

ANSWER KEY WITH EXPLANATIONS FOR CHAPTER 11

Skill Drill Answers

SD 11.1: AED Mechanism Matching

1. **A** — Phenytoin blocks sodium channels
2. **D** — Levetiracetam binds SV2A
3. **C** — Ethosuximide blocks T-type calcium channels
4. **B** — Phenobarbital enhances GABA-A
5. **A** — Carbamazepine blocks sodium channels
6. **E** — Valproic acid has multiple mechanisms
7. **B** — Lorazepam enhances GABA-A
8. **A** — Lamotrigine blocks sodium channels

SD 11.2: True/False with Correction

1. **F** — Carbamazepine can WORSEN absence seizures; use ethosuximide or valproate instead.
2. **T** — Phenytoin has saturable metabolism, causing nonlinear kinetics.
3. **T** — Levodopa crosses the BBB via amino acid transporters.
4. **F** — Cholinesterase inhibitors provide MODEST SYMPTOMATIC benefit; they do not cure the disease.
5. **F** — Ethosuximide is ONLY effective for absence seizures.
6. **F** — Valproic acid is TERATOGENIC (neural tube defects) and should be avoided in pregnancy.

SD 11.3: Fill in the Blank

1. **ethosuximide**

2. **carbidopa**
 3. **Stevens-Johnson**
 4. **nigrostriatal**
 5. **donepezil**
 6. **status**
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SD 11.4: Seizure Type-Drug Matching

1. **B** — Carbamazepine for focal seizures
 2. **A** — Ethosuximide for absence seizures
 3. **D** — Lorazepam IV for status epilepticus
 4. **C** — Valproic acid for generalized tonic-clonic
 5. **C** — Valproic acid for myoclonic seizures
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SD 11.5: Parkinson's Drug Classification

1. **A** — Levodopa/carbidopa is a dopamine precursor
 2. **B** — Pramipexole is a dopamine agonist
 3. **C** — Selegiline is an MAO-B inhibitor
 4. **D** — Entacapone is a COMT inhibitor
 5. **E** — Benztropine is an anticholinergic
 6. **B** — Ropinirole is a dopamine agonist
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SD 11.6: Rapid Recall

1. **Ethosuximide**
2. **Levodopa (L-DOPA)**
3. **Lorazepam (IV)**
4. **Memantine**
5. **Stevens-Johnson syndrome**
6. **Phenytoin**

SD 11.7: Complete the Sentence

1. **worsen**
2. **duration**
3. **kidney**
4. **does not cross**
5. **broad-spectrum**
6. **dyskinesias**

SD 11.8: AED Adverse Effect Matching

1. **A** — Phenytoin causes gingival hyperplasia, hirsutism
2. **C** — Valproic acid causes neural tube defects
3. **E** — Vigabatrin causes irreversible visual field defects
4. **D** — Topiramate causes weight loss, cognitive slowing, kidney stones
5. **B** — Carbamazepine causes Stevens-Johnson (HLA-B*15:02)

SD 11.9: Drug Interaction Identification

1. **T** — Phenytoin is a strong CYP450 inducer
2. **F** — Levetiracetam has minimal hepatic metabolism and few interactions
3. **T** — Carbamazepine induces its own metabolism
4. **T** — Valproate inhibits lamotrigine metabolism, increasing SJS risk
5. **F** — Gabapentin has no hepatic metabolism (renal excretion)

SD 11.10: Alzheimer's Drug Comparison

1. **A** — Donepezil is a cholinesterase inhibitor
2. **B** — Memantine is an NMDA antagonist
3. **A** — Rivastigmine is a cholinesterase inhibitor
4. **C** — Lecanemab is an anti-amyloid antibody

5. **A** — Galantamine is a cholinesterase inhibitor
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SD 11.11: MS Drug Mechanism Matching

1. **B** — Fingolimod is an S1P receptor modulator
 2. **C** — Natalizumab is an anti-integrin antibody
 3. **D** — Ocrelizumab is an anti-CD20 antibody
 4. **A** — Interferon beta-1a is an interferon
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SD 11.12: Clinical Scenario Drug Selection

1. **B** — Ethosuximide for absence seizures only
2. **B** — Add entacapone to extend levodopa effect
3. **C** — Lamotrigine is safer in pregnancy than valproate or carbamazepine

Case Study Answers

Case 11.1: New-Onset Epilepsy

Question 1. Appropriate first-line choices for generalized tonic-clonic seizures include valproic acid, lamotrigine, levetiracetam, or topiramate. All are effective for generalized seizures.

Question 2. Valproic acid should be avoided because she is of childbearing potential. Valproate is highly teratogenic (neural tube defects, cognitive impairment). Additionally, she takes oral contraceptives, and while valproate doesn't induce enzymes, pregnancy prevention is critical if using any AED.

Question 3. Lamotrigine requires slow titration (over 6-8 weeks) to minimize the risk of Stevens-Johnson syndrome, a potentially fatal skin reaction. The risk is higher with rapid titration or when combined with valproate.

Question 4. Enzyme-inducing AEDs (phenytoin, carbamazepine, phenobarbital, topiramate, oxcarbazepine) accelerate oral contraceptive metabolism, reducing efficacy and risking unintended pregnancy. Levetiracetam and lamotrigine are better choices as they don't significantly affect contraceptive levels.

Case 11.2: Parkinson's Disease Progression

Question 1. Motor fluctuations develop because progressive dopamine neuron loss reduces the brain's ability to buffer dopamine levels. With fewer neurons to store dopamine, brain levels fluctuate more directly with plasma levodopa levels. Dyskinesias may result from pulsatile dopamine receptor stimulation causing receptor sensitization.

Question 2. To extend levodopa duration: Add a COMT inhibitor (entacapone) to block peripheral levodopa metabolism, or add an MAO-B inhibitor (rasagiline) to block brain dopamine breakdown. Both extend the "on" time.

Question 3. Dopamine agonists (pramipexole, ropinirole) can be added as adjunctive therapy. They have longer half-lives than levodopa, providing more stable dopamine receptor stimulation. They may also allow levodopa dose reduction.

Question 4. Anticholinergics cause significant cognitive side effects (confusion, memory impairment, hallucinations) in elderly patients, who are already at risk for dementia. They also cause peripheral anticholinergic effects (urinary retention, constipation) that are problematic in the elderly.

Diagram/Table Exercise Answers

DT 11.1: AED Mechanisms Diagram

1. Sodium channel blockers (Site 1): **Phenytoin, carbamazepine, lamotrigine, oxcarbazepine**
2. GABA-A enhancers (Site 2): **Benzodiazepines, phenobarbital, (valproate partially)**
3. T-type calcium channel blocker (Site 3): **Ethosuximide**

DT 11.2: Parkinson's Treatment Sites

1. Site 1 (dopamine precursor): **Levodopa (with carbidopa)**
2. Site 2 (MAO-B inhibition): **Selegiline, rasagiline**
3. Site 3 (COMT inhibition): **Entacapone, tolcapone**
4. Site 4 (D2 receptor agonism): **Pramipexole, ropinirole, rotigotine**

DT 11.3: AED Comparison Table

Drug	Mechanism	Seizure Types	Key Adverse Effects
Phenytoin	Na ⁺ channel blockade	Focal, GTC	Gingival hyperplasia, hirsutism, ataxia

Carbamazepine	Na ⁺ channel blockade	Focal, GTC (not absence)	Stevens-Johnson, hyponatremia
Valproic acid	Multiple	All types	Teratogenicity, weight gain, hepatotoxicity
Ethosuximide	T-type Ca ²⁺ channel	Absence only	GI upset, headache
Levetiracetam	SV2A binding	Broad-spectrum	Behavioral changes (irritability)

DT 11.4: Neurodegenerative Disease Treatment Table

Disease	Pathophysiology	Drug Classes	Limitations
Parkinson's	Nigrostriatal dopamine loss	Levodopa, dopamine agonists, MAO-B/COMT inhibitors	Motor fluctuations with time
Alzheimer's	Cholinergic loss, amyloid plaques	Cholinesterase inhibitors, memantine	Modest benefit, no disease modification
ALS	Motor neuron degeneration	Riluzole, edaravone	Minimal survival benefit
MS	Autoimmune demyelination	Interferons, S1P modulators, antibodies	Doesn't cure, only reduces relapses

Multiple-Choice Question Answers

Question 1. Answer: C

Ethosuximide is first-line for absence seizures; it blocks T-type calcium channels in thalamic neurons.

Question 2. Answer: B

Carbidopa inhibits peripheral DOPA decarboxylase, preventing levodopa conversion outside the brain and reducing GI/cardiovascular side effects.

Question 3. Answer: B

IV lorazepam is first-line for status epilepticus due to rapid onset and effectiveness.

Question 4. Answer: B

Donepezil inhibits acetylcholinesterase, increasing synaptic acetylcholine to partially compensate for cholinergic neuron loss.

Question 5. Answer: C

Phenytoin has saturable hepatic metabolism, causing nonlinear kinetics where small dose increases can dramatically raise serum levels.

Question 6. Answer: B

Sodium channel blockers (carbamazepine) can worsen absence seizures by affecting thalamic circuits differently than other seizure types.

Question 7. Answer: B

Lamotrigine requires slow titration; valproate inhibits its metabolism, further increasing SJS risk with the combination.

Question 8. Answer: A

Peripheral conversion of levodopa to dopamine causes nausea by stimulating the chemoreceptor trigger zone (outside BBB). Carbidopa reduces this.

Question 9. Answer: B

Entacapone inhibits peripheral COMT, reducing levodopa degradation and prolonging its effect.

Question 10. Answer: B

Memantine blocks NMDA receptors, reducing glutamate-mediated excitotoxicity in moderate-severe Alzheimer's.

Question 11. Answer: C

Levetiracetam is renally eliminated with minimal hepatic metabolism, resulting in few drug interactions.

Question 12. Answer: B

Valproate is highly teratogenic, causing neural tube defects (spina bifida) and cognitive impairment in offspring.

Question 13. Answer: B

Dopamine agonists stimulate mesolimbic reward pathways, causing impulse control disorders (gambling, hypersexuality, compulsive shopping).

Question 14. Answer: B

Phenytoin toxicity causes cerebellar signs: nystagmus, ataxia, diplopia, and slurred speech.

Question 15. Answer: C

Levetiracetam binds SV2A protein, has renal elimination, and minimal drug interactions—making it very useful clinically.

Question 16. Answer: C

Natalizumab (anti-integrin antibody) carries risk of PML, a serious opportunistic brain infection caused by JC virus.