which of the following is the active ingredient in Toradol?

I. Ketorolac tromethamine
II. Flurbiprofen
III. Oxaprozin

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

19. Ketorolac tromethamine can be administered by which of the following routes?

I. Orally
II. Intramuscularly
III. Intravenously

A. I only
B. III only
C. I and II only
D. II and III only
E. All

20. Because of its risk of serious adverse effects, Ketorolac tromethamine should not be administered for more than:

A. 3 days
B. 5 days
C. 7 days
D. 11 days
E. 14 days

21. Which of the following statements about Ketorolac tromethamine is **NOT TRUE**?

A. Ketorolac tromethamine is indicated for the short-term management of moderately severe acute pain requiring analgesia at the opioid level.

B. Ketorolac tromethamine can cause peptic ulcers, gastrointestinal bleeding, and perforation and is contraindicated in patients with active peptic ulcer disease.

C. Ketorolac tromethamine is contraindicated in patients with advanced renal impairment or those at risk for renal failure due to volume depletion.

D. Ketorolac tromethamine inhibits platelet aggregation and increases the risk of bleeding.

E. Ketorolac tromethamine is a preferred analgesic for epidural and/or intrathecal administration.

22. Which of the following medications should be avoided in a patient receiving ketorolac tromethamine?

I. Plicamycin
II. Valproic acid
III. Aspirin

A. I only
B. III only
C. I and II only
D. II and III only
E. All

23. All of the following drugs should be avoided with ketorolac tromethamine **EXCEPT:**

A. Antivert
B. Cefotetan
C. Auranofin
D. Methotrexate
E. Probenecid

24. A patient with a history of gastrointestinal (GI) ulcers requires potassium supplementation to treat hypokalemia. Which of the following potassium supplements should the pharmacist recommend? **[Select All That Apply.]**

A. K-Dur
B. K-Tab
C. Micro-K Extencaps
D. Kaochlor
E. Klotrix

25. Which active ingredients are found in Symbicort?

I. Budesonide
II. Formoterol
III. Ipratropium

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

26. In Catapres-TTS-2, what does the numeral 2 indicate?

A. 2 mg of clonidine per day for 15 days
B. 0.2 mg of clonidine per day for 3 days
C. 0.3 mg of clonidine per day for 7 days
D. 0.2 mg of clonidine per day for 1 week
E. 0.2 mg of clonidine per day for 2 weeks

27. Clonidine is classified as a(n):

A. Alpha-1 adrenergic antagonist.
B. Alpha-2 adrenergic agonist.
C. Beta-1 adrenergic antagonist.
D. Beta-2 adrenergic agonist.
E. 5-HT3 receptor antagonist.

28. Abilify is indicated for which of the following conditions? Select all that apply.

A. Hypertension
B. Bipolar-I disorder
C. Major depressive disorder
D. Schizophrenia
E. Glaucoma

29. Lasix is available in which of the following dosage forms?

I. Tablet
II. Oral solution
III. Injection

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

30. What is the active ingredient in Xolegel?

A. Fluconazole
B. Metronidazole
C. Ketoconazole
D. Itraconazole
E. Clotrimazole

31. Which of the following is a major adverse effect of Geodon?

A. Hypertension
B. Seizure
C. Edema
D. Arrhythmia
E. Jaundice

32. Which of the following is/are true about Toradol?

I. Orally, it is less bioavailable.

II. Parenteral administration by I.M. route provides more bioavailability.

III. Oral route provides more bioavailability compared to parenteral route.

A. I only
B. III only
C. I and II only
D. II and III only
E. All

33. The dosage of Abilify should be reduced to half when prescribed with:

I. Prozac
II. Nizoral
III. Tegretol

A. I only
B. III only
C. I and II only
D. II and III only
E. All

34. Which medication should be avoided in a patient with heparin hypersensitivity?

A. Lovenox
B. Viracept
C. Rescriptor
D. Coumadin
E. Ticlid

35. Which of the following are angiotensin II receptor antagonists?

I. Diovan
II. Cozaar
III. Avapro

A. I only
B. III only
C. I and II only
D. II and III only
E. All

36. Duetact is indicated for the treatment of which condition?

A. Hypertension
B. Type 2 diabetes mellitus
C. Parkinson's disease
D. Arrhythmia
E. Ulcerative colitis

51. After initiating therapy with one of the following drugs, Chris feels symptoms of malaise, weakness, lethargy, facial edema, anorexia, and vomiting. His liver enzymes ALT, AST and LH are also elevated. These indicate the toxicity of: **[Select All That Apply.]**

A. Augmentin
B. Tegretol
C. Depakote
D. Cytotec
E. Nimotop

52. Chris has documented allergies to belladonna alkaloids and phenobarbital. Which of the following medications should he avoid?

I. Butibel
II. Donnatal Extentabs
III. Transderm Scop

A. I only
B. III only
C. I and II only
D. II and III only
E. All

53. Tagamet is available in which of the following dosage forms?

I. Tablet
II. Injection
III. Oral solution

A. I only
B. III only
C. I and II only
D. II and III only
E. All

54. What is the major difference between Travatan and Travatan Z? **[Select all that apply.]**

A. Different active ingredient
B. Different potency
C. Different manufacturer
D. Different preservative
E. Different drug indication

55. Which of the following agents may interact with Tagamet?

I. Maalox
II. Ketoconazole
III. Theophylline

A. I only
B. III only
C. I and II only
D. II and III only
E. All

56. Which of the following drugs is available without a prescription?

A. Ritalin
B. Aleve
C. Dilantin
D. Depakote
E. Tegretol

57. Which of the following statements about NSAIDs is/are **TRUE**?

I. NSAIDs are indicated for the treatment of pain, dysmenorrhea, and bursitis.

II. Gastrointestinal ulceration and bleeding have been reported with NSAID use.

III. Any OTC NSAID should not be used for more than 15 days for pain or 10 days for fever.

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

588. Which of the following prostaglandins is a potent mast cell-derived mediator of an asthma attack?

A. PGD_2
B. PGE_2
C. $PGF_{2\alpha}$
D. PGI_2
E. Thromboxane A_2

589. Which of the following statements about asthma is/are true?

I. During the early phase, asthma causes chest tightness and shortness of breath.

II. During the late phase, airway inflammation causes excessive mucus secretion.

III. Repetition of this cycle can lead to chronic airway remodeling and bronchiolar obstruction.

A. I only
B. III only
C. I and II only
D. II and III only
E. All of the above

590. Crestor is indicated for the treatment of which condition?

A. Hypertension
B. Depression
C. Alzheimer's disease
D. Parkinsonism
E. Hypercholesterolemia

591. A 16-year-old patient with asthma is prescribed montelukast (Singulair) for maintenance therapy. Which counseling point is most important for the pharmacist to discuss with the patient and caregiver?

A. Use montelukast for immediate relief during an acute asthma attack.

B. Report new or worsening changes in mood, behavior, or sleep.

C. Take each dose with a high-fat meal to improve absorption.

D. Avoid dairy products for 2 hours after each dose.

E. Monitor for permanent discoloration of the teeth.

592. A 59-year-old patient with primary open-angle glaucoma is prescribed bimatoprost. Which adverse effect should the pharmacist discuss with the patient?

A. Permanent blue discoloration of the sclera
B. Increased brown pigmentation of the iris
C. Severe xerostomia
D. Progressive hearing loss
E. Corneal calcium deposition

593. Theophylline products require particular caution when used to treat asthma because: (Select All That Apply)

A. They may damage lung fibers when used for a prolonged period.

B. Their pharmacologic effects diminish with prolonged use.

C. They interact with numerous drugs.

D. They increase mucus production in the bronchioles.

E. They have intrinsic beta-2 receptor-blocking activity.

612. Which of the following statements about Pentam-300 are true?

I. It is indicated for the treatment of Pneumocystis jirovecii pneumonia.

II. Severe hypotension has been reported when it is administered by the intramuscular (IM) or intravenous (IV) route.

III. A prescription for Pentam-300 can be filled with NebuPent.

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

613. A 52-year-old woman experiencing frequent moderate-to-severe vasomotor symptoms due to menopause prefers nonhormonal treatment. The prescriber initiates Veozah. Which of the following should be performed before initiating therapy?

A. Pulmonary function testing
B. Hepatic laboratory testing
C. Bone mineral density testing
D. Thyroid ultrasound
E. Serum creatine kinase measurement

614. A 34-year-old woman is diagnosed with an uncomplicated urinary tract infection caused by a susceptible strain of Escherichia coli. The prescriber selects gepotidacin (Blujepa), an oral antibacterial agent. Which of the following best describes the mechanism of action of gepotidacin?

A. Inhibits bacterial cell-wall synthesis by binding penicillin-binding proteins

B. Inhibits bacterial DNA replication by targeting DNA gyrase and topoisomerase IV through a distinct binding mechanism

C. Inhibits the 30S ribosomal subunit and prevents aminoacyl-tRNA binding

D. Inhibits bacterial folate synthesis by blocking dihydrofolate reductase

E. Disrupts bacterial cell membranes by binding membrane phospholipids

615. A 36-year-old patient presents to the emergency department after ingesting an unknown quantity of antifreeze. Laboratory testing reveals a high anion gap metabolic acidosis and an elevated osmolar gap. Ethylene glycol poisoning is suspected. Which medication should be administered to inhibit formation of the toxic metabolites responsible for this patient's metabolic acidosis and organ toxicity?

A. Fomepizole
B. N-acetylcysteine
C. Flumazenil
D. Pralidoxime
E. Deferoxamine

616. Which of the following drugs may cause renal toxicity?

I. Foscavir
II. Edecrin
III. Cisplatin

A. I only
B. III only
C. I and II only
D. II and III only
E. All

625. Which of the following medications are associated with acute pancreatitis?

I. Pentamidine
II. 6-Mercaptopurine
III. Valproic acid

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

626. A 44-year-old patient with ulcerative colitis begins azathioprine therapy. Three weeks later, the patient develops severe, persistent epigastric pain radiating to the back, nausea, and vomiting. Laboratory testing reveals a markedly elevated serum lipase concentration. Which of the following is the most likely explanation for these findings?

A. Azathioprine-induced acute pancreatitis
B. Azathioprine-induced nephrolithiasis
C. Azathioprine-induced cholecystitis
D. Azathioprine-induced peptic ulcer disease
E. Azathioprine-induced bowel obstruction

627. Which of the following statements about Cerebyx are true?

I. Phenytoin is an active metabolite.

II. The serum phenytoin concentration should not be measured until the conversion of fosphenytoin to phenytoin is complete, which normally occurs approximately 2 hours after an I.V. infusion or 4 hours after an I.M. injection.

III. Cerebyx should always be prescribed and dispensed in phenytoin sodium equivalent units.

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

628. Aspergillosis primarily affects which site?

A. Ear canals
B. Eyes
C. Lungs
D. Nose
E. Sinus cavities

629. If a patient's serum phenytoin concentration is 35 mcg/ml, which of the following adverse reactions would most likely occur?

I. Nystagmus
II. Ataxia
III. Dysarthria

A. I only
B. III only
C. I and II only
D. II and III only
E. All

630. A patient has just received counseling about a new prescription for Actemra. Which statement demonstrates an understanding of the drug's boxed warning?

A. This medication can lower my blood pressure.

B. This medication can cause stiffness in my joints.

C. I need to wear sunscreen outside while I'm taking this drug.

D. This medication can reduce my immunity and increase the chances of serious infections.

E. This medication can cause severe headache.

631. Each Cerebyx vial contains fosphenytoin sodium 75 mg/ml, which is equivalent to what concentration of phenytoin sodium?

A. 20 mg/ml phenytoin sodium.
B. 30 mg/ml phenytoin sodium.
C. 40 mg/ml phenytoin sodium.
D. 50 mg/ml phenytoin sodium.
E. 60 mg/ml phenytoin sodium.

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659. Which of the following beta blockers has not been indicated for the treatment of glaucoma?

A. Betaxolol
B. Levobunolol
C. Timolol
D. Metipranolol
E. Atenolol

660. Which of the following terms describes an unpleasant odor of the breath?

A. Balanitis
B. Blastomycosis
C. Giardiasis
D. Halitosis
E. Helicobacteriosis

661. A 67-year-old patient with primary open-angle glaucoma is prescribed netarsudil. Which of the following best describes how this medication lowers intraocular pressure?

A. Blocks beta-adrenergic receptors and decreases aqueous humor production

B. Inhibits carbonic anhydrase and decreases aqueous humor production

C. Inhibits Rho kinase and increases aqueous humor outflow through the trabecular meshwork

D. Stimulates muscarinic receptors and produces contraction of the ciliary muscle

E. Blocks cysteinyl leukotriene receptors and decreases ocular inflammation

662. Oxytrol is available in which of the following dosage forms?

A. Tablet
B. Capsule
C. Transdermal patch
D. Injection
E. Suspension

663. Gralise is indicated for the treatment of which condition?

A. PHN
B. CHF
C. IBS
D. SLE
E. MDD

664. All of the following are typical early manifestations of idiopathic intracranial hypertension (formerly benign intracranial hypertension) EXCEPT:

A. Papilledema
B. Headache
C. Visual disturbances
D. Seizure
E. Nausea

665. Balanitis can occur in which of the following populations?

I. a young boy
II. an adult male
III. an adult female

A. I only
B. III only
C. I and II only
D. II and III only
E. All

666. Successful antiretroviral therapy for HIV infection is expected to increase the count of which of the following cells?

A. Red blood cells
B. CD4+ T lymphocytes
C. Thrombocytes
D. Neutrophils
E. Reticulocytes

667. Prograf is classified as a(n):

A. Antidepressant
B. Antihypertensive
C. Immunosuppressant
D. Anti-HIV
E. Muscle relaxant

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678. A farm worker is brought to the emergency department after accidental exposure to an organophosphate insecticide. The patient has excessive salivation, lacrimation, diarrhea, bronchial secretions, miosis, muscle weakness, and fasciculations. Atropine is administered. Which medication should also be administered to reactivate acetylcholinesterase and improve the nicotinic manifestations of organophosphate poisoning?

A. Pralidoxime
B. Flumazenil
C. Fomepizole
D. Physostigmine
E. Digoxin immune Fab

679. A 29-year-old patient is brought to the emergency department with severe agitation, delirium, hallucinations, mydriasis, dry flushed skin, urinary retention, and tachycardia after an overdose of an anticholinergic medication. The ECG shows no evidence of a significant conduction abnormality. Which of the following medications may be used to reverse severe central and peripheral anticholinergic toxicity in an appropriately selected patient?

A. Physostigmine
B. Pralidoxime
C. Atropine
D. Flumazenil
E. Naloxone

680. The expectorant contained in Tussi Organidin DM NR is:

A. Benzonatate
B. Guaifenesin
C. Iodinated glycerol
D. Dextromethorphan
E. Iodinated codeine

681. Jim has a hypersensitivity to belladonna alkaloids. Which of the following drugs does NOT need to be avoided specifically because of this allergy?

A. Atrohist
B. Cystospaz
C. Donnatal
D. Levsin
E. Fedahist

682. Which of the following is NOT a pancreatic enzyme product containing pancrelipase?

A. Cotazym
B. Pancrease
C. Zymase
D. Donnazyme
E. Pulmozyme

683. Concomitant use of Zyvox with which of the following medications increases the risk of serotonin syndrome?

I. Effexor
II. Celexa
III. Demerol

A. I only
B. III only
C. I and II only
D. II and III only
E. All

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745. A patient receiving chronic lithium therapy develops persistent polyuria and polydipsia consistent with lithium-induced nephrogenic diabetes insipidus. Which medication may be particularly useful in managing this condition?

A. Desmopressin
B. Acetazolamide
C. Mannitol
D. Amiloride
E. Tolvaptan

746. Based on the patient's medication profile, which of the following drugs should the pharmacist question because the prescribed dose is too high?

A. Lescol
B. Griseofulvin
C. Robaxin
D. Zestril
E. Naproxen

747. A patient stabilized on warfarin begins treatment with metronidazole. Which change is most likely?

A. Decreased INR and increased risk of thrombosis
B. Increased INR and increased risk of bleeding
C. Decreased warfarin absorption with no change in INR
D. Increased platelet aggregation
E. Increased vitamin K production

748. The active ingredient in Xyzal is the R-enantiomer of the active ingredient in which of the following products?

A. Claritin
B. Zyrtec
C. Tavist
D. Clarinex
E. Chlor-Trimeton

749. Which of the following statements is/are true about methyldopa?

I. Before initiating therapy, obtain a complete blood count and repeat it periodically thereafter.

II. Hemolytic anemia that occurs during therapy may remit promptly after the drug is discontinued.

III. Prolonged therapy may result in a positive direct antiglobulin (Coombs) test.

A. I only
B. III only
C. I and II only
D. II and III only
E. All

750. Which of the following is the pharmacologic target of Xolair?

A. Thrombocytes
B. Thromboxane
C. Leukocytes
D. IgE
E. Prostaglandin

751. Which of the following statements about amphotericin B deoxycholate is false?

A. It is a polyene antifungal that binds to ergosterol and disrupts the fungal cell membrane.

B. It is indicated for the treatment of oral thrush and esophageal candidiasis.

C. An overdose of amphotericin B can cause cardiorespiratory arrest.

D. It should be refrigerated and protected from light.

E. Tolerance to therapy can be improved by pretreating patients with aspirin, acetaminophen, diphenhydramine, and/or an antiemetic.

762. Which of the following drugs is indicated for the treatment of schizophrenia?

A. Cerebyx
B. Zyprexa
C. Lexapro
D. Avapro
E. Voltaren

763. Which of the following statements about Zyprexa Relprevv are TRUE? (Select All That Apply).

A. It is available only through a restricted distribution program.

B. It is indicated for the treatment of schizophrenia.

C. It is intended for deep subcutaneous injection only.

D. A recommended dosage regimen is 405 mg every 4 weeks.

E. A patient should be monitored for post-injection delirium/sedation syndrome.

764. PhosLo is indicated for the treatment of which condition?

A. Hypocalcemia
B. Hypophosphatemia
C. Hypercalcemia
D. Hyperphosphatemia
E. Hyperkalemia

765. Which of the following is a serious adverse effect associated with Arixtra?

A. Hypotension
B. Vomiting
C. Diarrhea
D. Arrhythmia
E. Hematoma

766. Which of the following products are indicated for the emergency treatment of accidental drug poisoning?

I. Charcoal Plus
II. Actidose with Sorbitol
III. Actidose-Aqua

A. I only
B. III only
C. I and II only
D. II and III only
E. All

767. Molindone is classified as which type of medication?

A. Antihypertensive
B. Antidepressant
C. Antipsychotic
D. Antiarrhythmic
E. Antiviral

768. Which administration time is appropriate for Apidra?

A. Within 15 minutes before a meal
B. Within 2 hours after a meal
C. At any time of day
D. At bedtime
E. In the early morning

769. Relenza is classified as which type of medication?

A. Antifungal
B. Antibacterial
C. Anthelmintic
D. Antiviral
E. Cytotoxic

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790. Which of the following drugs have a clinically significant interaction with ciprofloxacin? (Select All That Apply)

A. Sucralfate
B. Ferrous sulfate
C. Erythromycin
D. Theophylline
E. Docusate sodium

791. A 67-year-old woman with postmenopausal osteoporosis is prescribed Atelvia 35 mg once weekly. Which instruction should the pharmacist provide?

A. Take the tablet at bedtime on an empty stomach.
B. Take the tablet in the morning immediately after breakfast with at least 4 ounces of plain water.
C. Take the tablet 30 minutes before breakfast.
D. Crush the tablet and mix it with food to improve absorption.
E. Take the tablet immediately before breakfast with milk.

792. Probenecid may increase the serum concentrations of all of the following drugs EXCEPT:

A. Bicillin
B. Cefamandole
C. Retrovir
D. Methotrexate
E. Rifampin

793. On January 1, a patient's serum digoxin concentration was 1.2 ng/ml; 1 month later, it was 1.8 ng/ml. Each of the following drugs may increase the serum digoxin concentration EXCEPT:

A. Quinidine
B. Ery-500
C. Calan
D. Norvir
E. Reglan

794. A 52-year-old woman with hormone receptor-positive breast cancer is prescribed tamoxifen. Which of the following best describes the mechanism of action of tamoxifen in breast tissue?

A. Irreversibly inhibits aromatase and prevents estrogen synthesis

B. Competitively antagonizes estrogen receptors

C. Inhibits HER2 receptor tyrosine kinase activity

D. Stimulates progesterone receptors and suppresses estrogen secretion

E. Inhibits gonadotropin-releasing hormone receptors

795. A patient receiving leflunomide (Arava) for rheumatoid arthritis develops serious toxicity requiring rapid elimination of the drug and its active metabolite. Which bile acid sequestrant is used to accelerate elimination?

A. Cholestyramine
B. Activated charcoal
C. Sodium bicarbonate
D. Leucovorin
E. Protamine sulfate

796. A patient receiving a medication that is primarily metabolized by CYP3A4 begins prolonged treatment with dexamethasone. Which of the following effects may occur?

A. Increased concentrations of the CYP3A4 substrate

B. Irreversible inhibition of P-glycoprotein

C. Complete inhibition of renal drug elimination

D. Increased gastric absorption of the CYP3A4 substrate

E. Decreased concentrations of the CYP3A4 substrate

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974. Which of the following statements about Talwin are true?

I. Injection sites must be rotated in patients receiving multiple doses.

II. A dose of 30 mg or less may be administered by the intramuscular, subcutaneous, or intravenous route.

III. Talwin NX must be administered intravenously.

A. I only
B. III only
C. I and II only
D. II and III only
E. All

975. Which of the following statements about Pentam 300 are true?

I. Because of the risk of extravasation, the I.V. needle or catheter must be properly inserted and carefully monitored throughout administration.

II. Patients should receive Pentam in a recumbent position, and their blood pressure should be closely monitored during administration.

III. It is indicated for the treatment of Pneumocystis jirovecii pneumonia.

A. I only
B. III only
C. I and II only
D. II and III only
E. I, II, and III

976. Which of the following statements about meperidine is/are true?

I. The usual dose of meperidine is 50 to 150 mg by I.M. or S.C. every 3 to 4 hours as needed.

II. Meperidine is contraindicated in patients taking MAO inhibitors.

III. Rapid I.V. administration is the preferred method for administering meperidine.

A. I only
B. III only
C. I and II only
D. II and III only
E. All

977. Meperidine should be avoided in combination with all of the following medications EXCEPT:

A. Phenelzine
B. A phenothiazine
C. Amitriptyline
D. Alprazolam
E. Furosemide

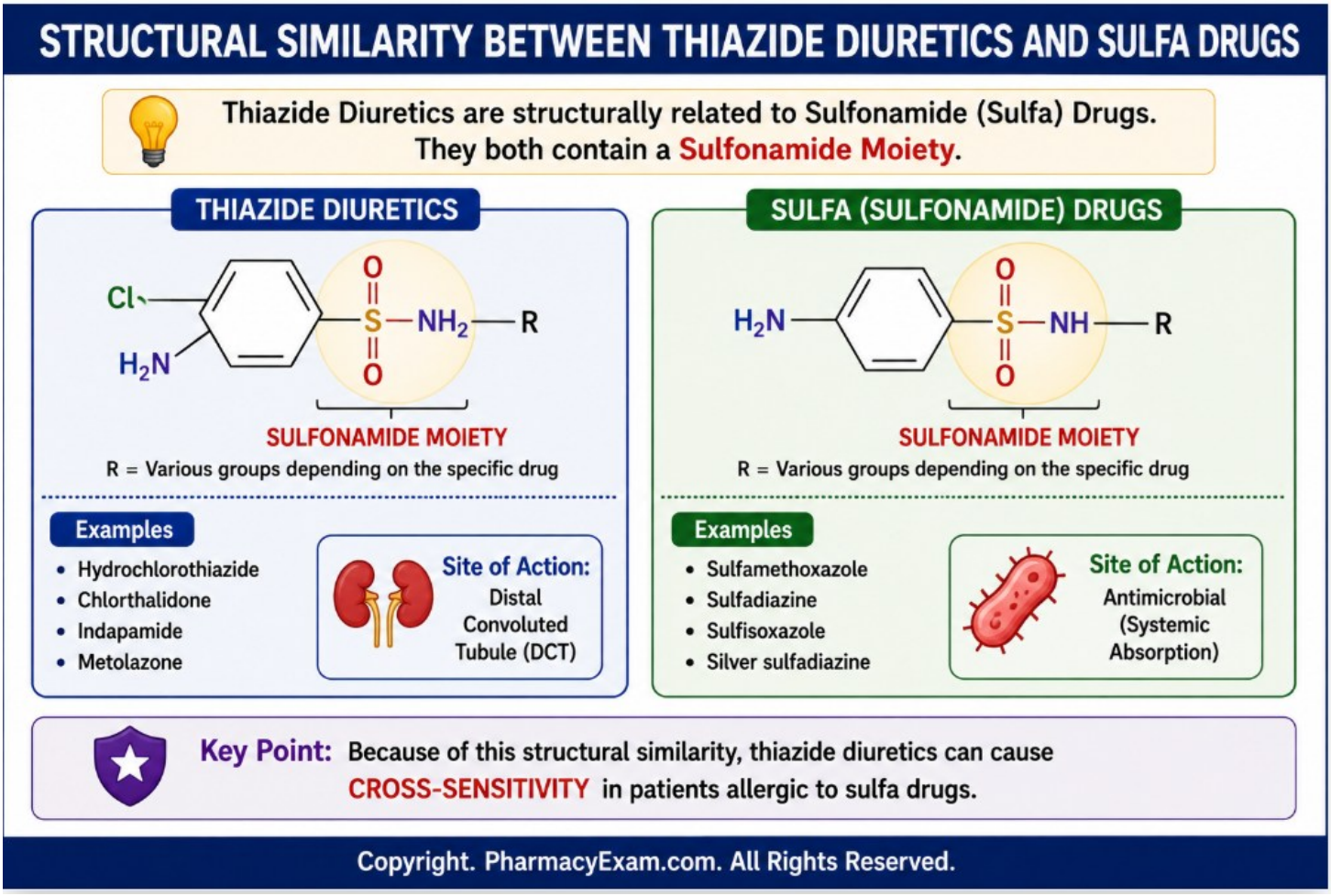
978. Which medication is used to reverse opioid-induced respiratory depression from a meperidine overdose?

A. Protamine sulfate
B. Naloxone hydrochloride
C. Buprenorphine hydrochloride
D. Methadone
E. Mesna

979. All of the following are manifestations of meperidine overdose EXCEPT:

A. Respiratory depression
B. Cold and clammy skin
C. Bradycardia
D. Circulatory collapse
E. Hypertension

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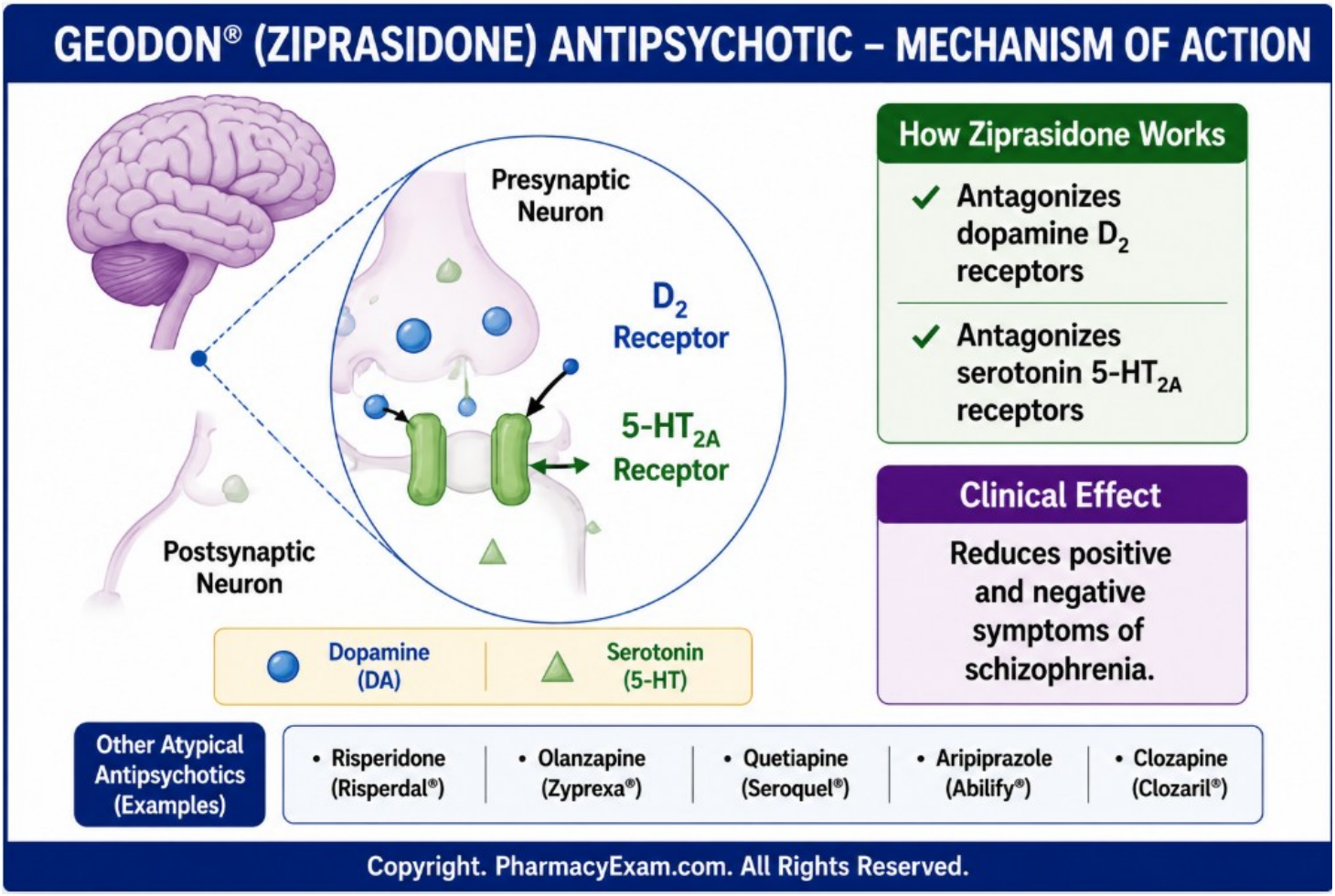


Key Points:
- Monitor serum sodium, potassium, renal function, and blood pressure during therapy.
- Hydrochlorothiazide may increase uric acid and precipitate gout in susceptible patients.
- Thiazides can reduce lithium clearance and increase the risk of lithium toxicity.

Exam Pearl: Thiazide diuretics can cause cross-hypersensitivity reactions in patients allergic to sulfa drugs.

3. Correct Answer: E

Geodon (Ziprasidone) is a second-generation (atypical) antipsychotic that primarily antagonizes dopamine D_2 and serotonin 5-HT_{2A} receptors. It is indicated for schizophrenia, acute manic or mixed episodes associated with bipolar I disorder, and maintenance treatment of bipolar I disorder as an adjunct to lithium or valproate.

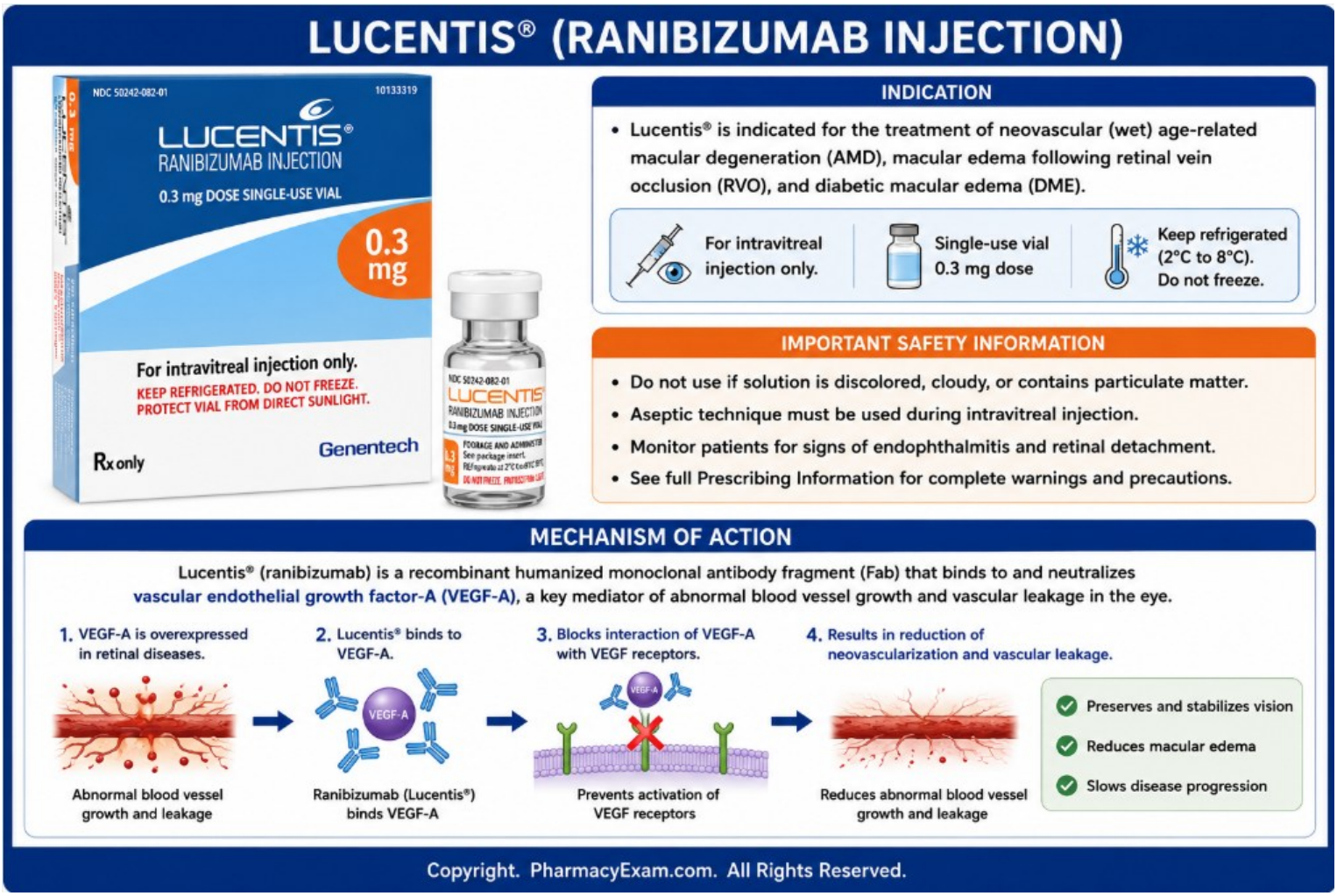


Ziprasidone is available as oral capsules and an intramuscular injection. The oral capsules must be taken with food; a meal containing at least 500 calories provides reliable absorption. Common adverse effects include somnolence, dizziness, akathisia, and other extrapyramidal symptoms.

Key Points:
• Ziprasidone can prolong the QT interval; avoid it in patients with known QT prolongation, recent acute myocardial infarction, uncompensated heart failure, or concomitant use of other QT-prolonging drugs.
• Correct hypokalemia and hypomagnesemia before treatment because electrolyte abnormalities increase the risk of torsades de pointes.
• Strong CYP3A4 inducers can decrease ziprasidone exposure and potentially reduce its clinical effect.
• Like other antipsychotics, ziprasidone carries a boxed warning for increased mortality in older adults with dementia-related psychosis and is not approved for this use.

Exam Pearl: Ziprasidone generally causes less weight gain and metabolic disturbance than many other second-generation antipsychotics.

4. Correct Answer: C



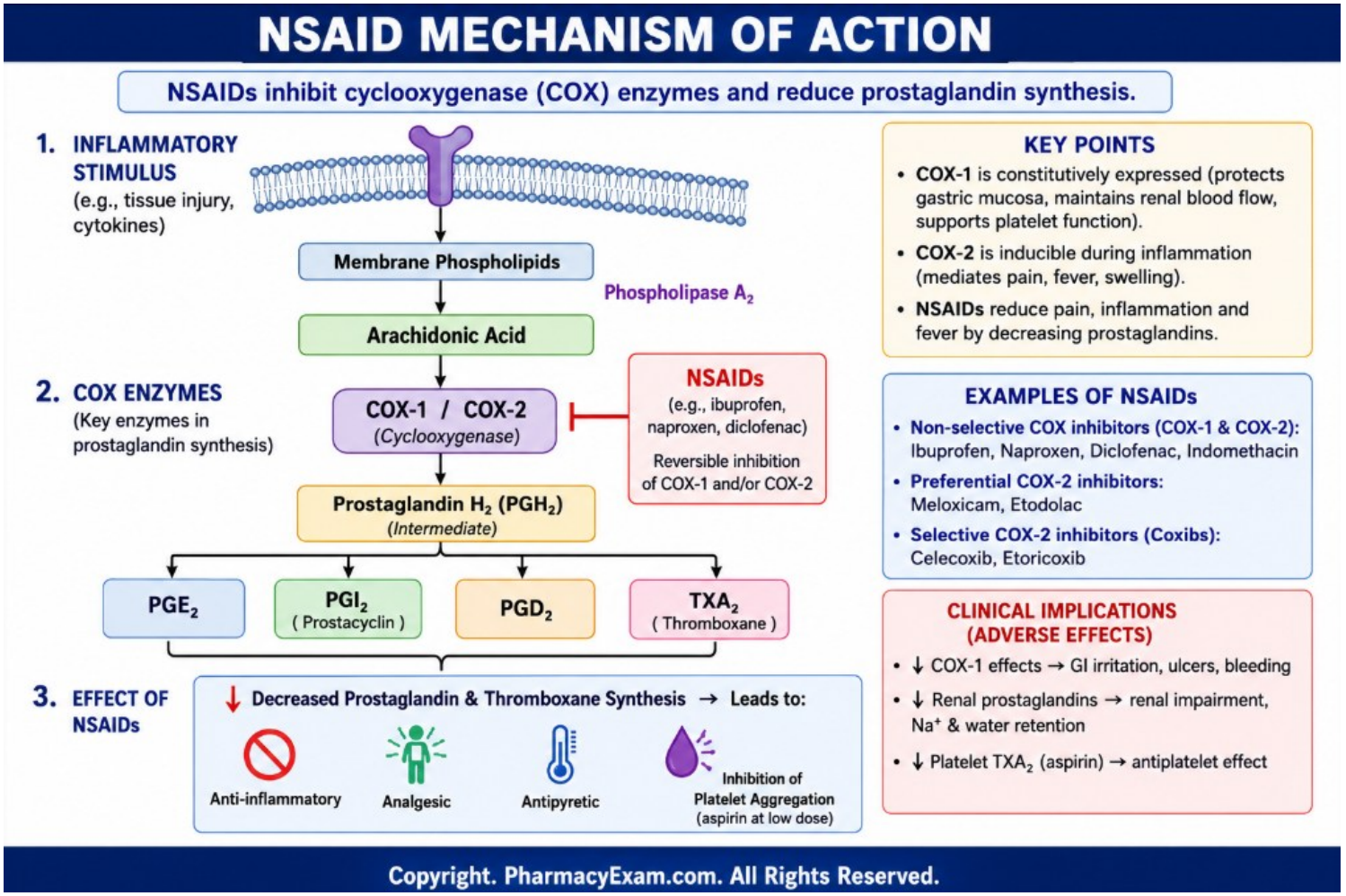
18. Correct Answer: A

Ketorolac tromethamine, formerly marketed in the United States as Toradol, is the sole active ingredient; therefore, statement I only is correct. Flurbiprofen and oxaprozin are separate NSAIDs and are not components of Toradol.

Ketorolac is a nonselective cyclooxygenase inhibitor used for the short-term management of moderately severe acute pain. Reduced prostaglandin synthesis produces analgesic, anti-inflammatory, and antipyretic effects but also increases the risks of gastrointestinal ulceration, bleeding, renal injury, and impaired platelet function.

Boxed warnings include serious gastrointestinal and cardiovascular thrombotic events. Ketorolac is contraindicated in patients with active peptic ulcer disease, recent gastrointestinal bleeding or perforation, advanced renal impairment, or concurrent aspirin or NSAID therapy.

Key Points:
• Oral ketorolac is used only as continuation therapy after intravenous or intramuscular treatment, not as initial therapy.
• Lower doses are required in adults aged 65 years or older, patients weighing less than 50 kg, and patients with renal impairment.
• Anticoagulants, antiplatelet drugs, corticosteroids, and SSRIs or SNRIs may further increase bleeding risk.



Exam Pearl: Count parenteral and oral ketorolac exposure together—the total treatment duration must not exceed 5 days.

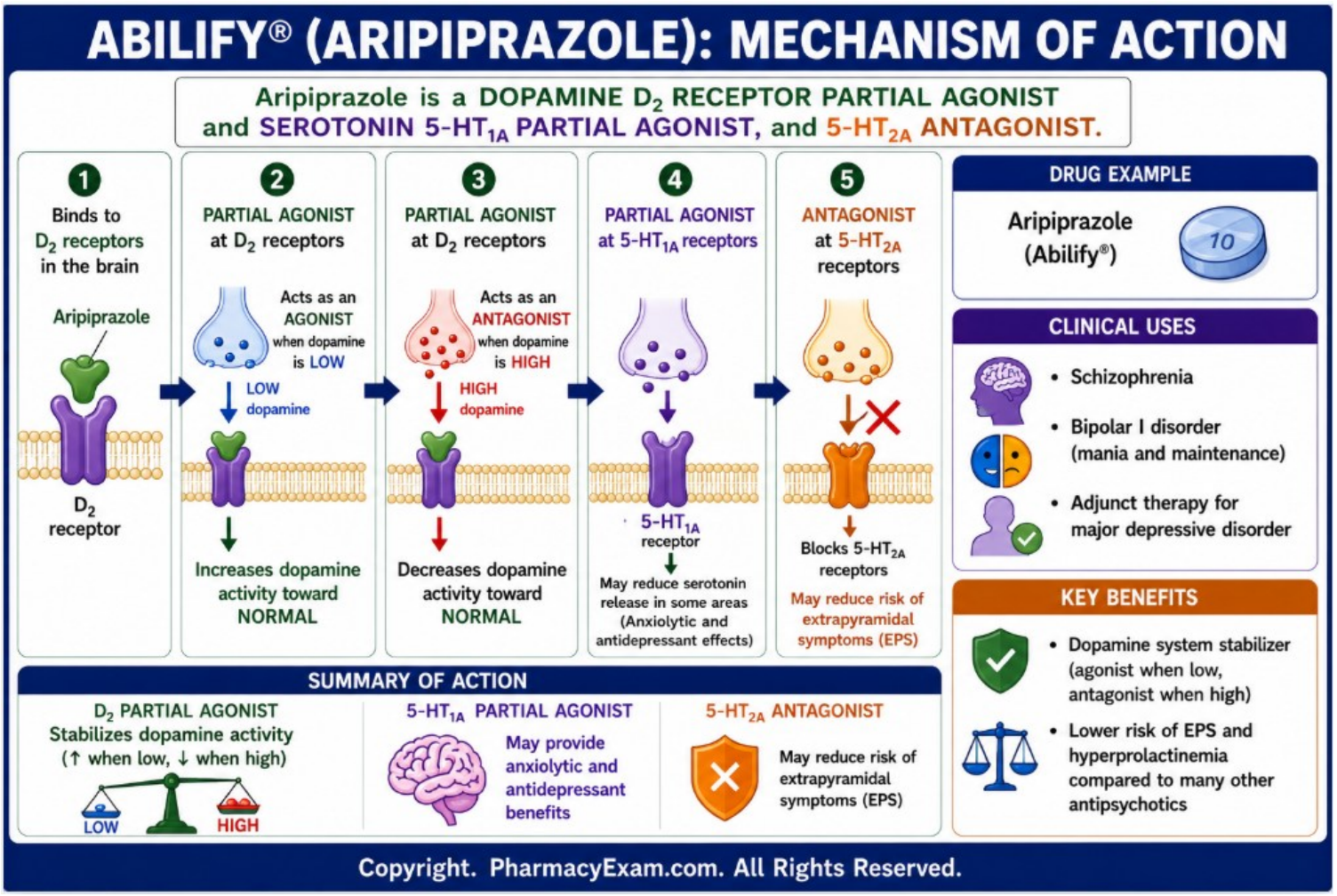
19. Correct Answer: E

Toradol (ketorolac tromethamine) is available in oral, intramuscular (IM), and intravenous (IV) formulations; therefore, I, II, and III are correct. Oral ketorolac is not indicated as initial therapy; it is used only as continuation therapy after IM or IV administration in adults requiring short-term treatment of moderately severe acute pain.

Key Points:
• Ketorolac is contraindicated in patients with active peptic ulcer disease or gastrointestinal bleeding, advanced renal impairment, and in the setting of coronary artery bypass graft surgery.
• Dosage reduction is required for patients aged 65 years or older, those weighing less than 50 kg, and those with moderately elevated serum creatinine.
• Avoid concurrent aspirin or other NSAIDs because of cumulative toxicity; concomitant probenecid or pentoxifylline is contraindicated.
• Administer IV doses over at least 15 seconds and IM doses slowly and deeply into the muscle.

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Common adverse effects include akathisia, restlessness, insomnia, nausea, and other gastrointestinal symptoms. Serious risks include neuroleptic malignant syndrome, tardive dyskinesia, and other extrapyramidal symptoms.

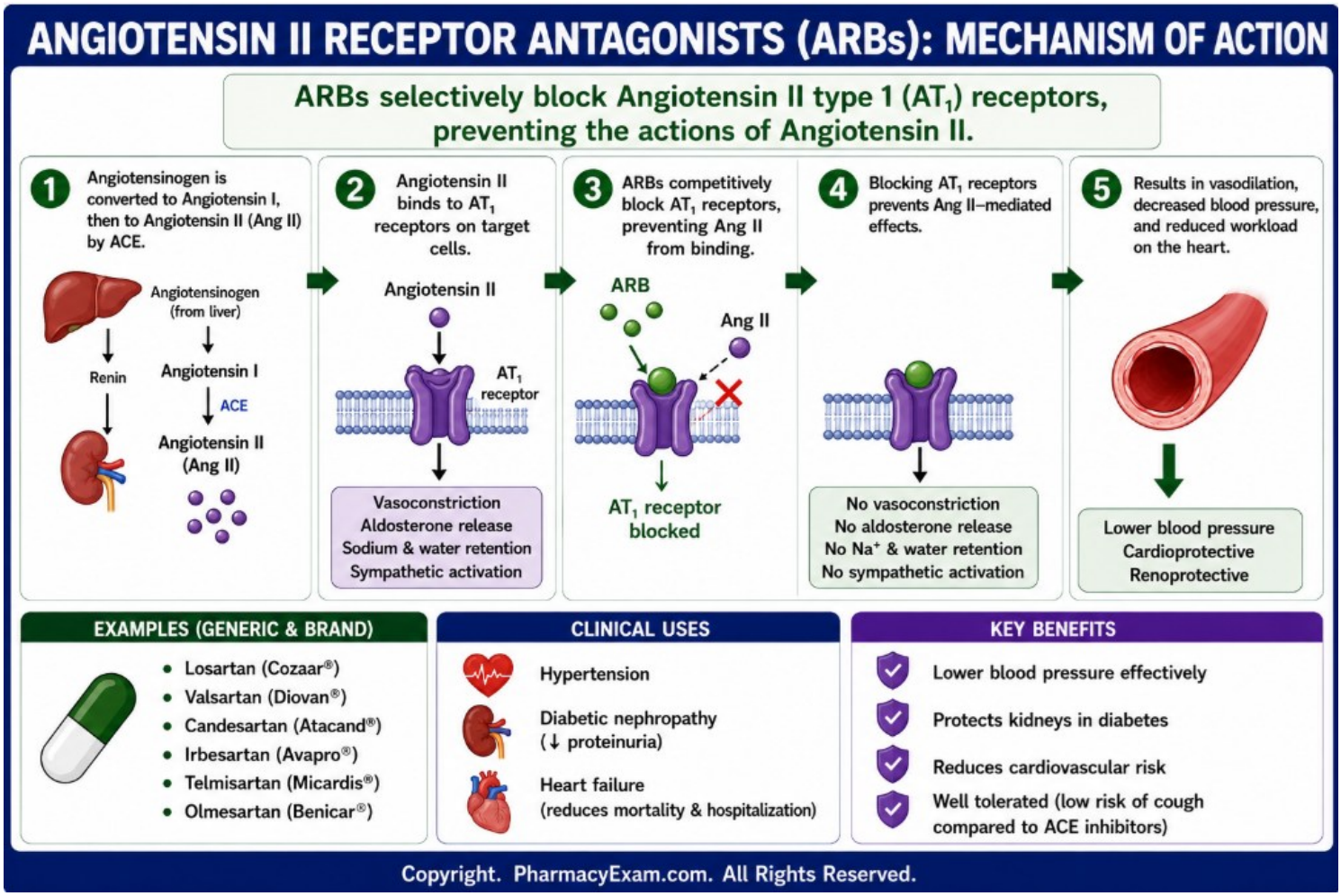


Key Points:
• Monitor weight, blood glucose, lipids, and abnormal involuntary movements during therapy.
• Strong CYP2D6 or CYP3A4 inhibitors can increase aripiprazole exposure, whereas strong CYP3A4 inducers can decrease exposure and require dosage adjustment.
• Counsel patients and caregivers to report new compulsive gambling, shopping, eating, or sexual behaviors.
• Antipsychotics carry a boxed warning for increased mortality in older adults with dementia-related psychosis.

Exam Pearl: Aripiprazole is distinguished from many antipsychotics by partial agonism at dopamine D2 and serotonin 5-HT1A receptors.

29. Correct Answer: E

Lasix (Furosemide) is a loop diuretic that inhibits the sodium-potassium-chloride cotransporter in the thick ascending limb of the loop of Henle, increasing the excretion of sodium, chloride, and water.



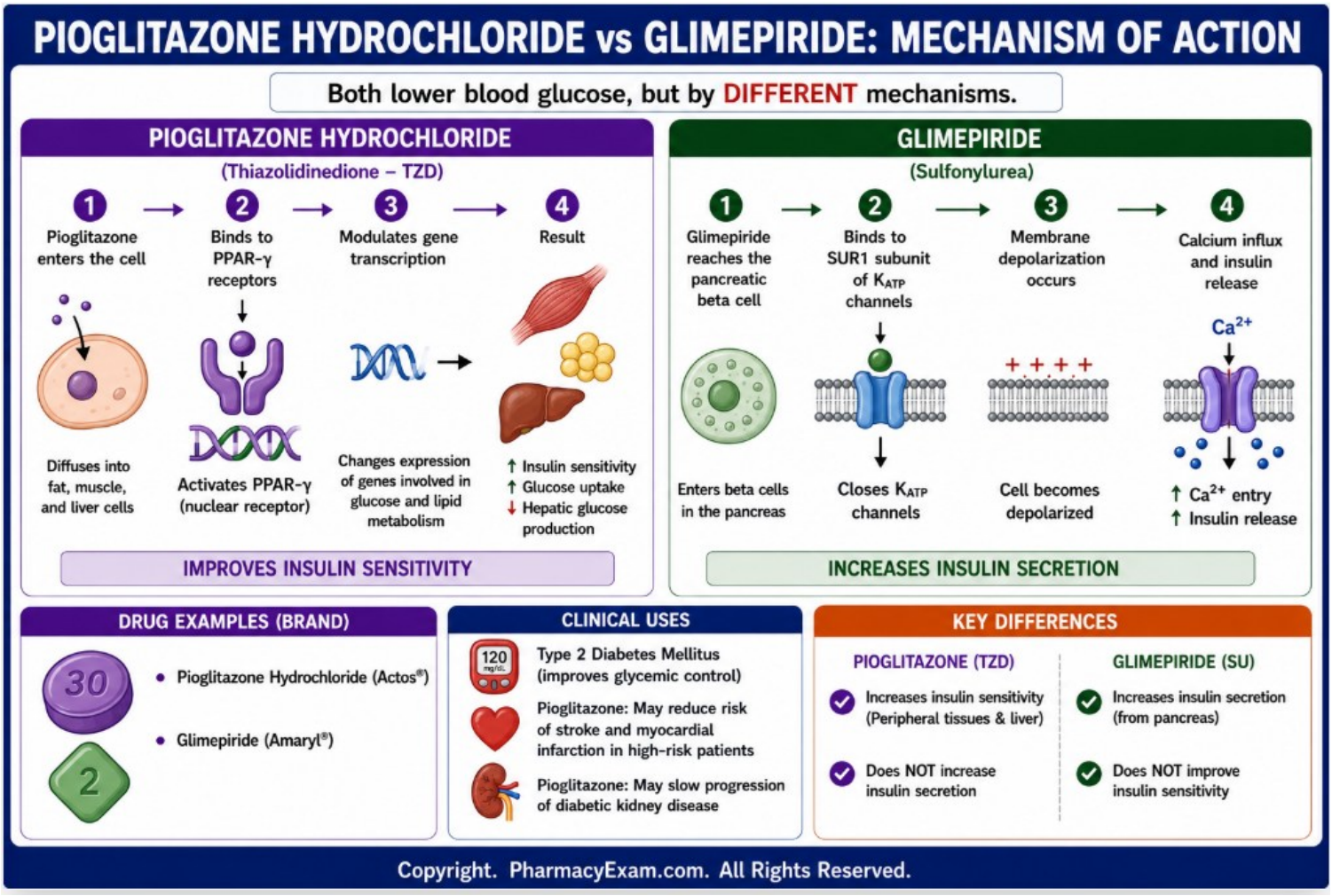
Important adverse effects include hyperkalemia, hypotension, and increased serum creatinine. Acute kidney injury may occur, particularly in patients with volume depletion or bilateral renal artery stenosis. ARBs carry a boxed warning for fetal toxicity and should be discontinued as soon as pregnancy is detected.

Key Points:
• Monitor blood pressure, serum potassium, and renal function at baseline and after initiation or dosage increases.
• NSAIDs may reduce the antihypertensive effect and increase the risk of renal impairment, especially in older or volume-depleted patients.
• Avoid routine dual renin-angiotensin system blockade with an ACE inhibitor or aliskiren; aliskiren is contraindicated with an ARB in patients with diabetes.

Exam Pearl: Unlike ACE inhibitors, ARBs do not inhibit bradykinin breakdown and are therefore much less likely to cause cough.

36. Correct Answer: B

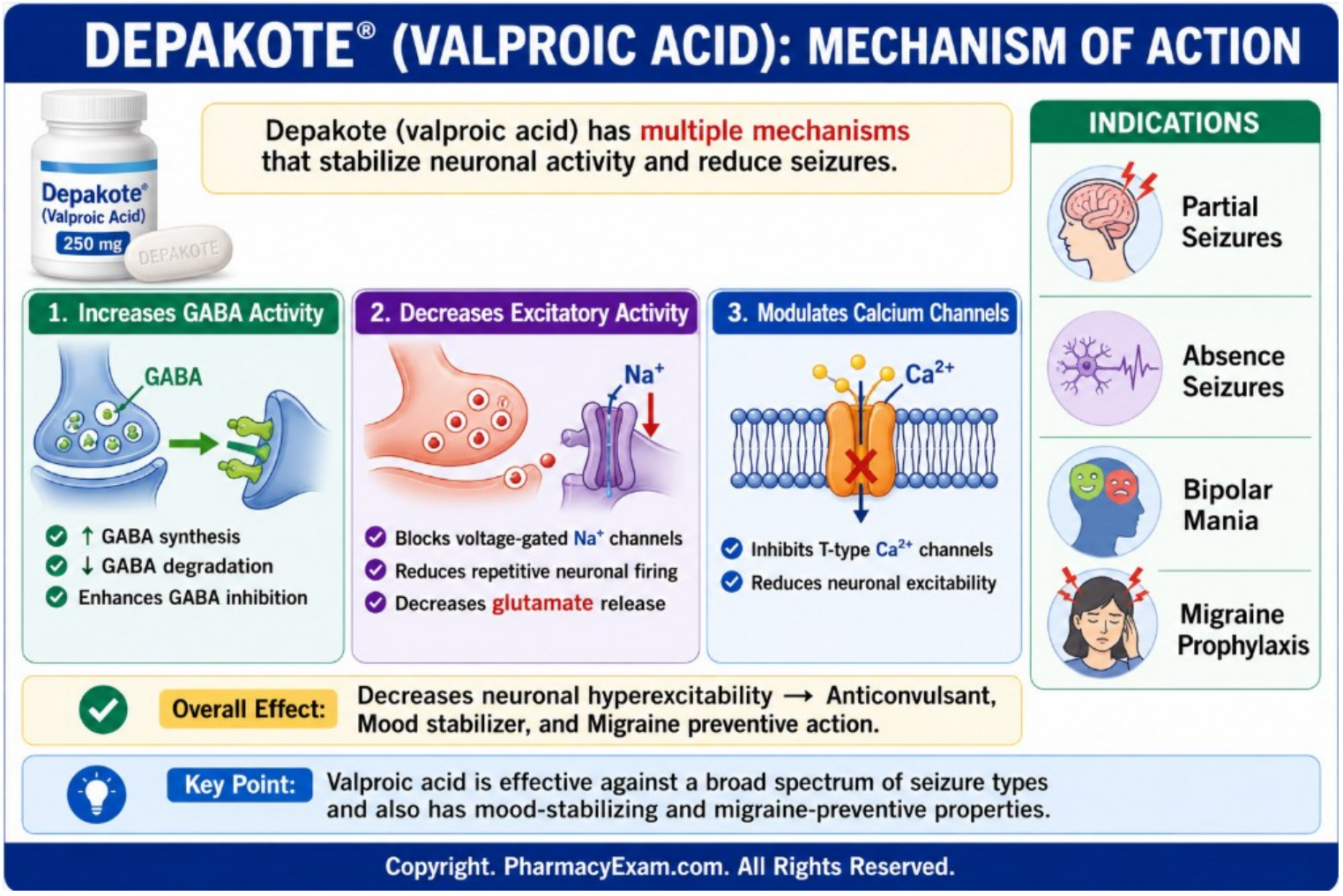
Duetact (Pioglitazone/Glimepiride) is a fixed-dose oral combination indicated as an adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus. Pioglitazone, a thiazolidinedione, activates peroxisome proliferator-activated receptor-gamma (PPAR-gamma) to improve insulin sensitivity. Glimepiride, a sulfonylurea, increases pancreatic insulin secretion. Duetact is available as 30 mg/2 mg and 30 mg/4 mg tablets (pioglitazone/glimepiride).



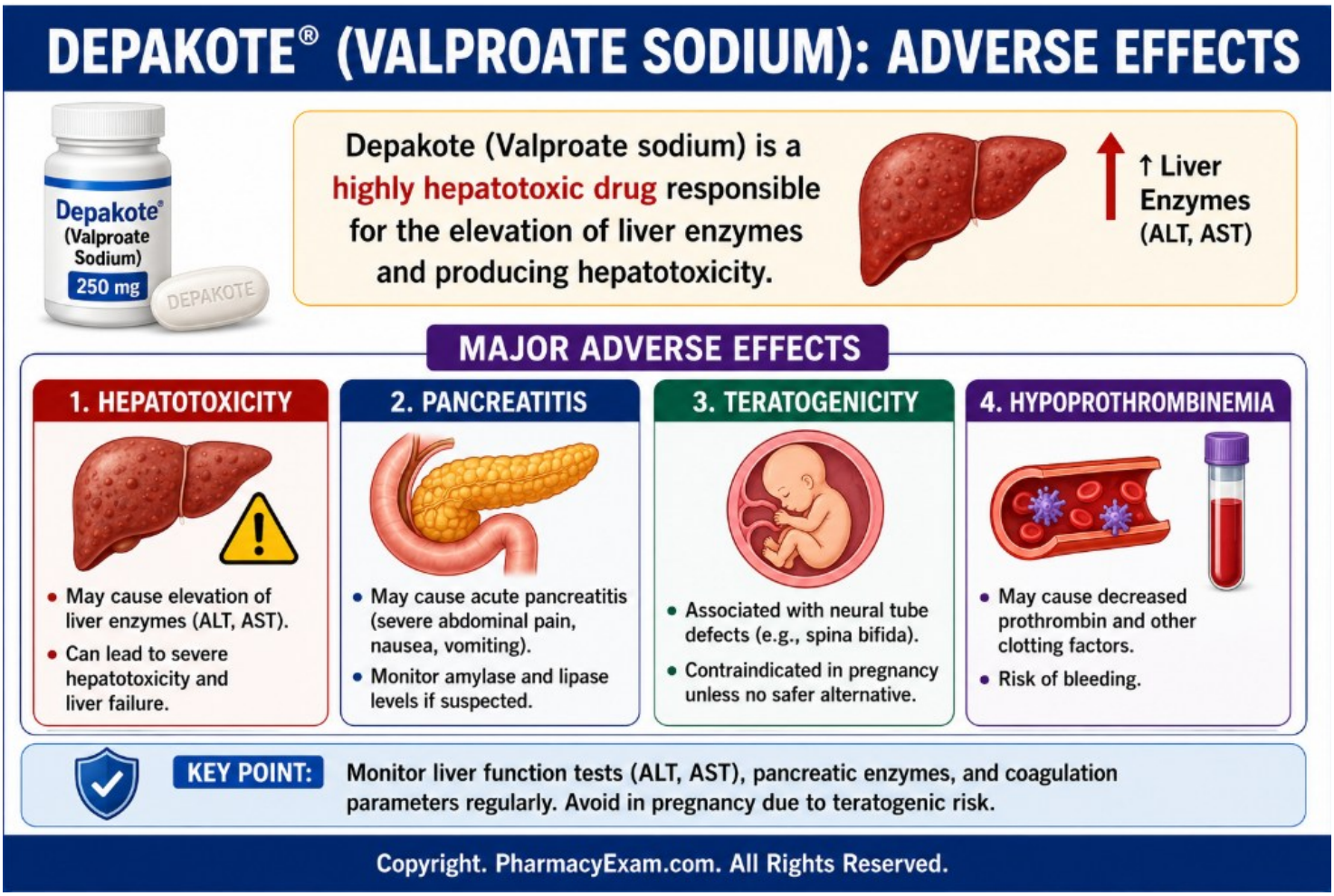
Pioglitazone-containing products carry a boxed warning because thiazolidinediones can cause or exacerbate congestive heart failure. Monitor for rapid weight gain, edema, and dyspnea after initiation or dose increases. Initiation is contraindicated in patients with New York Heart Association class III or IV heart failure. Other important adverse effects include hypoglycemia, weight gain, fractures, and macular edema.

Key Points:
• Administer once daily with the first main meal to reduce the risk of glimepiride-associated hypoglycemia.
• Obtain liver tests before initiation and evaluate promptly if symptoms of hepatic injury develop; routine periodic testing is not required in asymptomatic patients without liver disease.
• Avoid Duetact with gemfibrozil because this strong CYP2C8 inhibitor increases pioglitazone exposure and requires limiting pioglitazone to 15 mg daily.
• Pioglitazone may restore ovulation in premenopausal patients with anovulation; counsel regarding pregnancy risk and contraception.

Exam Pearl: Duetact is not indicated for type 1 diabetes mellitus or diabetic ketoacidosis because its effects require endogenous insulin.



51. Correct Answer: C



52. Correct Answer: E

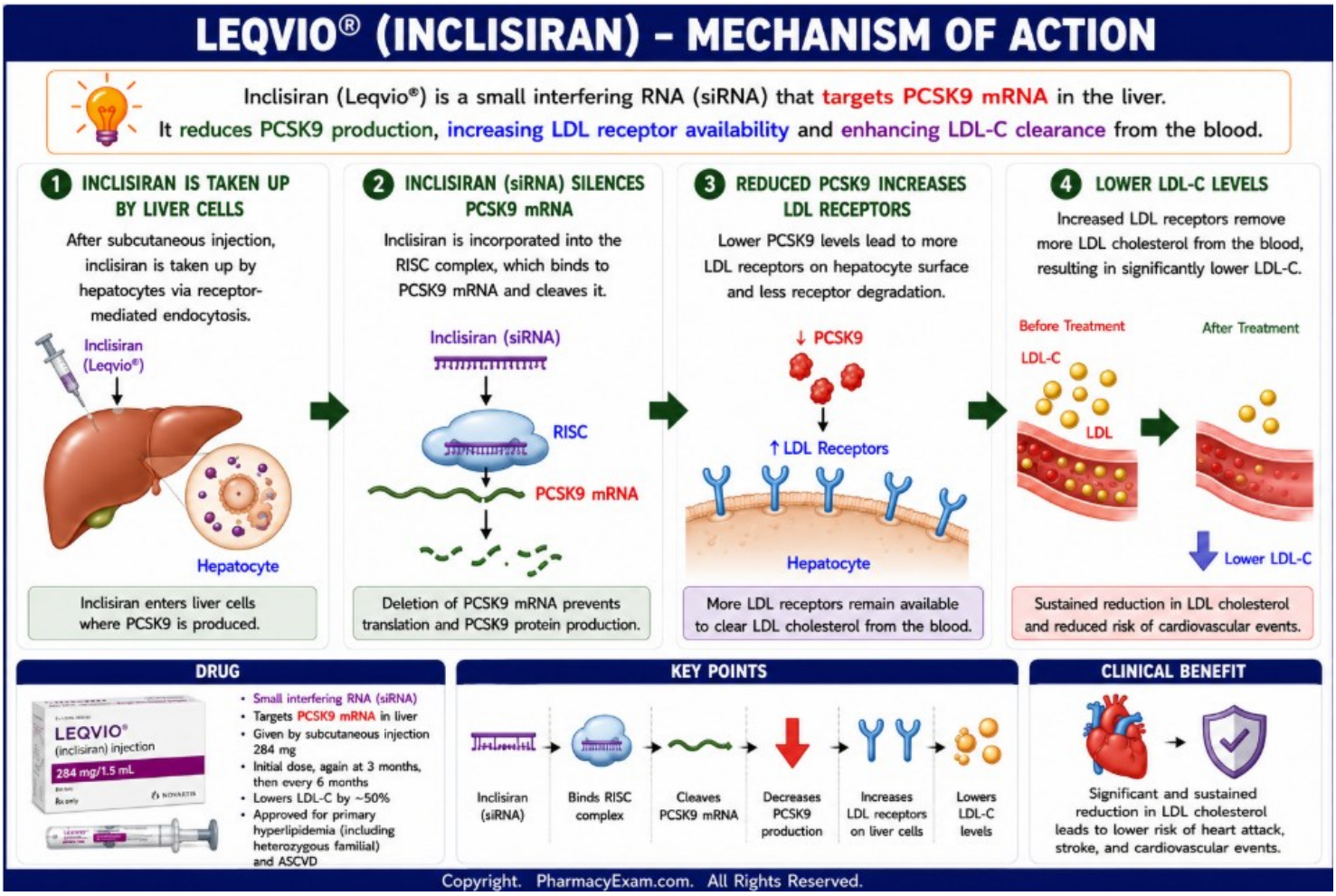
Butibel (belladonna alkaloids/phenobarbital) and Donnatal Extentabs (belladonna alkaloids/phenobarbital) contain both substances to which Chris is allergic. Belladonna alkaloids include atropine, hyoscyamine, and scopolamine. Because each product contains at least one implicated allergen, Chris should avoid all three products.

Key Points:
• Belladonna alkaloids may cause dry mouth, blurred vision, constipation, urinary retention, and confusion.
• After handling a scopolamine patch, wash the hands thoroughly and remove the patch before MRI because its backing may cause burns.

Exam Pearl: For combination-product questions, evaluate every active ingredient rather than relying on the product name or route of administration.

• Assess LDL-C when clinically indicated to evaluate therapeutic response.

Exam Pearl: Inclisiran is administered by a healthcare professional rather than self-injected by the patient.

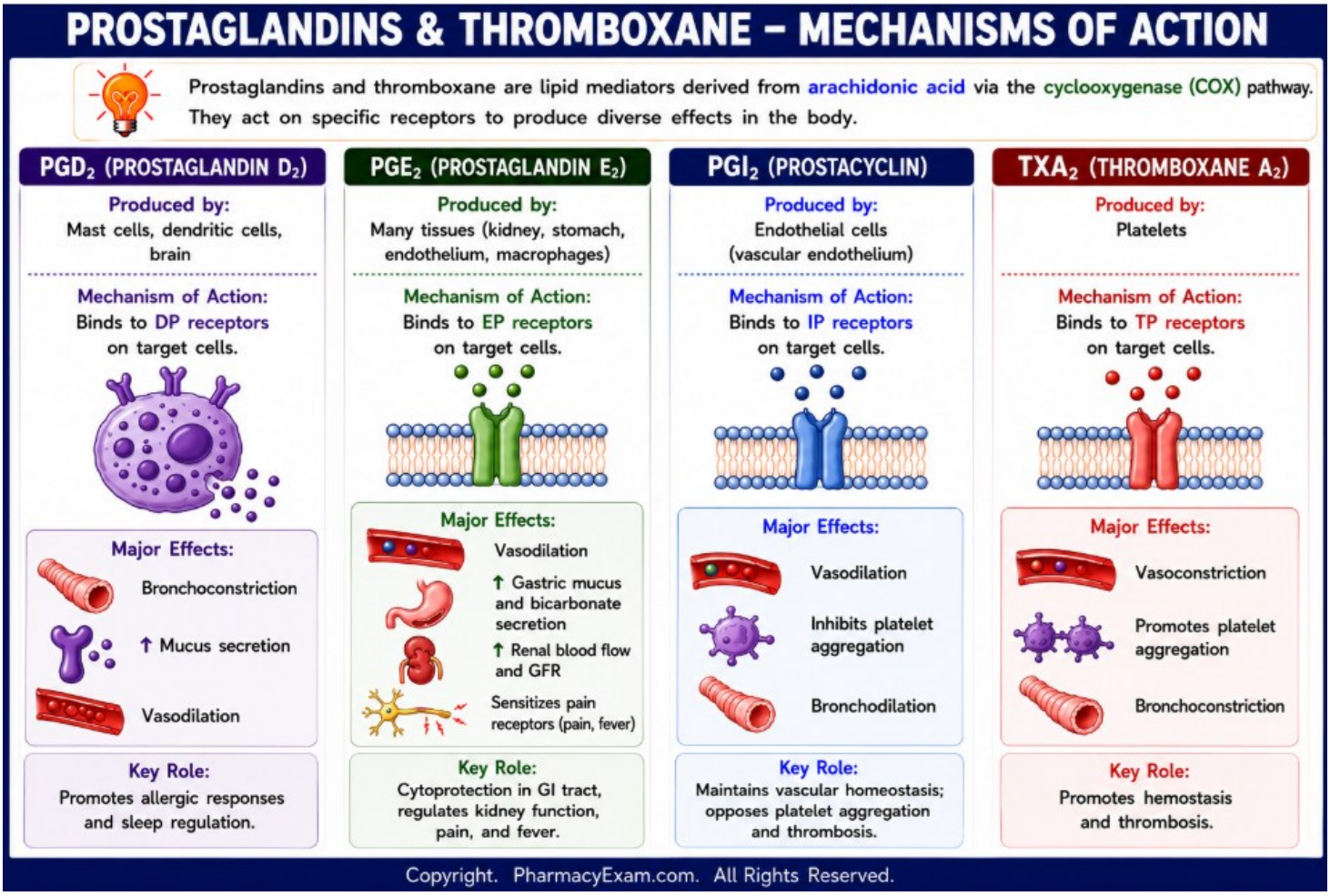


Exam Pearl: Unlike salmeterol, formoterol is a LABA with a rapid onset of bronchodilation.

Review Figure: Beta-2 Bronchodilators - M/A (page 327).

588. Correct Answer: A

PGD_2 is the best answer. It is released predominantly from activated mast cells during an allergic response and contributes to asthma through bronchoconstriction and type 2 airway inflammation. PGD_2 can contract bronchial smooth muscle through thromboxane-prostanoid receptors and recruit eosinophils, basophils, and type 2 helper T cells through DP_2 receptors, also called CRTH2.



PGE_2 and PGI_2 generally have bronchodilatory or bronchoprotective effects. $PGF_{2\alpha}$ can cause bronchoconstriction but is not the characteristic mast cell–derived mediator tested here. Thromboxane A_2 also promotes bronchoconstriction, but it is a thromboxane rather than a prostaglandin.

Key Points:
• The cysteinyl leukotrienes LTC4, LTD4, and LTE4 cause prolonged bronchoconstriction, mucus secretion, and increased vascular permeability.
• Aspirin-exacerbated respiratory disease is associated with COX-1 inhibition and excess leukotriene production; the classic triad includes asthma, chronic rhinosinusitis with nasal polyps, and respiratory reactions to COX-1 inhibitors.

Exam Pearl: PGI_2 and thromboxane A_2 have opposing platelet effects: PGI_2 inhibits aggregation, whereas thromboxane A_2 promotes it.

589. Correct Answer: E

During the early asthmatic response, inflammatory mediators trigger bronchial smooth muscle contraction, producing chest tightness, shortness of breath, wheezing, and cough. Several hours later, inflammatory cells—particularly eosinophils—promote airway edema and excessive mucus secretion.

Repeated episodes of inflammation and bronchoconstriction can cause airway remodeling, including smooth muscle hypertrophy, subepithelial fibrosis, and goblet-cell hyperplasia. These structural changes may result in persistent airflow obstruction. Therefore, statements I, II, and III are correct.

Key Points:
• In adults, an increase in FEV1 of at least 12% and 200 ml after bronchodilator administration supports the diagnosis of variable airflow limitation.
• A long-acting beta2-agonist should not be used without an inhaled corticosteroid in patients with asthma.

Exam Pearl: A silent chest during a severe asthma exacerbation indicates critically reduced airflow and impending respiratory failure.

590. Correct Answer: E

Crestor (Rosuvastatin) is an HMG-CoA reductase inhibitor (statin) indicated for hypercholesterolemia and other lipid disorders, including mixed dyslipidemia and hypertriglyceridemia. By inhibiting hepatic cholesterol synthesis, rosuvastatin increases LDL receptor activity and lowers LDL cholesterol.

The usual adult dosage is 5-40 mg orally once daily. The 40-mg dose should be reserved for patients who do not achieve their LDL cholesterol goal with 20 mg. Important adverse effects include myalgia, myopathy, rare rhabdomyolysis, and hepatic enzyme elevations. Dose-related proteinuria and microscopic hematuria may occur, particularly with 40 mg, but these findings are generally transient and are not usually associated with worsening renal function.

Key Points:
• In severe renal impairment without hemodialysis, initiate 5 mg once daily and do not exceed 10 mg daily.
• Consider a 5-mg starting dose in patients of Asian ancestry because systemic exposure may be increased.
• Administer aluminum- or magnesium-containing antacids at least 2 hours after rosuvastatin.
• Cyclosporine substantially increases rosuvastatin exposure; do not exceed 5 mg daily.

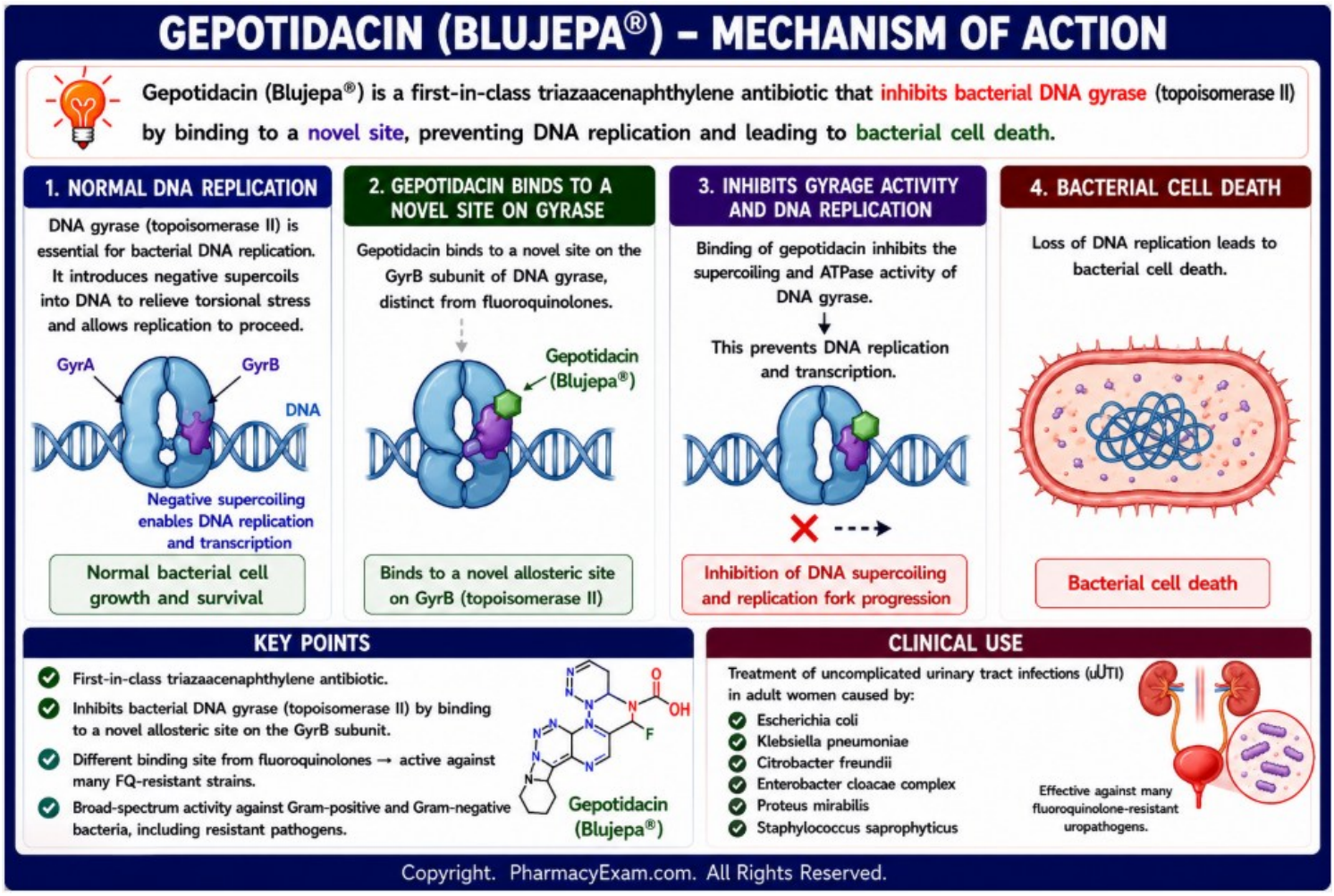
Exam Pearl: Rosuvastatin 20-40 mg is classified as high-intensity statin therapy.

Review Figure: ACE Inhibitors and AT2 Receptors Antagonists M/A (page 247).

Exam Pearl: Patients should stop fezolinetant immediately and seek medical evaluation if symptoms of liver injury, such as jaundice, dark urine, severe fatigue, or right upper-quadrant pain, develop.

614. Correct Answer: B

Blujepa (Gepotidacin) is an oral triazaacenaphthylene antibacterial agent approved for treating uncomplicated urinary tract infections caused by susceptible bacteria.



Choice B is correct. Gepotidacin inhibits bacterial DNA replication through balanced inhibition of the type II topoisomerases DNA gyrase and topoisomerase IV. It binds these enzymes by a mechanism distinct from that of fluoroquinolones, establishing a separate antibacterial class.

DNA gyrase and topoisomerase IV regulate DNA supercoiling and chromosome separation, respectively. Options A, C, D, and E instead describe the actions of selected cell-wall inhibitors, tetracyclines, trimethoprim, and membrane-active antibacterials.

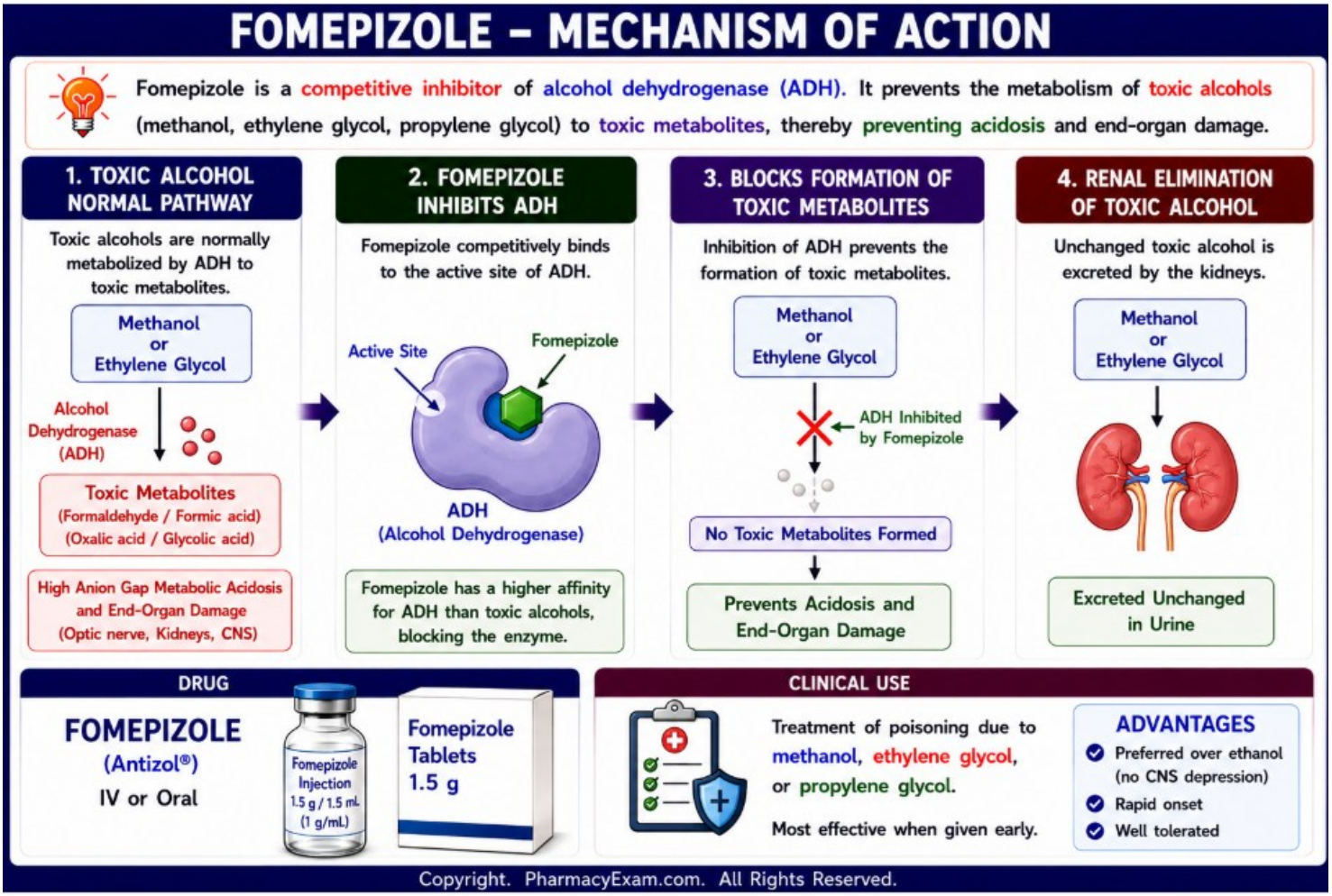
Key Points:
• The recommended regimen for uncomplicated urinary tract infection is 1,500 mg orally twice daily for 5 days, taken after a meal.
• Gepotidacin can prolong the QT interval; evaluate QT-related risk factors and interacting medications.
• Common adverse reactions include diarrhea and nausea.

Exam Pearl: Gepotidacin is approved for uncomplicated urinary tract infection in female patients aged 12 years or older who weigh at least 40 kg.

615. Correct Answer: A

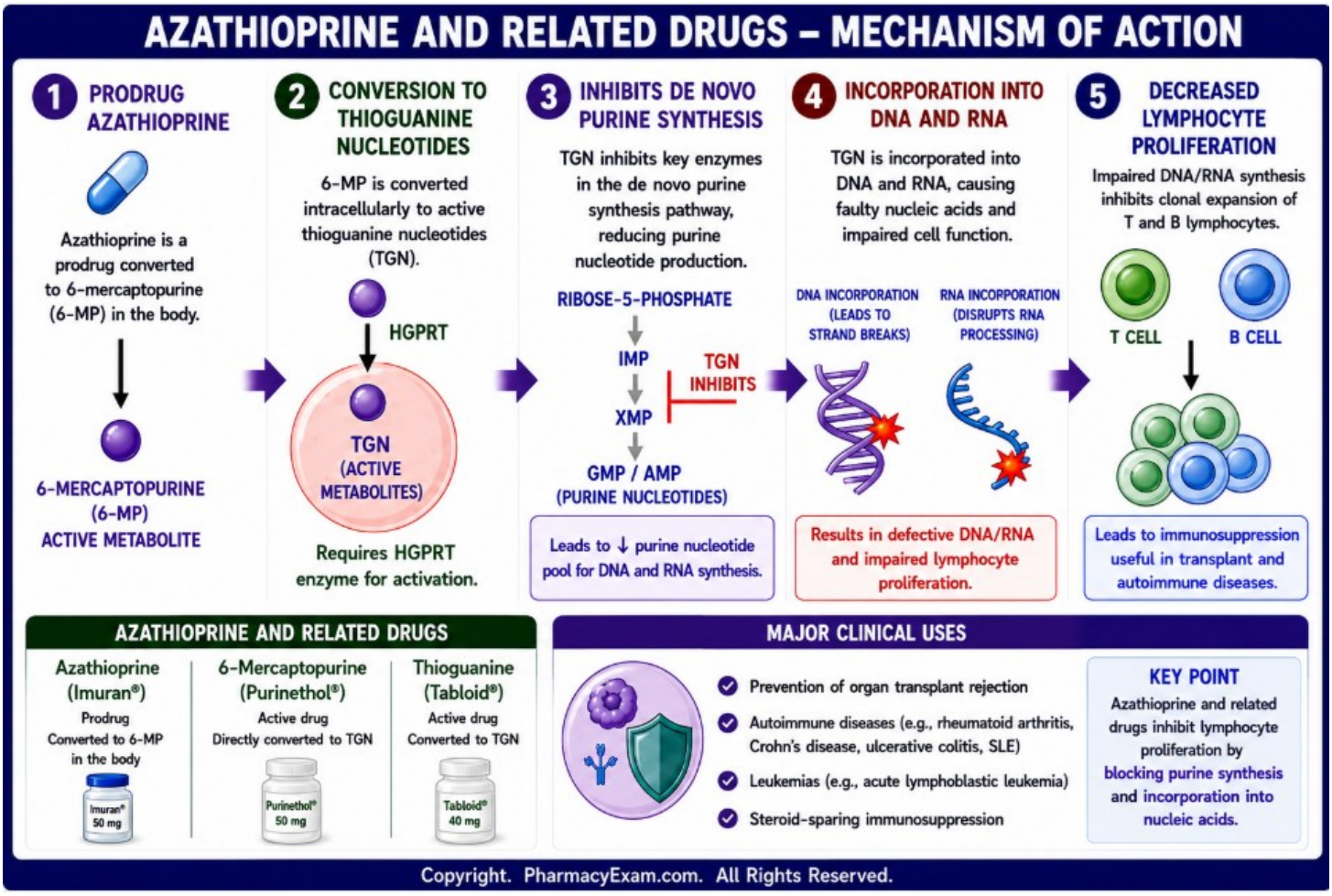
Fomepizole is the preferred antidote for ethylene glycol and methanol poisoning. It competitively inhibits alcohol dehydrogenase, thereby preventing formation of toxic metabolites. Treatment should begin promptly when clinically significant poisoning is suspected rather than waiting for confirmatory concentrations.

Ethylene glycol is metabolized to glycolic acid, which is primarily responsible for the high anion gap metabolic acidosis, and oxalic acid, which binds calcium and may cause hypocalcemia, calcium oxalate crystalluria, and acute kidney injury.



Fomepizole also prevents methanol metabolism to formic acid, a metabolite associated with metabolic acidosis and ocular toxicity. Acetadote (Acetylcysteine) treats acetaminophen poisoning; flumazenil reverses benzodiazepines; Protopam Chloride (Pralidoxime) reactivates acetylcholinesterase in organophosphate poisoning; and Desferal (Deferoxamine) chelates iron.

Hemodialysis may be required for severe acidosis, kidney injury, end-organ toxicity, or a high ethylene glycol concentration because it removes the parent alcohol and its metabolites while correcting metabolic abnormalities.



Key Points:
• TPMT and NUDT15 status can identify patients at increased risk of severe thiopurine-induced myelosuppression; pharmacogenetic testing does not replace routine complete blood count monitoring.
• Allopurinol markedly increases thiopurine exposure; if coadministration is unavoidable, substantially reduce the azathioprine dose and monitor closely. Avoid concomitant febuxostat.

Exam Pearl: Avoid rechallenge after thiopurine-induced pancreatitis because recurrence is likely.

627. Correct Answer: E

All three statements are true. Cerebyx (Fosphenytoin Sodium) is a prodrug that is converted to Dilantin (Phenytoin), the active antiseizure drug. Cerebyx is supplied at a concentration of 50 mg phenytoin equivalents (PE) per ml, corresponding to 75 mg fosphenytoin sodium per ml.

Serum phenytoin concentrations should not be measured until conversion is essentially complete—approximately 2 hours after an I.V. infusion or 4 hours after an I.M. injection. Earlier measurement may produce falsely elevated results because some immunoassays cross-react with fosphenytoin.

Fosphenytoin must be prescribed and dispensed in mg PE to prevent dosing errors. For adult status epilepticus, the loading dose is 15–20 mg PE/kg. Because rapid I.V. administration can cause severe hypotension and cardiac arrhythmias, the boxed warning limits the adult infusion rate to 150 mg PE/min. The usual initial maintenance dose is 4–6 mg PE/kg/day in divided doses.

Key Points:
• Monitor blood pressure, electrocardiography, and respiratory status during I.V. loading and through the period of peak phenytoin concentrations.
• Measure unbound rather than total phenytoin concentrations in patients with hypoalbuminemia or renal or hepatic impairment.

Exam Pearl: Fosphenytoin may be diluted in normal saline or dextrose solutions, whereas I.V. phenytoin should be diluted only in normal saline.

628. Correct Answer: C

Aspergillosis encompasses diseases caused by Aspergillus species. Infection most commonly begins in the lungs after airborne spores are inhaled into the lower respiratory tract.

Aspergillus can also cause otomycosis, keratitis, and sinonasal disease, so the ear canals, eyes, nose, and sinus cavities are possible but less common sites. Invasive pulmonary aspergillosis may spread through the bloodstream to other organs, including the brain.

Key Points:
• Major clinical syndromes include allergic bronchopulmonary aspergillosis, chronic pulmonary aspergillosis or aspergilloma, and invasive aspergillosis.
• Invasive disease occurs primarily with prolonged neutropenia, hematologic malignancy, transplantation, or substantial immunosuppressive therapy.
• Serum or bronchoalveolar lavage galactomannan testing can support the diagnosis of invasive aspergillosis.

Exam Pearl: Aspergillus classically appears as septate hyphae with acute-angle branching.

629. Correct Answer: C

Using conventional total serum concentration correlations, Dilantin (Phenytoin) causes concentration-dependent neurologic toxicity. Nystagmus generally appears at concentrations around 20 mcg/ml, and ataxia commonly occurs around 30 mcg/ml. Dysarthria and lethargy are more commonly associated with concentrations above 40 mcg/ml.

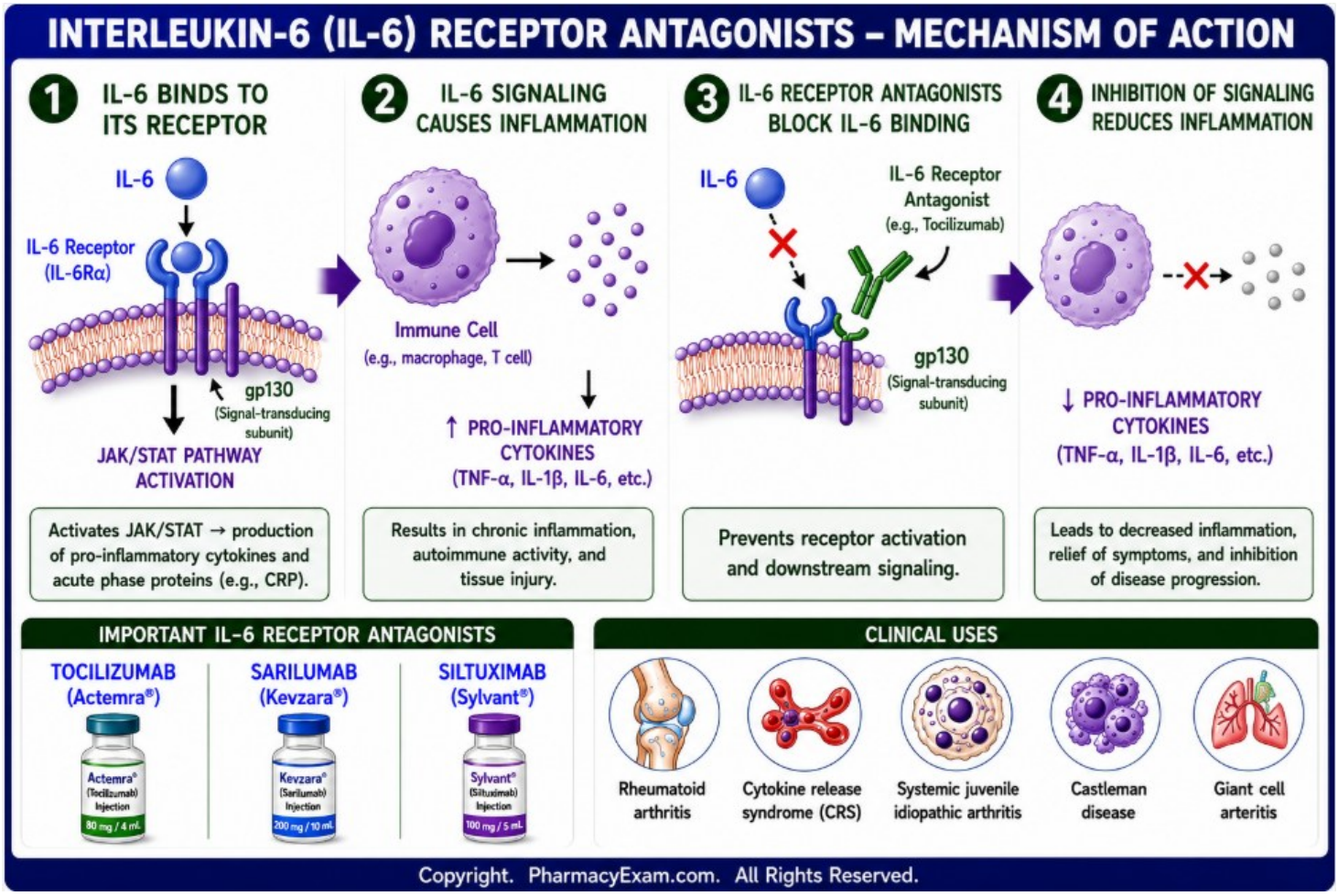
Therefore, at 35 mcg/ml, nystagmus and ataxia are most likely; dysarthria is less likely. The best answer is **I and II only**. These concentration thresholds are approximate because susceptibility varies among patients.

Key Points:
• Phenytoin exhibits nonlinear, capacity-limited elimination; small dosage increases can cause disproportionate increases in serum concentration.
• Because phenytoin is highly protein bound, a free concentration is preferred when altered protein binding is suspected, such as with hypoalbuminemia or kidney dysfunction.

Exam Pearl: The usual therapeutic range is 10–20 mcg/ml for total phenytoin and 1–2 mcg/ml for free phenytoin.

630. Correct Answer: D

Actemra (Tocilizumab) is an interleukin-6 (IL-6) receptor antagonist used primarily to treat moderately to severely active rheumatoid arthritis in adults who have had an inadequate response to one or more disease-modifying antirheumatic drugs. It is also approved for several other inflammatory conditions, cytokine release syndrome, and selected hospitalized patients with COVID-19.



For adult rheumatoid arthritis, the recommended intravenous dose is 4 mg/kg every 4 weeks and may be increased to 8 mg/kg based on clinical response; doses exceeding 800 mg per infusion are not recommended. A subcutaneous formulation is also available.

Tocilizumab carries a boxed warning for serious infections that may result in hospitalization or death, particularly when it is combined with corticosteroids or other immunosuppressants. Reported infections include tuberculosis, invasive fungal infections, and bacterial, viral, or other opportunistic infections. Patients should be evaluated for latent tuberculosis before treatment, and therapy should be interrupted if a serious infection develops. Therefore, choice D is correct.

Tocilizumab is associated with hypertension rather than decreased blood pressure, making choice A incorrect. Joint stiffness is a manifestation of rheumatoid arthritis rather than a characteristic adverse effect, and routine photosensitivity precautions are not required. Headache can occur during therapy, but it is not the boxed warning tested in this question.

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Key Points:

• Obtain ANC, platelet count, and hepatic transaminase levels before treatment and monitor periodically during therapy. Initiation is generally not recommended in patients with an ANC below 2,000/mm^3, a platelet count below 100,000/mm^3, or ALT/AST levels greater than 1.5 times the upper limit of normal.
• Assess the lipid profile approximately 4–8 weeks after initiation because total cholesterol, LDL-C, HDL-C, and triglyceride levels may increase.
• Avoid live vaccines during therapy. Bring immunizations up to date before treatment when possible.
• New-onset abdominal pain may indicate gastrointestinal perforation, particularly in patients with diverticulitis.

Exam Pearl: IL-6 blockade may suppress fever and C-reactive protein responses, so infection can be present despite muted inflammatory markers.

631. Correct Answer: D

Cerebyx (Fosphenytoin Sodium) is a prodrug that is converted to phenytoin. Fosphenytoin sodium 75 mg corresponds to 50 mg phenytoin sodium equivalents (PE); therefore, a concentration of 75 mg/ml fosphenytoin sodium is equivalent to 50 mg PE/ml. Thus, choice D is correct. The other concentrations do not reflect the labeled conversion.

Key Points:
• Fosphenytoin prescriptions, doses, and concentrations should be expressed in mg PE to reduce conversion-related medication errors.
• In adults, the IV infusion rate must not exceed 150 mg PE/min because rapid administration can cause severe hypotension and cardiac arrhythmias; monitor blood pressure, ECG, and respiratory function during and after infusion.

Exam Pearl: Unlike IV phenytoin, fosphenytoin may also be administered intramuscularly.

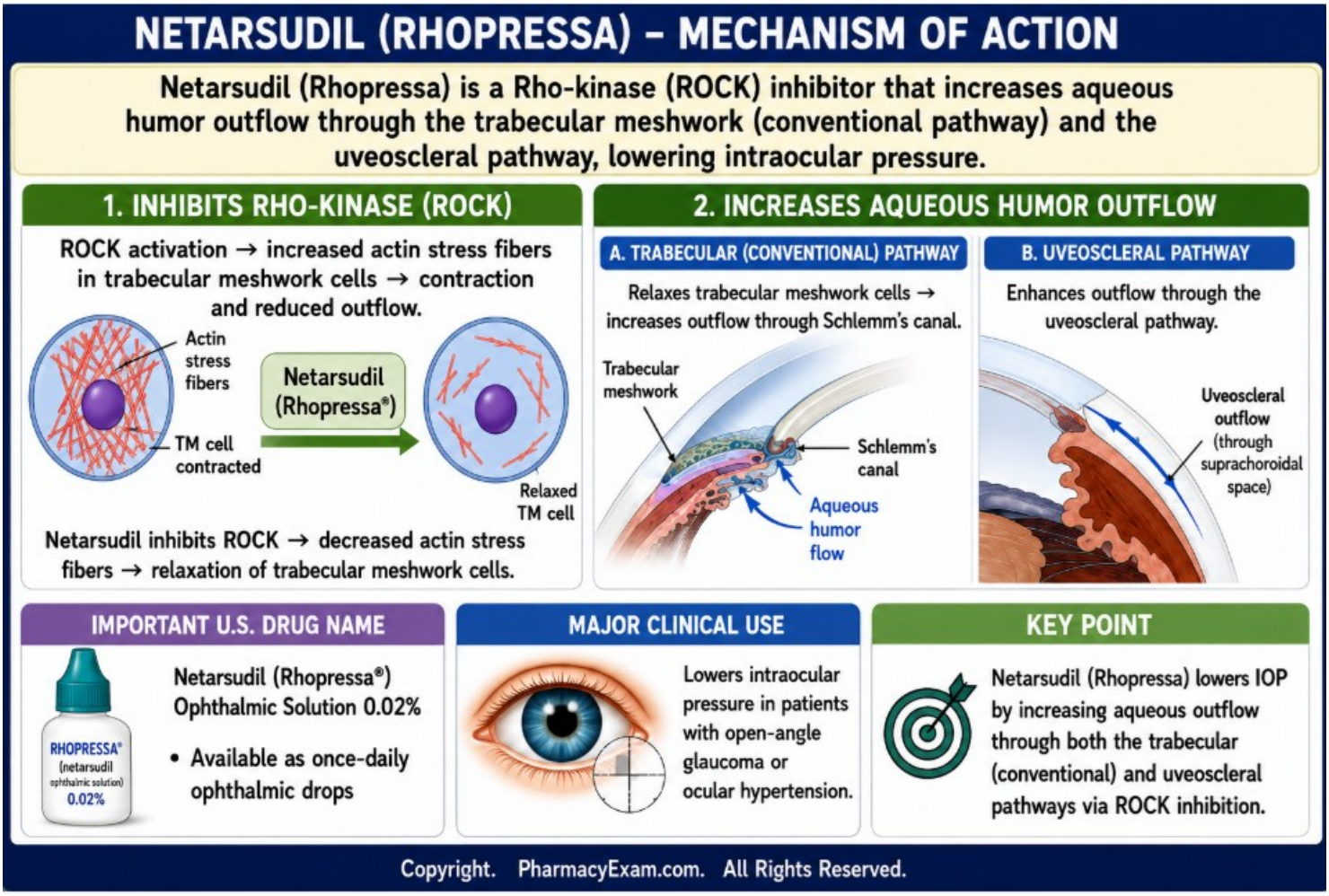
632. Correct Answer: D

Cerebyx (Fosphenytoin) is a water-soluble prodrug that is converted to phenytoin. For status epilepticus, intravenous administration is preferred because therapeutic phenytoin concentrations are achieved more rapidly. Intramuscular fosphenytoin should not ordinarily be used for status epilepticus; therefore, option D is false.

The recommended loading dose is 15–20 mg phenytoin equivalents (PE)/kg. The intravenous infusion rate must not exceed 150 mg PE/minute because rapid administration increases the risk of severe hypotension and cardiac arrhythmias. Pediatric patients may require a slower weight-based rate. Fosphenytoin must be prescribed and dispensed in PE units to reduce dosing errors.

Fosphenytoin is normally refrigerated at 2–8°C (36–46°F) and may be stored at controlled room temperature for no more than 48 hours.

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Conjunctival hyperemia is the most common adverse effect. Other characteristic ocular adverse effects include corneal verticillata, instillation-site pain, and conjunctival hemorrhage.

Key Points:
• Remove contact lenses before administration and wait at least 15 minutes before reinsertion.
• Separate netarsudil from other topical ophthalmic medications by at least 5 minutes.
• Store unopened bottles at 2°C to 8°C; after opening, the bottle may be stored at 2°C to 25°C for up to 6 weeks.

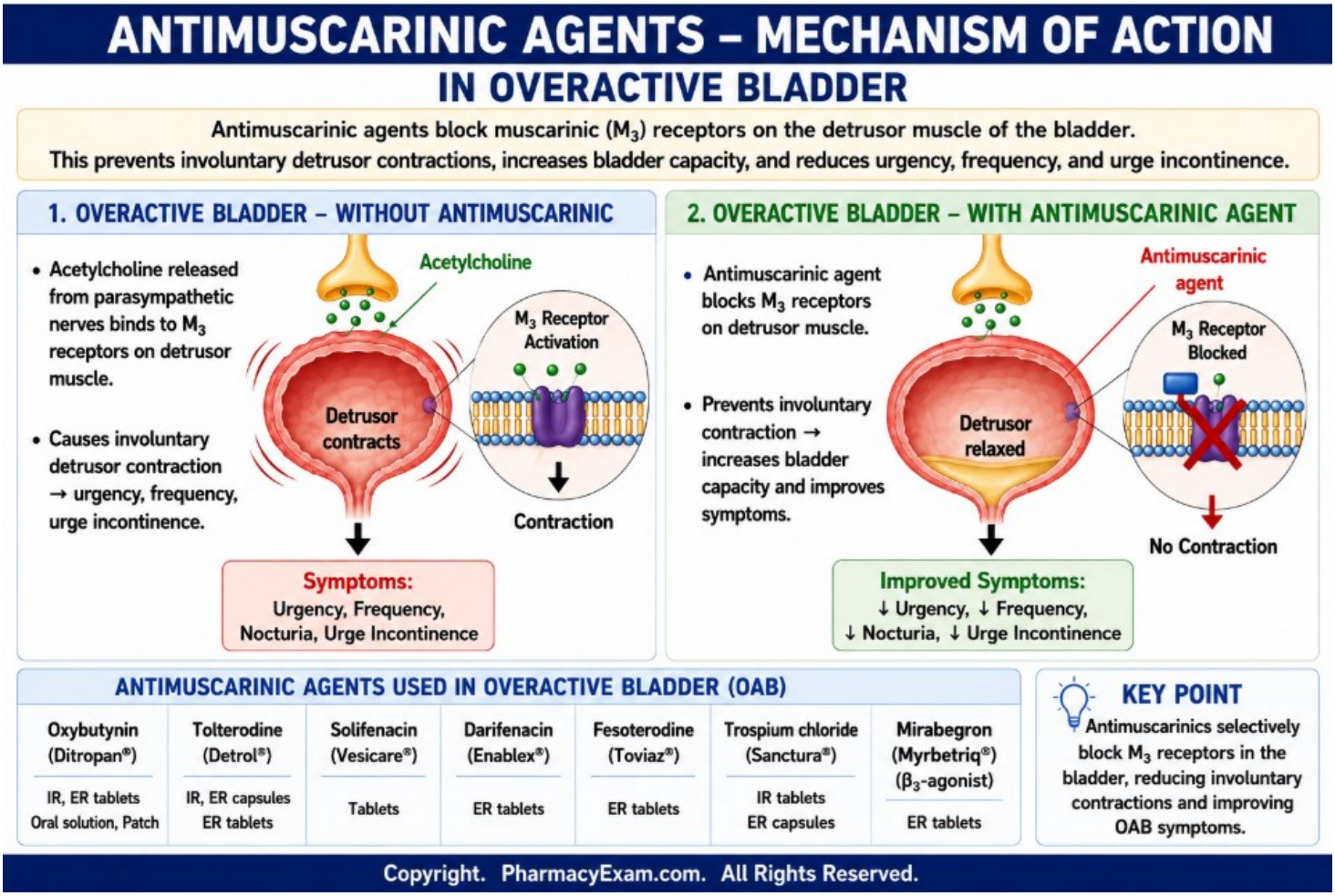
Exam Pearl: Administer netarsudil as one drop in the affected eye(s) once daily in the evening; more frequent dosing is not recommended.

662. Correct Answer: C

Oxytrol (Oxybutynin) is a transdermal patch containing 36 mg of oxybutynin that delivers approximately 3.9 mg per day. One patch is applied to intact skin and replaced every 3 to 4 days (twice weekly). Thus, the correct answer is transdermal patch; Oxytrol is not supplied as a tablet, capsule, injection, or suspension.

Oxybutynin is an antimuscarinic used to treat overactive bladder symptoms, including urinary urgency, frequency, and urge incontinence. Transdermal delivery reduces first-pass formation of the active metabolite N-desethyloxybutynin and generally causes less dry mouth than oral oxybutynin.

Common adverse effects include application-site reactions and anticholinergic effects such as dry mouth, constipation, blurred vision, and urinary retention.



Key Points:
• Apply the patch to clean, dry, intact skin on the abdomen, hip, or buttock; rotate sites and avoid reusing the same site within 7 days.
• Avoid applying the patch to skin treated with oils, lotions, or powders because these products may impair adhesion.
• Remove the old patch before applying a new one, fold it adhesive sides together, and discard it away from children and pets.

Exam Pearl: Nonprescription Oxytrol for Women is labeled for women 18 years and older; men with overactive bladder symptoms should seek medical evaluation.

663. Correct Answer: A

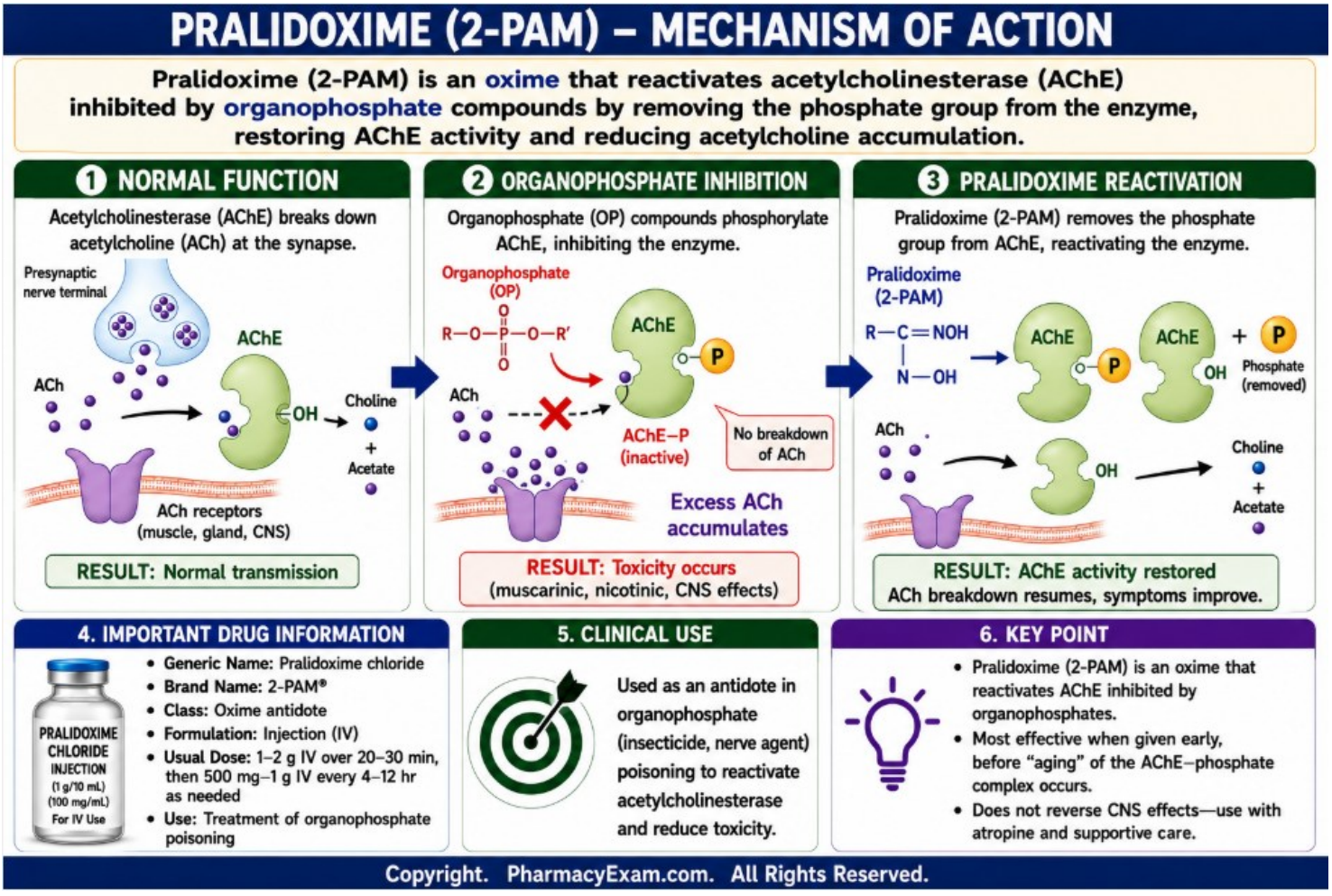
Gralise (Gabapentin) is an extended-release tablet indicated for the management of postherpetic neuralgia (PHN) in adults. PHN is persistent neuropathic pain caused by nerve injury from herpes zoster in the affected dermatome. Therefore, PHN is the correct answer.

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678. Correct Answer: A

Protopam Chloride (Pralidoxime; 2-PAM) is an acetylcholinesterase reactivator administered with atropine for poisoning caused by organophosphate insecticides and nerve agents.

Organophosphates phosphorylate and inhibit acetylcholinesterase, causing acetylcholine to accumulate at muscarinic and nicotinic receptors. Muscarinic toxicity includes salivation, lacrimation, diarrhea, bronchial secretions, bronchospasm, bradycardia, and miosis. Nicotinic toxicity produces fasciculations, skeletal muscle weakness, and potentially respiratory paralysis.



Atropine competitively blocks muscarinic receptors and controls life-threatening bronchial secretions and bronchospasm, but it does not adequately reverse nicotinic skeletal muscle toxicity. Pralidoxime removes the organophosphate from phosphorylated acetylcholinesterase and can restore enzyme activity if administered before irreversible enzyme aging occurs. It should be given as early as possible without delaying atropine.

Flumazenil reverses benzodiazepines, whereas fomepizole inhibits alcohol dehydrogenase in methanol or ethylene glycol poisoning. Physostigmine inhibits acetylcholinesterase and can worsen organophosphate toxicity. DigiFab (Digoxin Immune Fab) binds free digoxin and is used for severe digoxin toxicity.

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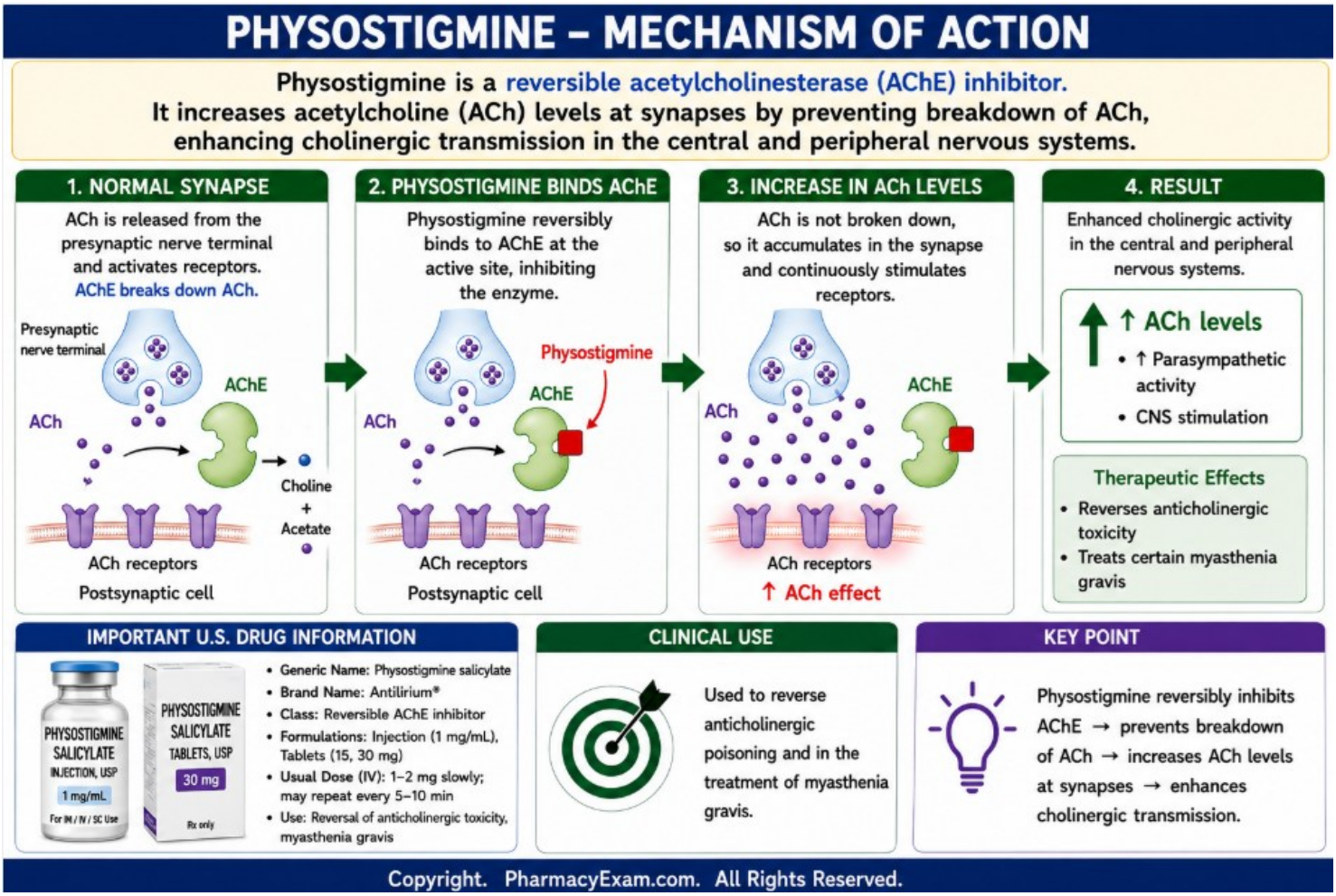
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Key Points:
• Protect healthcare personnel from secondary contamination; remove contaminated clothing and irrigate exposed skin.
• Treat organophosphate-associated seizures with a benzodiazepine.
• Organophosphate poisoning may prolong paralysis from succinylcholine because cholinesterase activity is reduced.

Exam Pearl: Titrate atropine to drying of bronchial secretions and improved ventilation—not to normalization of pupil size.

679. Correct Answer: A

Physostigmine is a reversible acetylcholinesterase inhibitor that may be used in selected patients with severe anticholinergic toxicity. By increasing acetylcholine concentrations, it can reverse both central and peripheral antimuscarinic effects.

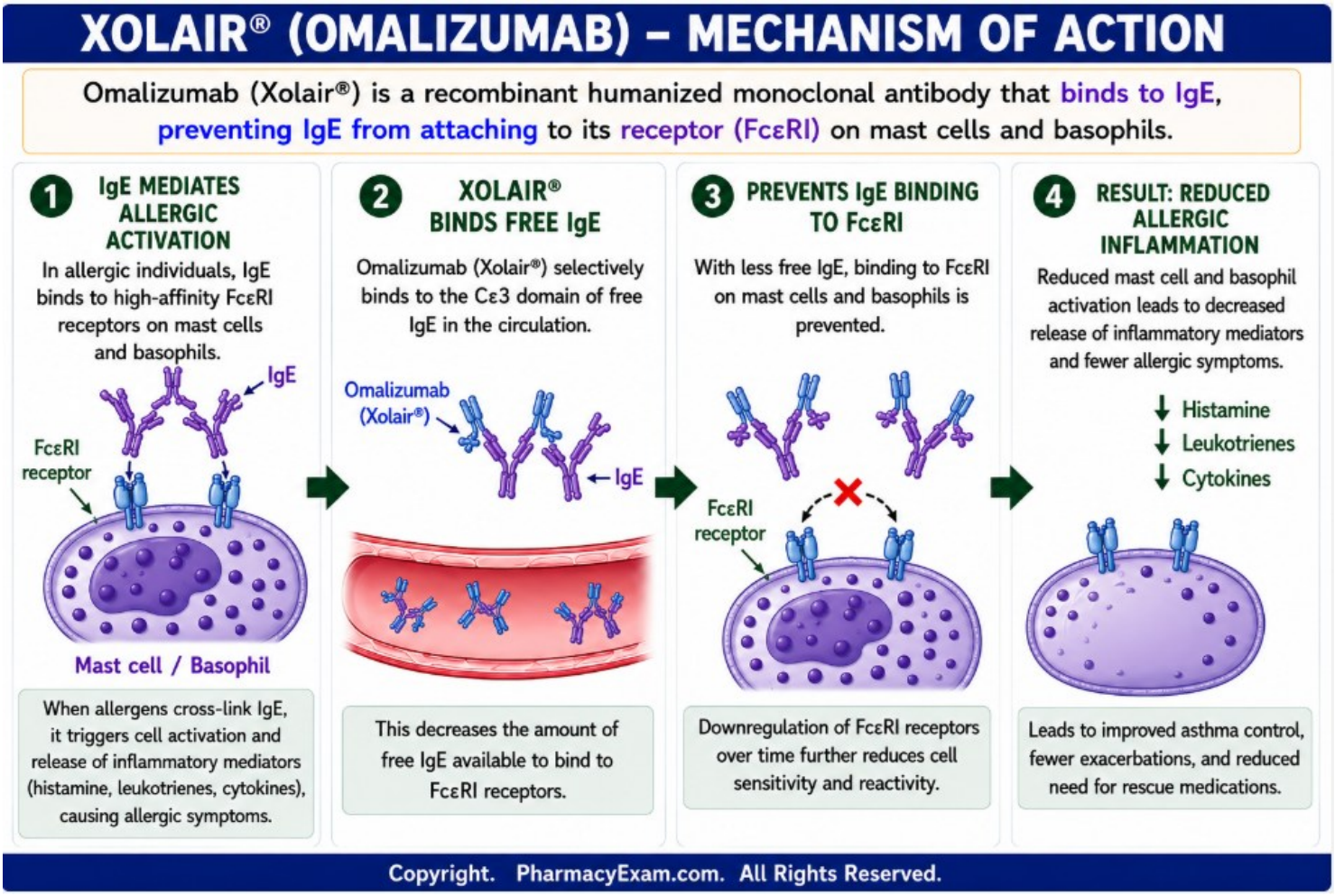


Unlike neostigmine and pyridostigmine, physostigmine is a tertiary amine that crosses the blood-brain barrier. It can therefore reverse central manifestations, including severe agitation, delirium, and hallucinations, as well as peripheral findings such as mydriasis, dry skin, urinary retention, and tachycardia.

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750. Correct Answer: D

Xolair (Omalizumab) is a monoclonal antibody that binds free immunoglobulin E (IgE). By preventing IgE from binding to high-affinity FcεRI receptors on mast cells and basophils, omalizumab decreases receptor expression and limits the release of allergic inflammatory mediators.



Omalizumab is used for allergic asthma, chronic spontaneous urticaria, chronic rhinosinusitis with nasal polyps, and IgE-mediated food allergy in appropriate patients. It is not an antagonist of thrombocytes, leukocytes, thromboxane, or prostaglandins; these cells and eicosanoids are not its direct pharmacologic targets.

Key Points:
• Omalizumab carries a boxed warning for anaphylaxis, which may occur after the first dose or after prolonged treatment.
• It is not indicated for acute bronchospasm or status asthmaticus.
• Dosing for asthma, nasal polyps, and food allergy is based on pretreatment total serum IgE and body weight; dosing for chronic spontaneous urticaria is independent of both.

Exam Pearl: Total IgE increases during omalizumab therapy and may remain elevated for up to 1 year after discontinuation, so it should not be used to recalculate the dose during this period.

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751. Correct Answer: B

Choice B is the intended false statement. Intravenous amphotericin B deoxycholate (Fungizone) is generally reserved for severe, progressive, or potentially life-threatening fungal infections because of its substantial toxicity. It is not routinely used for uncomplicated oropharyngeal candidiasis. Esophageal candidiasis requires systemic therapy, usually fluconazole; amphotericin B may be considered when preferred therapy cannot be used or the infection is refractory.

Choice A is true. Amphotericin B is a polyene antifungal that binds fungal membrane ergosterol, forms membrane pores, and causes leakage of intracellular contents. It is not interchangeable with lipid-based amphotericin B formulations; the exact formulation and dose must be verified.

Choice C is true because an amphotericin B overdose can cause potentially fatal cardiorespiratory arrest. Choice D is true for unopened amphotericin B deoxycholate vials, which should be refrigerated and protected from light.

Choice E is true. Infusion-related fever, chills, nausea, and rigors may be reduced by pretreatment with Bayer (aspirin), Tylenol (acetaminophen), Benadryl (diphenhydramine), and/or an antiemetic.

Key Points:
• Monitor renal function, potassium, magnesium, complete blood count, and liver function during systemic therapy.
• Concurrent nephrotoxic drugs increase the risk of kidney injury, and amphotericin-induced hypokalemia may increase toxicity from Lanoxin (digoxin).
• Normocytic anemia may develop because amphotericin B decreases renal erythropoietin production.

Exam Pearl: Amphotericin B deoxycholate is diluted in 5% dextrose rather than saline because electrolytes can cause precipitation.

Review Figure: Amphotericin B M/A (page 197*).*

752. Correct Answer: A

Viracept (Nelfinavir) is a protease inhibitor indicated, in combination with other antiretroviral agents, for the treatment of HIV-1 infection. It inhibits HIV protease, preventing cleavage of viral polyproteins and producing immature, noninfectious virions.

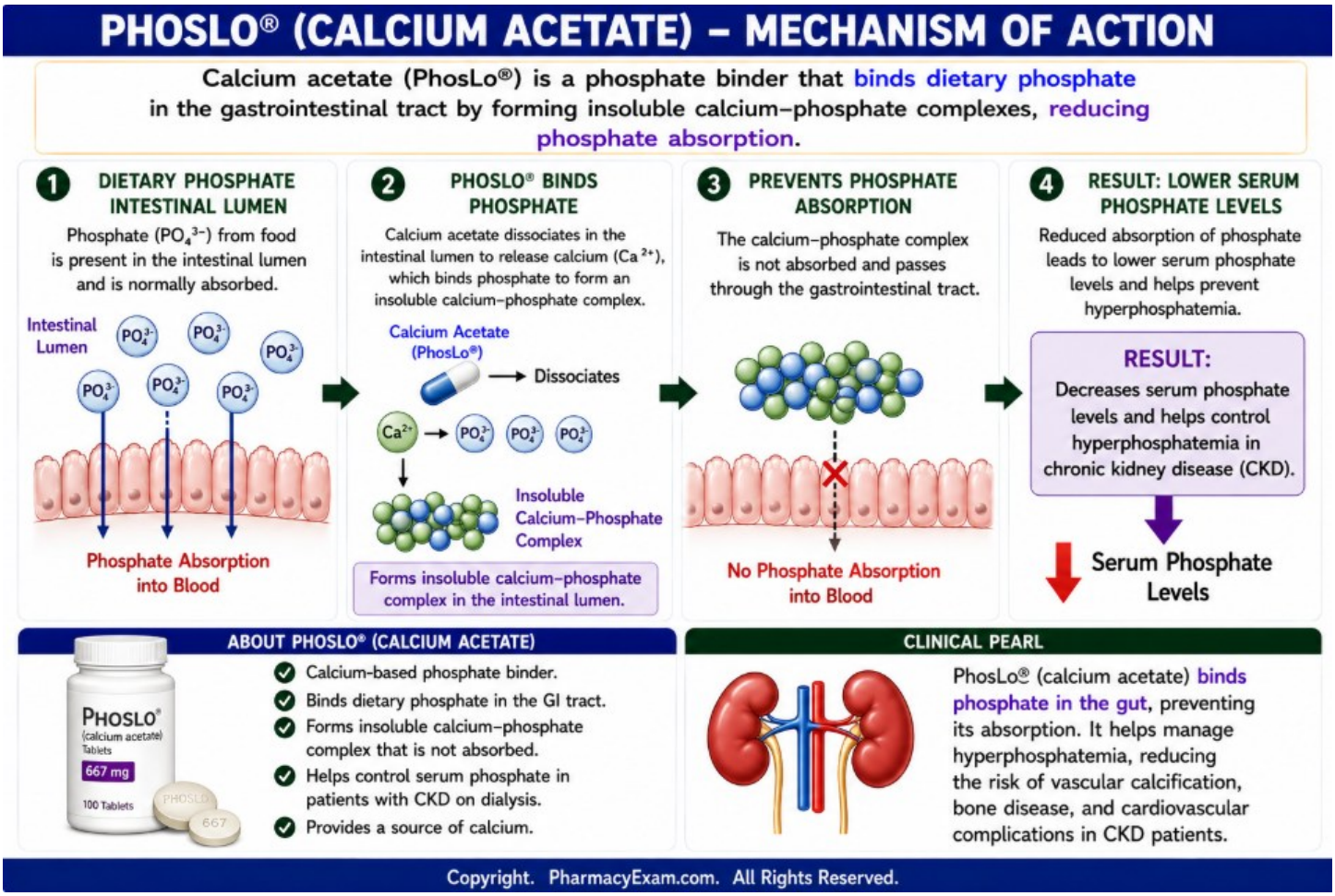
The recommended adult dose is 1,250 mg twice daily or 750 mg three times daily with food. Tablets may be dispersed in a small amount of water for patients who cannot swallow them; the mixture should be consumed immediately, and the container should be rinsed with water that is also swallowed.

Diarrhea is the most common adverse effect; nausea and flatulence may also occur. Nelfinavir does not treat pneumonia, Pneumocystis jirovecii pneumonia, cytomegalovirus infection, or Epstein–Barr virus infection because these conditions require therapies directed against their respective pathogens.

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764. Correct Answer: D

PhosLo (Calcium Acetate) is a phosphate binder indicated to reduce elevated serum phosphorus in patients with end-stage renal disease. Calcium acetate binds dietary phosphate in the gastrointestinal tract, forming insoluble calcium phosphate that is excreted in the feces.



The labeled initial dosage for adults receiving dialysis is two 667-mg capsules with each meal; the dosage is gradually titrated to the serum phosphorus goal while avoiding hypercalcemia. Hypercalcemia is a contraindication and the principal dose-limiting adverse effect. Other adverse effects include nausea, vomiting, and constipation.

Calcium acetate does not treat hyperkalemia or hypophosphatemia and is not routinely used to correct hypocalcemia. It may worsen preexisting hypercalcemia.

Key Points:
• Administer calcium acetate with meals so it can bind phosphate from food.
• During dosage titration, monitor serum calcium frequently and assess serum phosphorus periodically.
• Calcium can reduce the absorption of certain oral medications; when clinically significant, administer them at least 1 hour before or 3 hours after calcium acetate.

Exam Pearl: Each 667-mg calcium acetate capsule provides approximately 169 mg of elemental calcium.

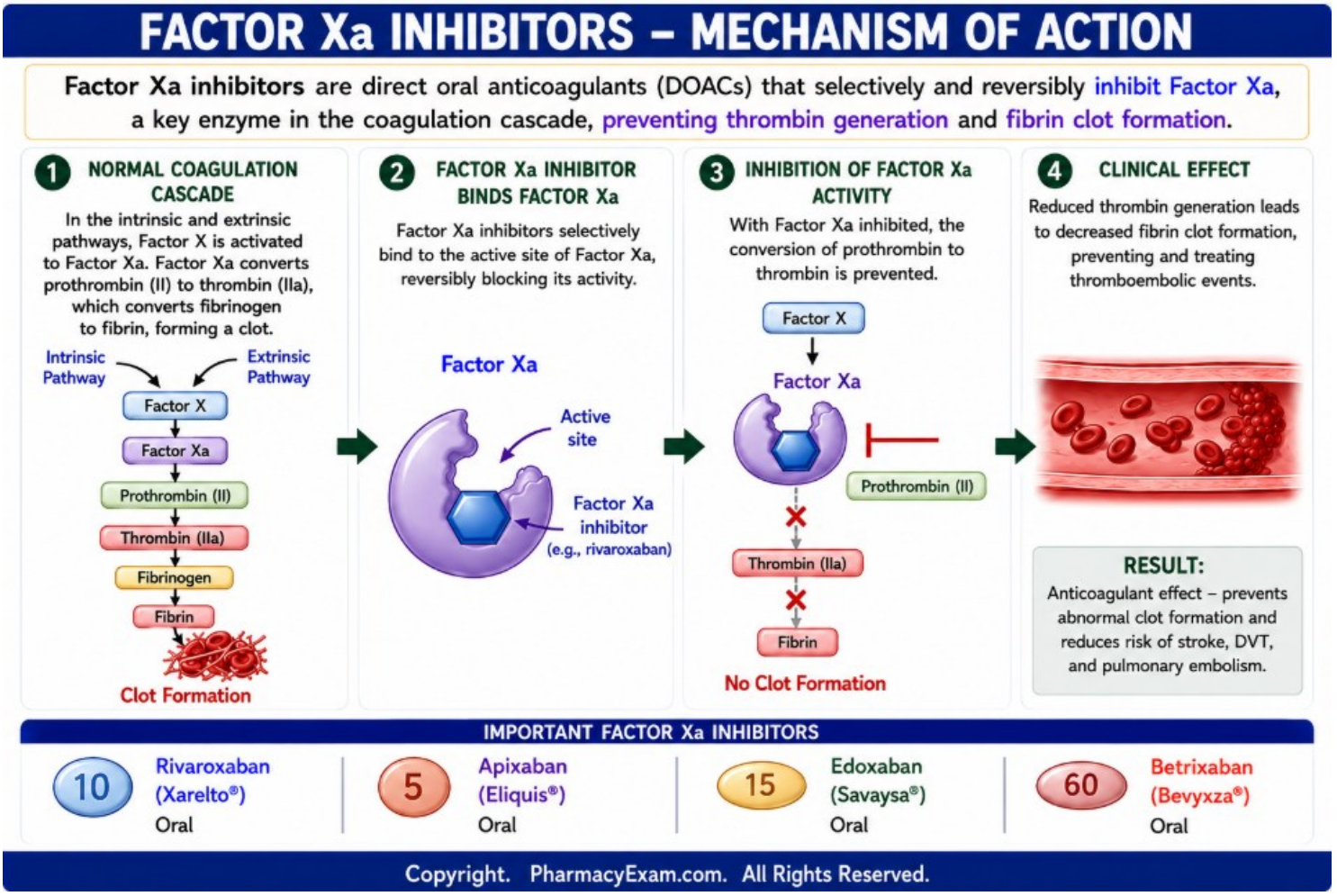
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765. Correct Answer: E

Arixtra (Fondaparinux) is an anticoagulant used for the prevention and treatment of venous thromboembolism. It binds antithrombin and selectively inhibits factor Xa, thereby reducing thrombin generation and clot formation.

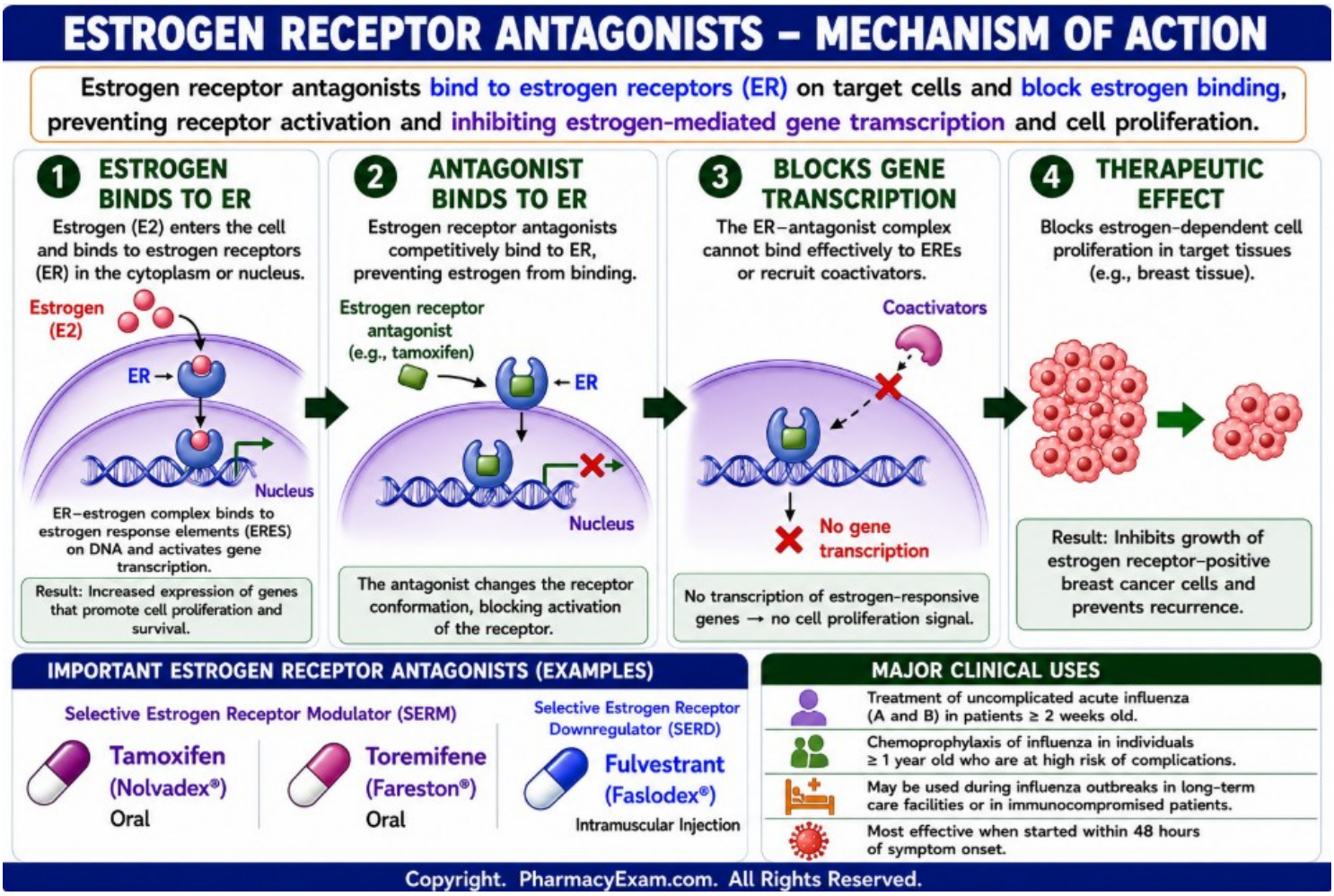
Bleeding is the principal serious adverse effect. Fondaparinux carries a boxed warning for spinal or epidural hematomas in patients undergoing neuraxial anesthesia or spinal puncture; these hematomas can cause long-term or permanent paralysis. Therefore, hematoma is the best answer.

Vomiting may occur but is not a major toxicity. Hypotension can develop secondary to severe blood loss but is not a characteristic direct adverse effect. Diarrhea and arrhythmia are not typical serious adverse effects of fondaparinux.



Key Points:
• Fondaparinux is contraindicated in patients with severe renal impairment (CrCl below 30 ml/min) or active major bleeding.
• For postoperative prophylaxis, administer the first dose no earlier than 6–8 hours after surgery and only after hemostasis is established.
• Monitor CBC, renal function, and signs of occult or overt bleeding; routine coagulation testing is generally not required.
• NSAIDs, antiplatelet drugs, and other anticoagulants can further increase bleeding risk.

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In breast tissue, tamoxifen competitively binds estrogen receptors and acts as an antagonist, thereby inhibiting estrogen-dependent gene transcription and tumor-cell proliferation. It does not inhibit estrogen synthesis, HER2 tyrosine kinase activity, progesterone receptors, or gonadotropin-releasing hormone receptors. Therefore, option B is correct.

Key Points:
• Tamoxifen increases the risk of venous thromboembolism and endometrial malignancy; patients should promptly report abnormal uterine bleeding.
• CYP2D6 converts tamoxifen to the active metabolite endoxifen; avoid strong CYP2D6 inhibitors such as paroxetine and fluoxetine when reasonable alternatives are available.
• Common adverse effects include hot flashes, vaginal discharge, and menstrual irregularities.

Exam Pearl: Unlike aromatase inhibitor monotherapy, tamoxifen can be used in premenopausal patients without ovarian suppression.

795. Correct Answer: A

Arava (Leflunomide) is a disease-modifying antirheumatic drug used to treat active rheumatoid arthritis. Its active metabolite, teriflunomide, inhibits dihydroorotate dehydrogenase, thereby reducing de novo pyrimidine synthesis and lymphocyte proliferation.

Cholestyramine is correct. It interrupts the enterohepatic recirculation of teriflunomide and accelerates its elimination. The recommended washout regimen is cholestyramine 8 g orally three times daily for 11 days. Activated charcoal powder, 50 g orally every 12 hours for 11 days, is an alternative accelerated-elimination regimen; however, it is not a bile acid sequestrant.

Sodium bicarbonate promotes elimination of selected weak acids by alkalinizing the urine. Leucovorin is used as rescue therapy after high-dose methotrexate and for certain folate antagonist toxicities. Protamine sulfate reverses unfractionated heparin and partially reverses low-molecular-weight heparins.

Key Points:
• Leflunomide carries boxed warnings for embryo-fetal toxicity and severe liver injury.
• After washout, confirm a plasma teriflunomide concentration below 0.02 mg/L on two tests performed at least 14 days apart when reliable elimination is required.
• Monitor alanine aminotransferase at least monthly for the first 6 months and every 6–8 weeks thereafter.

Exam Pearl: Without an accelerated-elimination procedure, teriflunomide may take up to 2 years to reach minimally detectable concentrations.

796. Correct Answer: E

Decadron (dexamethasone) is a long-acting corticosteroid used to treat inflammatory and immune-mediated disorders. With prolonged use, dexamethasone induces CYP3A4 by increasing enzyme expression. This induction can increase the metabolism and clearance of CYP3A4 substrates, resulting in decreased substrate concentrations and potentially reduced therapeutic efficacy. Therefore, choice E is correct.

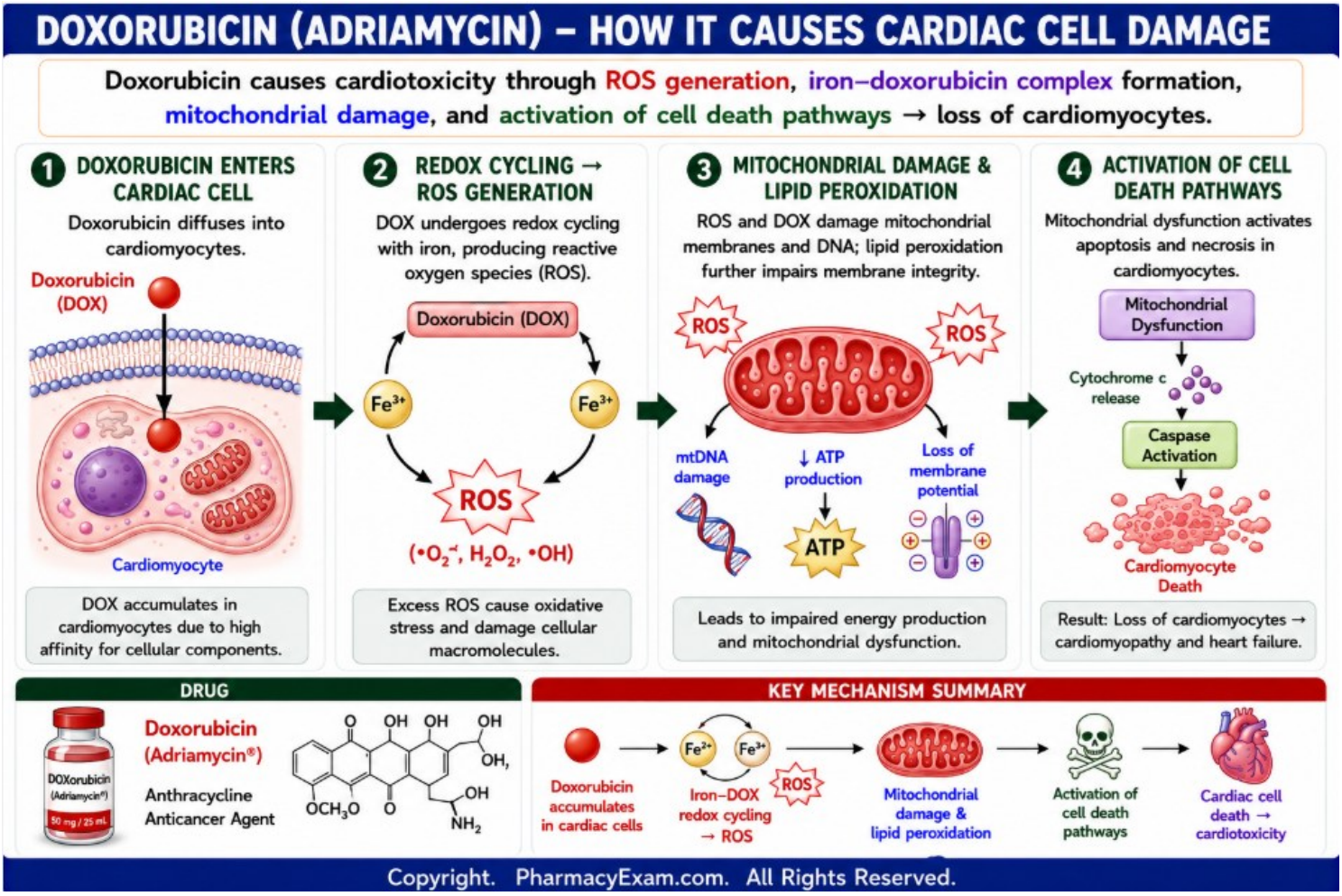
Choice A describes the expected effect of CYP3A4 inhibition, not induction. Dexamethasone does not irreversibly inhibit P-glycoprotein, completely inhibit renal drug elimination, or predictably increase gastric absorption of a CYP3A4 substrate; therefore, choices B, C, and D are incorrect.

Key Points:
• Prolonged systemic corticosteroid therapy can suppress the hypothalamic-pituitary-adrenal axis and may require gradual tapering.
• Strong CYP3A4 inhibitors, such as ritonavir or certain azole antifungals, can increase dexamethasone exposure and corticosteroid toxicity.

Exam Pearl: Dexamethasone has minimal mineralocorticoid activity compared with many other systemic corticosteroids.

797. Correct Answer: A

Reclast (Zoledronic Acid) is a bisphosphonate indicated for the treatment of postmenopausal osteoporosis. The usual treatment dose is 5 mg IV once yearly, infused over at least 15 minutes.



Doxorubicin causes cumulative, dose-dependent cardiomyopathy that can progress to potentially fatal heart failure. The risk begins to increase substantially above a cumulative dose of approximately 400 mg/m^2; the commonly cited lifetime maximum is 450–550 mg/m^2, with a lower limit appropriate for patients with cardiac risk factors. Therefore, **400–550 mg/m^2** is the intended answer. The lower ranges are not standard lifetime limits, whereas 600–900 mg/m^2 exceeds the generally accepted maximum.

Cardiotoxicity may occur during treatment or months to years afterward. Left ventricular ejection fraction should be assessed before therapy and periodically during treatment, particularly as cumulative exposure increases.

Key Points:
• Prior mediastinal radiation, underlying cardiovascular disease, and concurrent cardiotoxic therapy can increase the risk of cardiomyopathy.
• Dexrazoxane may reduce cardiotoxicity in selected patients who require continued doxorubicin after substantial cumulative exposure.
• Doxorubicin is a vesicant; extravasation requires prompt management and may be treated with dexrazoxane.

Exam Pearl: Include all prior anthracycline exposure when estimating a patient's lifetime cumulative cardiotoxic dose.

956. Correct Answer: C

Cyanocobalamin injection is used to treat vitamin B_{12} deficiency, particularly deficiency caused by malabsorption or pernicious anemia. It may be administered intramuscularly or subcutaneously.

Intravenous administration should be avoided because most of the dose is rapidly excreted in the urine, reducing vitamin retention. Therefore, statements I and II are correct, while statement III is incorrect.

Key Points:
• Monitor the reticulocyte response, blood counts, and serum potassium during initial treatment of severe deficiency; brisk hematopoiesis can cause hypokalemia.
• Patients with pernicious anemia generally require lifelong vitamin B12 replacement because intrinsic factor deficiency persists.

Exam Pearl: Do not confuse cyanocobalamin replacement therapy with hydroxocobalamin, which is used as a cyanide antidote.

957. Correct Answer: A

Demerol (Meperidine) is an opioid agonist reserved for pain severe enough to require an opioid when alternative treatments are inadequate. It is metabolized to normeperidine, an active neurotoxic metabolite that is eliminated renally. Repeated dosing in severe renal impairment can cause normeperidine accumulation, producing CNS excitation manifested by irritability, agitation, tremors, myoclonus, or seizures. Therefore, accumulation of normeperidine is the best explanation.

Meperidine is a full μ-opioid receptor agonist and does not precipitate withdrawal through partial agonism. Acetylcholinesterase inhibition is associated with cholinergic toxicity, N-acetyl-p-benzoquinone imine is the toxic metabolite of acetaminophen, and N-methyl-D-aspartate receptor blockade is characteristic of agents such as ketamine.

Key Points:
• When meperidine is used for acute pain, treatment should generally not exceed 48 hours or 600 mg in 24 hours.
• IV meperidine should be given slowly and preferably after dilution because rapid administration increases respiratory and cardiovascular risk.

Exam Pearl: Meperidine is contraindicated during or within 14 days after monoamine oxidase inhibitor therapy.

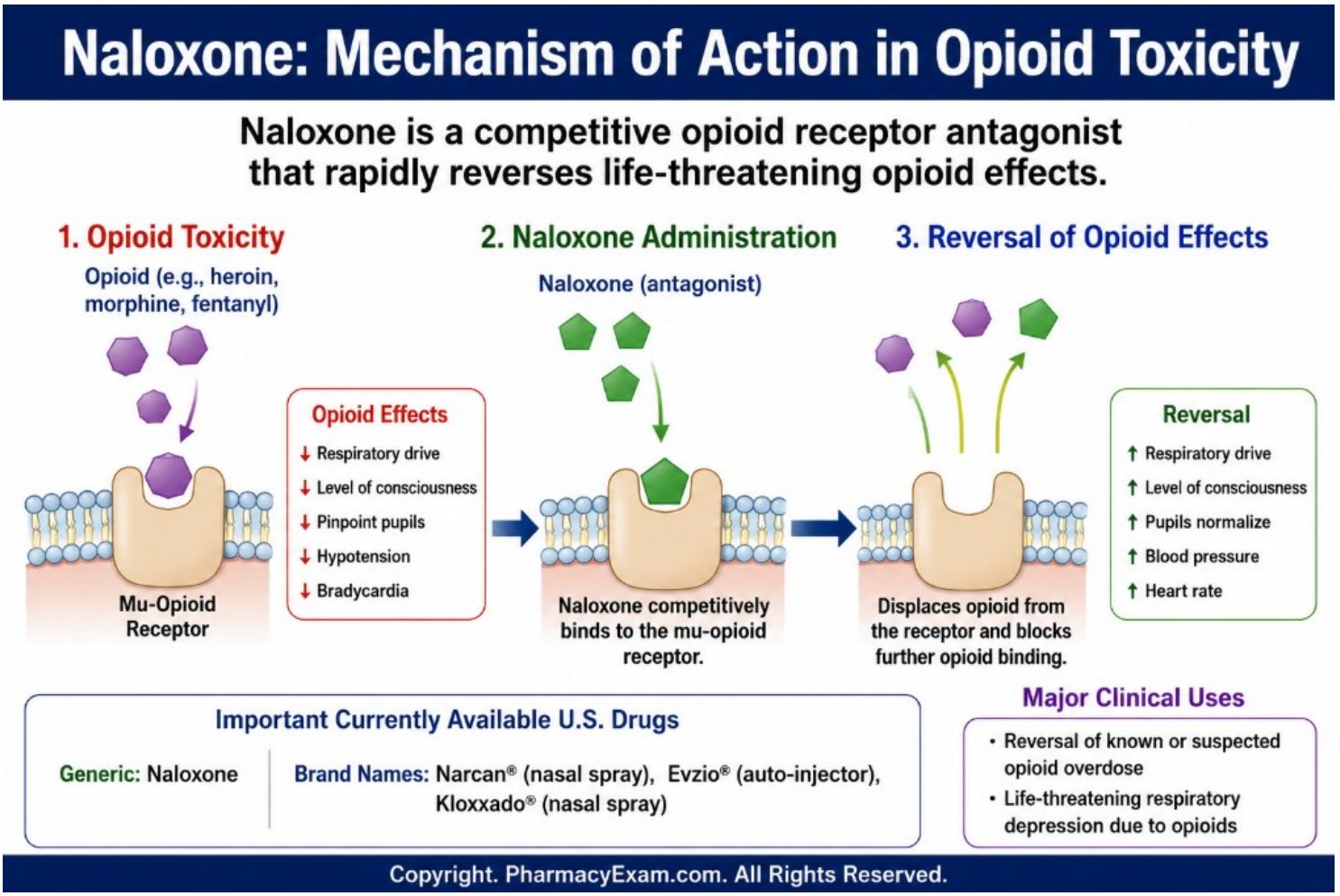
958. Correct Answer: D

Lanoxin (Digoxin) is used to improve symptoms in heart failure and control the ventricular response rate in chronic atrial fibrillation. Intravenous administration is acceptable when oral therapy is unsuitable; the dose should be administered slowly over at least 5 minutes to reduce the risk of systemic or coronary vasoconstriction.

Exam Pearl: Naloxone reverses meperidine-induced opioid toxicity but does not reliably control seizures caused by normeperidine.

978. Correct Answer: B

Demerol (meperidine) is an opioid analgesic used for severe pain when alternative treatments are inadequate. Narcan (naloxone) is a competitive opioid receptor antagonist indicated for the emergency treatment of known or suspected opioid overdose manifested by respiratory or central nervous system depression. It reverses the opioid effects of meperidine and is therefore the correct antidote.



In a monitored setting, intravenous naloxone may be titrated from 0.04 mg in an opioid-dependent patient to reduce the risk of severe withdrawal; product labeling recommends 0.4 to 2 mg IV initially, repeated every 2 to 3 minutes as needed. A 4-mg intranasal dose may be administered into one nostril and repeated every 2 to 3 minutes while emergency assistance is obtained. Naloxone may precipitate acute opioid withdrawal, including agitation, vomiting, hypertension, and tachycardia.

Protamine sulfate reverses heparin. Buprenorphine and methadone are opioids and are not antidotes for meperidine toxicity. Mesna prevents hemorrhagic cystitis associated with oxazaphosphorine chemotherapy.

Key Points:
• Naloxone may have a shorter duration of action than the ingested opioid; monitor for recurrent respiratory depression and administer repeat doses or an infusion when necessary.
• Meperidine's metabolite, normeperidine, can cause tremors and seizures, particularly in renal impairment; this neurotoxicity is not reliably reversed by naloxone and may require benzodiazepines.

Exam Pearl: Meperidine is contraindicated with monoamine oxidase inhibitors because the combination can cause severe serotonin toxicity.

979. Correct Answer: E

Demerol (Meperidine) is a mu-opioid receptor agonist indicated for acute pain severe enough to require an opioid when alternative treatments are inadequate.

Meperidine overdose produces excessive opioid effects, including respiratory depression, miosis, bradycardia, hypotension, cold and clammy skin, and reduced consciousness. Severe hypotension may progress to circulatory collapse. Therefore, **hypertension** is not an expected manifestation of meperidine overdose.

Management includes airway and ventilatory support. Narcan (Naloxone) should be administered for clinically significant opioid-induced respiratory or circulatory depression.

Key Points:
• Normeperidine, an active neurotoxic metabolite, can accumulate with repeated dosing or renal impairment and cause agitation, tremor, myoclonus, or seizures.
• Meperidine is contraindicated during or within 14 days after monoamine oxidase inhibitor therapy because severe, potentially fatal reactions may occur.
• Monitor after naloxone administration because recurrent opioid toxicity may require additional doses or a continuous infusion.

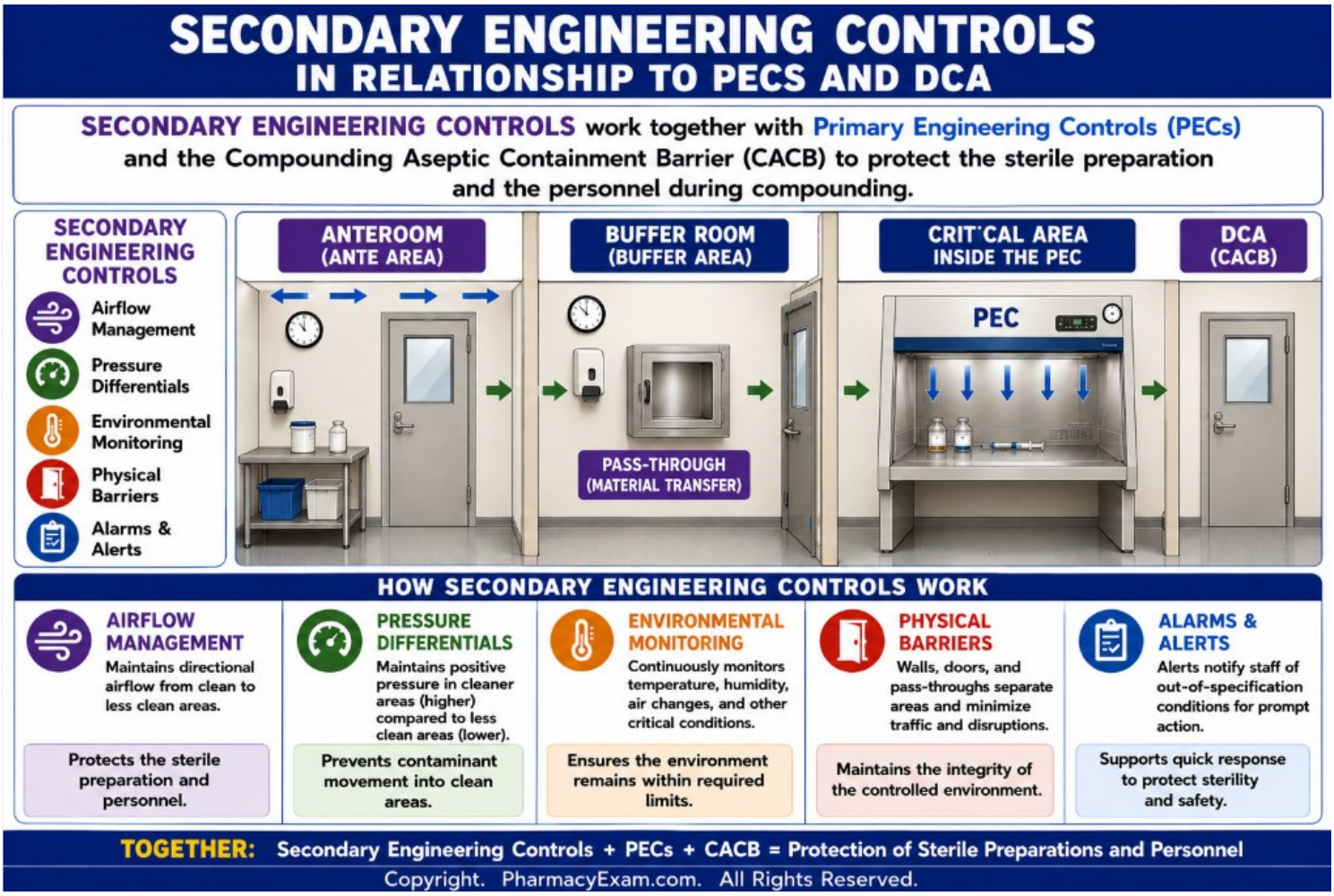
Exam Pearl: Naloxone reverses meperidine-induced opioid respiratory depression but does not treat normeperidine-induced seizures.

980. Correct Answer: E

BiCNU (Carmustine) has boxed warnings for delayed myelosuppression and pulmonary toxicity. Myelosuppression commonly manifests as thrombocytopenia and leukopenia and may be severe or fatal. Because toxicity is delayed and cumulative, complete blood counts should be monitored weekly for at least 6 weeks after each dose. Subsequent courses should not be administered more frequently than every 6 weeks, and the dose should be adjusted according to prior nadir blood counts.

Pulmonary toxicity, including potentially fatal pulmonary fibrosis, is dose-related. Risk increases substantially when the cumulative dose exceeds 1,400 mg/m^2. Delayed pulmonary toxicity may develop years after treatment, particularly in patients treated during childhood.

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Key Points:
• HEPA filters are at least 99.97% efficient at removing 0.3-micrometer particles but do not remove gases or vapors.
• Primary engineering controls must be certified before use, at least every 6 months, and after relocation or major repair.

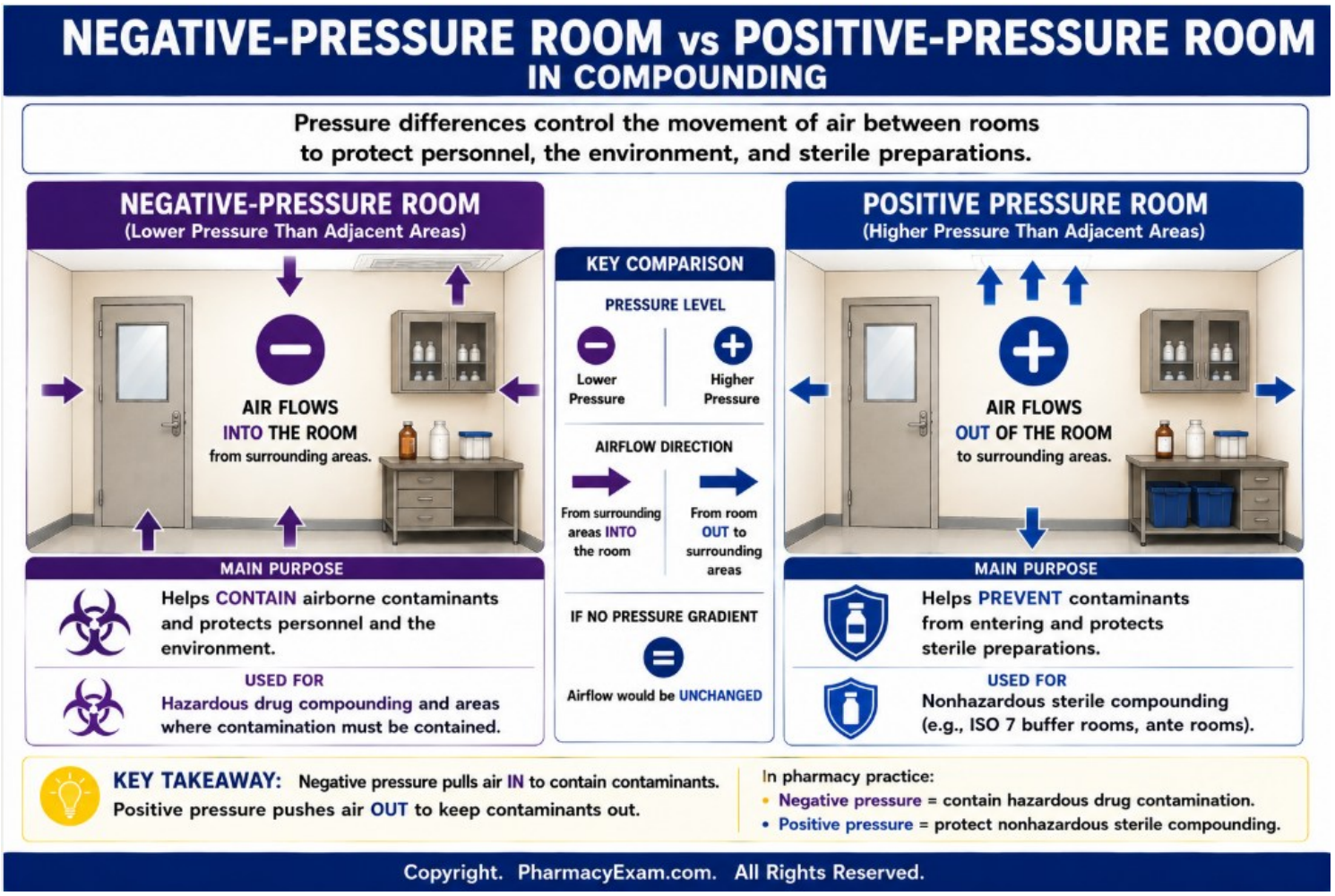
Exam Pearl: Critical sites must receive unobstructed first air without airflow passing over hands, supplies, or other potential contaminants.

1037. Correct Answer: A

A negative-pressure room has lower air pressure than adjacent spaces. This pressure gradient causes net airflow from the surrounding area into the room, helping contain airborne contaminants. Therefore, choice A is correct.

Airflow out of the room describes a positive-pressure room. Airflow would be unchanged only if no pressure gradient existed. In pharmacy practice, negative pressure is used to contain hazardous drug contamination, whereas positive pressure helps prevent contaminants from entering areas used for nonhazardous sterile compounding.

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Key Points:
• Under USP <800>, a hazardous drug containment secondary engineering control should maintain a negative pressure of 0.01–0.03 inch water column relative to adjacent areas.
• The pressure differential should be monitored and documented at least daily on days when hazardous drug compounding occurs.

Exam Pearl: A hazardous drug containment secondary engineering control must be externally vented.

1038. Correct Answer: B

Under current USP , a Category 1 compounded sterile preparation (CSP) may be assigned a maximum BUD of 12 hours at controlled room temperature or 24 hours when refrigerated at 2°C to 8°C. Category 1 CSPs are not assigned a frozen BUD.
These are maximum limits. A shorter BUD is required when supported stability data, component expiration dates, or container-closure limitations do not support the full period.

Key Points:
• Category 1 CSPs may be compounded in a compliant segregated compounding area.
• The BUD is calculated from the date and time compounding begins.
• Category 2 CSPs require a classified cleanroom suite and may qualify for longer BUDs.

Exam Pearl: For current Category 1 CSPs, memorize the 12-hour room-temperature and 24-hour refrigerated limits.

1039. Correct Answer: A

Category 3 CSPs require sterility testing. If testing has not been completed before release, the CSP must be stored before administration for no longer than:

1. 24 hours at controlled room temperature.
2. 3 days at a cold temperature.
3. 45 days in a solid frozen state between -25°C and -10°C.

Therefore, statement I is correct. Statement II is incorrect because the cold-storage limit is 3 days, not 7 days. Statement III is incorrect because the frozen-storage limit is 45 days, not 60 days. This provision applies only while results are pending; a CSP with a failed sterility test must not be administered.

Key Points:
• Controlled room temperature is generally 20°C to 25°C, whereas cold storage is generally 2°C to 8°C.
• If subsequent sterility testing indicates contamination, affected CSPs must be promptly recalled and the appropriate individuals notified.

Exam Pearl: Do not confuse these administration limits while sterility results are pending with the CSP's assigned beyond-use date.

1040. Correct Answer: D

A single-dose container entered or opened in ISO Class 5 or cleaner air may be used for up to 12 hours after initial entry or opening. Therefore, choice D is correct.

The 1-hour limit reflects a former USP provision for containers exposed to air worse than ISO Class 5. The 4-hour period applies to the time by which administration of an immediate-use CSP must begin, whereas 28 days is the usual beyond-use date for an opened or entered multiple-dose container unless otherwise specified by the manufacturer.

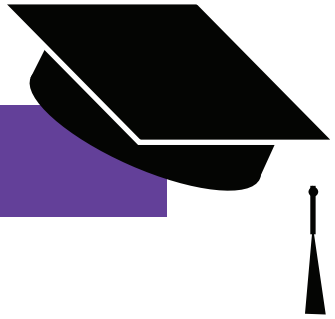
Key Points:
• A single-dose container entered or opened in air worse than ISO Class 5 must be discarded after use and cannot be stored.
• Unused contents from an opened single-dose ampule must be discarded regardless of the surrounding air quality.

Exam Pearl: ISO Class 5 or cleaner permits a 12-hour limit for an entered single-dose container, not the 28-day limit used for multiple-dose containers.

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