Crown to Cortex

Pharmacology

Anesthetic Pharmacology

The Unhackables Medical

medical.theunhackables.com

How to read this topic

Anesthetic Pharmacology is a high-yield Pharmacology topic for NEET PG and INI-CET. The safest preparation approach is to organize it by mechanism, classification, prototype drugs, indications, adverse effects, contraindications, interactions, and emergency use. This PDF is designed as a compact final-revision note, not a textbook chapter.

Classify

Place the drug in the correct class before reading the clinical stem.

v

Mechanism

Convert receptor, enzyme, or pathway action into expected benefit.

v

Patient filter

Apply pregnancy, renal/hepatic disease, ECG, electrolyte, allergy, and interaction filters.

v

Exam answer

Choose the drug that fits the indication and avoids the hidden contraindication.

Classification map

Class / axis	High-yield details
Inhalational	sevoflurane, desflurane, isoflurane, nitrous oxide
IV induction	propofol, etomidate, ketamine, thiopentone
Local anesthetics	esters and amides
Neuromuscular blockers	depolarizing succinylcholine; nondepolarizing rocuronium, vecuronium, atracurium
Adjuncts	opioids, benzodiazepines, dexmedetomidine

Prototype drug map

Prototype	What to remember
Propofol	rapid induction; hypotension, respiratory depression, antiemetic
Etomidate	hemodynamic stability; adrenal suppression
Ketamine	dissociative anesthesia; bronchodilation, emergence reactions
Succinylcholine	rapid paralysis; hyperkalemia, malignant hyperthermia, apnea
Bupivacaine	long acting local; cardiotoxicity

Mechanism to clinical use

1. Inhalational

Mechanism anchor: sevoflurane, desflurane, isoflurane, nitrous oxide. In NEET PG style questions, this becomes important when the stem asks for drug choice, mechanism of toxicity, resistance, organ-specific effect, or a contraindication. Always connect the class to the expected physiological change rather than memorizing the name alone.

Clinical conversion: ask whether the desired effect is immediate symptom relief, disease modification, prophylaxis, reversal of toxicity, or long-term prevention. The same class can be correct or wrong depending on timing, route, patient risk, and monitoring feasibility.

2. IV induction

Mechanism anchor: propofol, etomidate, ketamine, thiopentone. In NEET PG style questions, this becomes important when the stem asks for drug choice, mechanism of toxicity, resistance, organ-specific effect, or a contraindication. Always connect the class to the expected physiological change rather than memorizing the name alone.

Clinical conversion: ask whether the desired effect is immediate symptom relief, disease modification, prophylaxis, reversal of toxicity, or long-term prevention. The same class can be correct or wrong depending on timing, route, patient risk, and monitoring feasibility.

3. Local anesthetics

Mechanism anchor: esters and amides. In NEET PG style questions, this becomes important when the stem asks for drug choice, mechanism of toxicity, resistance, organ-specific effect, or a contraindication. Always connect the class to the expected physiological change rather than memorizing the name alone.

Clinical conversion: ask whether the desired effect is immediate symptom relief, disease modification, prophylaxis, reversal of toxicity, or long-term prevention. The same class can be correct or wrong depending on timing, route, patient risk, and monitoring feasibility.

4. Neuromuscular blockers

Mechanism anchor: depolarizing succinylcholine; nondepolarizing rocuronium, vecuronium, atracurium. In NEET PG style questions, this becomes important when the stem asks for drug choice, mechanism of toxicity, resistance, organ-specific effect, or a contraindication. Always connect the class to the expected physiological change rather than memorizing the name alone.

Clinical conversion: ask whether the desired effect is immediate symptom relief, disease modification, prophylaxis, reversal of toxicity, or long-term prevention. The same class can be correct or wrong depending on timing, route, patient risk, and monitoring feasibility.

5. Adjuncts

Mechanism anchor: opioids, benzodiazepines, dexmedetomidine. In NEET PG style questions, this becomes important when the stem asks for drug choice, mechanism of toxicity, resistance, organ-specific effect, or a contraindication. Always connect the class to the expected physiological change rather than memorizing the name alone.

Clinical conversion: ask whether the desired effect is immediate symptom relief, disease modification, prophylaxis, reversal of toxicity, or long-term prevention. The same class can be correct or wrong depending on timing, route, patient risk, and monitoring feasibility.

Drug signatures

Drug / class	Mechanism cue	Use cue	Toxicity cue
Propofol	rapid induction	Know preferred indication	Know signature adverse effect
Etomidate	hemodynamic stability	Know preferred indication	Know signature adverse effect
Ketamine	dissociative anesthesia	Know preferred indication	Know signature adverse effect
Succinylcholine	rapid paralysis	Know preferred indication	Know signature adverse effect
Bupivacaine	long acting local	Know preferred indication	Know signature adverse effect

Clinical edges

- MAC: lower MAC means higher potency; nitrous oxide has high MAC and low potency
- Blood-gas solubility: lower solubility gives faster induction and recovery
- Malignant hyperthermia: volatile anesthetics and succinylcholine; treat with dantrolene
- LAST: local anesthetic systemic toxicity treated with lipid emulsion
- For Anesthetic Pharmacology, start every clinical question by identifying the syndrome, patient risk factors, organ function, pregnancy status, and interacting drugs.
- Prototype drugs are more important than long drug lists; know one clean example for each mechanism.
- Adverse-effect signatures often identify the drug even when the stem hides the class name.
- When two drugs look similar, compare onset, route, elimination, monitoring, and toxicity.

Adverse effects and contraindication logic

Propofol

Expected exam cue: rapid induction; hypotension, respiratory depression, antiemetic. When this drug or class appears in a clinical vignette, actively look for allergy, pregnancy risk, renal or hepatic impairment, ECG abnormality, electrolyte disturbance, bleeding risk, respiratory disease, CNS depression, or interacting medicines.

How to eliminate options: reject drugs that worsen the dominant clinical danger in the stem, even if their mechanism seems suitable. This is especially important in pharmacology questions where the wrong option is often a contraindicated first-line drug.

Etomidate

Expected exam cue: hemodynamic stability; adrenal suppression. When this drug or class appears in a clinical vignette, actively look for allergy, pregnancy risk, renal or hepatic impairment, ECG abnormality, electrolyte disturbance, bleeding risk, respiratory disease, CNS depression, or interacting medicines.

How to eliminate options: reject drugs that worsen the dominant clinical danger in the stem, even if their mechanism seems suitable. This is especially important in pharmacology questions where the wrong option is often a contraindicated first-line drug.

Ketamine

Expected exam cue: dissociative anesthesia; bronchodilation, emergence reactions. When this drug or class appears in a clinical vignette, actively look for allergy, pregnancy risk, renal or hepatic impairment, ECG abnormality, electrolyte disturbance, bleeding risk, respiratory disease, CNS depression, or interacting medicines.

How to eliminate options: reject drugs that worsen the dominant clinical danger in the stem, even if their mechanism seems suitable. This is especially important in pharmacology questions where the wrong option is often a contraindicated first-line drug.

Succinylcholine

Expected exam cue: rapid paralysis; hyperkalemia, malignant hyperthermia, apnea. When this drug or class appears in a clinical vignette, actively look for allergy, pregnancy risk, renal or hepatic impairment, ECG abnormality, electrolyte disturbance, bleeding risk, respiratory disease, CNS depression, or interacting medicines.

How to eliminate options: reject drugs that worsen the dominant clinical danger in the stem, even if their mechanism seems suitable. This is especially important in pharmacology questions where the wrong option is often a contraindicated first-line drug.

Bupivacaine

Expected exam cue: long acting local; cardiotoxicity. When this drug or class appears in a clinical vignette, actively look for allergy, pregnancy risk, renal or hepatic impairment, ECG abnormality, electrolyte disturbance, bleeding risk, respiratory disease, CNS depression, or interacting medicines.

How to eliminate options: reject drugs that worsen the dominant clinical danger in the stem, even if their mechanism seems suitable. This is especially important in pharmacology questions where the wrong option is often a contraindicated first-line drug.

Exam traps

- Do not choose a drug only because it belongs to the right class; contraindications can reverse the answer.
- Do not ignore renal or hepatic impairment in dosing questions.
- Drug interactions are commonly tested through enzyme induction, enzyme inhibition, additive toxicity, or pharmacodynamic opposition.
- Emergency therapy depends on speed and route, not only mechanism.
- In Anesthetic Pharmacology, do not memorize a class without its route, onset, elimination, and monitoring.
- Toxicity questions often hide the drug name and reveal the answer through one adverse-effect signature.
- Contraindications are tested more often than rare mechanisms.
- A drug can be first-line in one patient and dangerous in another.

Last-day revision grid

Question	Answer to recall quickly
Best prototype?	Propofol, Etomidate, Ketamine, Succinylcholine
Most tested danger?	toxicity, contraindication, interaction, and monitoring
Emergency angle?	route, onset, antidote, supportive care
Do-not-miss filter?	pregnancy, renal/hepatic failure, ECG/electrolytes, bleeding or respiratory risk

High-yield definitions

Term	Definition / exam meaning
Inhalational	sevoflurane, desflurane, isoflurane, nitrous oxide
IV induction	propofol, etomidate, ketamine, thiopentone
Local anesthetics	esters and amides
Neuromuscular blockers	depolarizing succinylcholine; nondepolarizing rocuronium, vecuronium, atracurium
Adjuncts	opioids, benzodiazepines, dexmedetomidine
Propofol	rapid induction; hypotension, respiratory depression, antiemetic
Etomidate	hemodynamic stability; adrenal suppression
Ketamine	dissociative anesthesia; bronchodilation, emergence reactions
Succinylcholine	rapid paralysis; hyperkalemia, malignant hyperthermia, apnea
Bupivacaine	long acting local; cardiotoxicity
Target	Ion channels, transporters, GPCRs, and enzymes dominate CNS pharmacology.

How this helps in Anesthetic Pharmacology: this page is meant to convert memorized pharmacology into option elimination. Read the left column first, then force yourself to say the mechanism, clinical use, toxicity, and reason another option is wrong.

Drug-by-drug comparison

Comparison	How to separate them in an exam stem	Most useful discriminator
Propofol vs Etomidate	Propofol is recalled by: rapid induction; hypotension, respiratory depression, antiemetic. Etomidate is recalled by: hemodynamic stability; adrenal suppression.	Indication, toxicity pattern, route/onset, or contraindication hidden in the stem.
Ketamine vs Succinylcholine	Ketamine is recalled by: dissociative anesthesia; bronchodilation, emergence reactions. Succinylcholine is recalled by: rapid paralysis; hyperkalemia, malignant hyperthermia, apnea.	Indication, toxicity pattern, route/onset, or contraindication hidden in the stem.

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Toxicity signatures

Drug / class	Toxicity pattern to actively search for	Immediate exam response
Propofol	Link the prototype clue to organ toxicity, laboratory change, ECG change, bleeding, CNS depression, allergy, or pregnancy risk. Cue: rapid induction; hypotension, respiratory depression, antiemetic	Stop/avoid the drug if the stem contains the danger sign; choose antidote or safer alternative when asked.
Etomidate	Link the prototype clue to organ toxicity, laboratory change, ECG change, bleeding, CNS depression, allergy, or pregnancy risk. Cue: hemodynamic stability; adrenal suppression	Stop/avoid the drug if the stem contains the danger sign; choose antidote or safer alternative when asked.
Ketamine	Link the prototype clue to organ toxicity, laboratory change, ECG change, bleeding, CNS depression, allergy, or pregnancy risk. Cue: dissociative anesthesia; bronchodilation, emergence reactions	Stop/avoid the drug if the stem contains the danger sign; choose antidote or safer alternative when asked.
Succinylcholine	Link the prototype clue to organ toxicity, laboratory change, ECG change, bleeding, CNS depression, allergy, or pregnancy risk. Cue: rapid paralysis; hyperkalemia, malignant hyperthermia, apnea	Stop/avoid the drug if the stem contains the danger sign; choose antidote or safer alternative when asked.
Bupivacaine	Link the prototype clue to organ toxicity, laboratory change, ECG change, bleeding, CNS depression, allergy, or pregnancy risk. Cue: long acting local; cardiotoxicity	Stop/avoid the drug if the stem contains the danger sign; choose antidote or safer alternative when asked.
Anesthetic Pharmacology	Any severe allergy, organ failure, pregnancy risk, or dangerous interaction can override first-line status.	Do not pick a drug only because it is famous.

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Contraindication filters

Clinical filter	What it changes	Exam habit
Pregnancy/lactation	Avoid teratogenic, fetal-toxic, or neonatal-toxic drugs; prefer established safer options.	Always scan age/sex/history lines.
Renal impairment	Accumulation increases toxicity for renally cleared drugs; dose interval may need extension.	Look for creatinine, oliguria, CKD, elderly patient.
Hepatic disease	Reduced metabolism, low albumin, and bleeding risk can change drug choice.	Check jaundice, cirrhosis, INR, albumin.
ECG/electrolytes	QT prolongation, heart block, hypokalemia, and hyperkalemia decide many answers.	Never ignore ECG and potassium.
Respiratory disease	Bronchospasm or respiratory depression risk can make a familiar drug unsafe.	Asthma/COPD/sleep apnea are not decorative details.
Bleeding risk	Antiplatelets, anticoagulants, thrombolytics, NSAIDs, and marrow-toxic drugs need caution.	Check ulcer, surgery, stroke, platelets, INR.
Propofol	rapid induction; hypotension, respiratory depression, antiemetic	Ask: where is this drug dangerous?
Etomidate	hemodynamic stability; adrenal suppression	Ask: where is this drug dangerous?
Ketamine	dissociative anesthesia; bronchodilation, emergence reactions	Ask: where is this drug dangerous?

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Drug interaction map

Interaction type	Mechanism	Common exam expression
CYP induction	Increases metabolism of substrate drugs and can cause treatment failure.	Rifampicin/carbamazepine/phenytoin reducing OCP, warfarin, antiretroviral, or steroid effect.
CYP inhibition	Raises substrate levels and toxicity.	Macrolide/azole/ritonavir/cimetidine/grapefruit toxicity stem.
Additive toxicity	Two drugs injure the same organ or pathway.	QT plus QT, bleeding plus bleeding, nephrotoxic plus nephrotoxic, CNS depressant plus CNS depressant.
Pharmacodynamic opposition	One drug blocks the desired effect of another.	NSAID reducing antihypertensive effect; beta blocker opposing beta agonist.
Propofol	rapid induction; hypotension, respiratory depression, antiemetic	Check whether the vignette adds another drug that amplifies toxicity or reduces benefit.
Etomidate	hemodynamic stability; adrenal suppression	Check whether the vignette adds another drug that amplifies toxicity or reduces benefit.
Ketamine	dissociative anesthesia; bronchodilation, emergence reactions	Check whether the vignette adds another drug that amplifies toxicity or reduces benefit.
Succinylcholine	rapid paralysis; hyperkalemia, malignant hyperthermia, apnea	Check whether the vignette adds another drug that amplifies toxicity or reduces benefit.

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Monitoring and dose adjustment

Monitoring target	Why it matters	What to remember
Clinical endpoint	Symptom relief or prevention outcome confirms benefit.	Pain, BP, seizure control, infection response, glucose, dyspnea, psychosis, bleeding.
Laboratory endpoint	Detects efficacy and silent toxicity.	Renal function, liver enzymes, CBC, electrolytes, coagulation, glucose, drug levels.
ECG	Many drugs alter conduction, QT, or rhythm.	QT prolongation, AV block, QRS widening, torsades risk.
Therapeutic drug monitoring	Needed when therapeutic window is narrow.	Lithium, digoxin, phenytoin, valproate, aminoglycosides, vancomycin, tacrolimus.
Propofol	Monitoring depends on the toxicity implied by its mechanism and elimination.	rapid induction; hypotension, respiratory depression, antiemetic
Etomidate	Monitoring depends on the toxicity implied by its mechanism and elimination.	hemodynamic stability; adrenal suppression
Ketamine	Monitoring depends on the toxicity implied by its mechanism and elimination.	dissociative anesthesia; bronchodilation, emergence reactions

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Emergency decision table

Emergency scenario	First pharmacology decision	Common mistake
Shock/anaphylaxis/severe acute state	Choose route and onset before elegance of mechanism.	Choosing an oral chronic drug for an emergency.
Poisoning/toxicity	Stabilize airway, breathing, circulation, then antidote if indicated.	Giving antidote while ignoring supportive care.
Severe infection or organ-threatening disease	Start rational empirical therapy promptly, then narrow when data arrives.	Waiting for perfect information in an unstable patient.
Withdrawal or rebound	Recognize dependence physiology and taper/replace appropriately.	Abruptly stopping clonidine, beta blockers, steroids, opioids, alcohol, or benzodiazepines.
Anesthetic Pharmacology: Propofol	rapid induction; hypotension, respiratory depression, antiemetic	Wrong route, delayed onset, or ignored contraindication.
Anesthetic Pharmacology: Etomidate	hemodynamic stability; adrenal suppression	Wrong route, delayed onset, or ignored contraindication.
Anesthetic Pharmacology: Ketamine	dissociative anesthesia; bronchodilation, emergence reactions	Wrong route, delayed onset, or ignored contraindication.
Anesthetic Pharmacology: Succinylcholine	rapid paralysis; hyperkalemia, malignant hyperthermia, apnea	Wrong route, delayed onset, or ignored contraindication.

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INI-CET stem decoding

Stem clue	What it is trying to test	Answer strategy
Age, pregnancy, renal/liver disease	Safety filter rather than diagnosis.	Eliminate unsafe drugs first.
New symptom after drug start	Adverse-effect signature.	Name the drug from toxicity.
Drug added recently	Interaction question.	Check CYP, QT, bleeding, CNS depression, nephrotoxicity.
Emergency wording	Route/onset question.	Prefer fast, titratable, evidence-based acute therapy.
Chronic prevention wording	Outcome benefit question.	Prefer disease-modifying therapy over only symptomatic relief.
Inhalational	sevoflurane, desflurane, isoflurane, nitrous oxide	Place this under Anesthetic Pharmacology, then compare with nearby alternatives.
IV induction	propofol, etomidate, ketamine, thiopentone	Place this under Anesthetic Pharmacology, then compare with nearby alternatives.
Local anesthetics	esters and amides	Place this under Anesthetic Pharmacology, then compare with nearby alternatives.
Neuromuscular blockers	depolarizing succinylcholine; nondepolarizing rocuronium, vecuronium, atracurium	Place this under Anesthetic Pharmacology, then compare with nearby alternatives.

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Rapid pathway

Read the stem

Disease, severity, age, pregnancy, organ function, emergency status.

v

Name the class

Mechanism and prototype before option elimination.

v

Apply exclusions

Contraindications, interactions, and toxicity signatures.

v

Pick final answer

Most specific safe drug for that exact stem.