NCLEX-RN · NGN-ALIGNED · 2026 TEST PLAN

Antithyroid *Medications*

Thionamides · Iodides · Radioactive Iodine — pharmacologic suppression of thyroid hormone synthesis & release.

System Endocrine | **Classes** Thionamides · Iodides · Radiopharmaceutical | **Prototypes** Methimazole (Tapazole) · PTU · SSKI/Lugol's · I-131 | **Priority Risk** Agranulocytosis

1 Drug Overview

WHY WE GIVE IT

- **Hyperthyroidism** — Graves' disease (#1 cause), toxic multinodular goiter
- **Thyroid storm** (thyrotoxic crisis) — PTU is preferred thionamide
- **Pre-thyroidectomy prep** — iodides shrink & decrease gland vascularity
- **Bridge therapy** before radioactive iodine (I-131) ablation
- **Radiation emergencies** — potassium iodide blocks uptake of radioactive iodine

2 Mechanism of Action

HOW IT CHANGES PHYSIOLOGY

Methimazole / PTU → inhibit **thyroid peroxidase (TPO)** → block iodination of tyrosine → ↓ synthesis of T_3 & T_4

PTU only → also blocks **peripheral $T_4 \rightarrow T_3$ conversion** → faster symptom relief (why used in storm)

Potassium Iodide → **Wolff-Chaikoff effect** → ↓ hormone release + ↓ gland vascularity (short-term only)

I-131 → taken up by thyroid → **β-radiation destroys tissue** → permanent ablation

3 Therapeutic Effects

SIGNS IT'S WORKING

- ↓ heart rate, ↓ blood pressure
- Weight **stabilization or gain** (desired!)
- ↓ anxiety, tremors, palpitations
- ↓ heat intolerance & diaphoresis
- Normalized TSH & free T_4 (takes **4–8 weeks**)
- Smaller, firmer, less vascular gland (iodides pre-op)

4 Side Effects & Adverse Reactions

COMMON VS. LIFE-THREATENING

COMMON

- Rash, pruritus, urticaria
- GI upset, nausea, metallic taste
- Arthralgia, headache, mild alopecia
- **Iodism** (KI): brassy taste, burning mouth, swollen salivary glands, sore gums

SERIOUS / LIFE-THREATENING

- **AGRANULOCYTOSIS** (both thionamides) — **sore throat, fever, chills, malaise** = red flag. WBC < 1500 → hold drug.
- **HEPATOTOXICITY** — **PTU BLACK BOX WARNING**. Jaundice, dark urine, RUQ pain, ↑ AST/ALT
- **APLASIA CUTIS & embryopathy** — methimazole in 1st trimester (teratogenic)
- ANCA-positive vasculitis (PTU)
- **Iatrogenic hypothyroidism** — over-treatment → cold intolerance, fatigue, weight gain, bradycardia
- Thyroid storm if drug stopped abruptly

5 Priority Nursing Considerations

ASSESS · MONITOR · HOLD · NOTIFY

ASSESS & MONITOR

- **Vitals:** HR, BP, temp (fever = infection red flag)
- **Labs:** TSH, free T_4, T_3, **CBC with differential, LFTs**
- Weight trends, signs of hypo- or hyper-thyroid overshoot

6 Labs & Diagnostics

VALUES TO KNOW COLD

Lab	Normal	What it means
TSH	0.4–4.0 mIU/L	↓ in hyperthyroid → normalizes as drug works (q 4–6 wks)

- Skin (rash), sclera (jaundice), throat (infection)

HOLD THE DRUG IF…

- **Sore throat, fever, flu-like symptoms** → suspect agranulocytosis
- Jaundice, dark urine, RUQ pain, AST/ALT > 3× normal (esp. PTU)
- WBC < 1500/mm³ or ANC < 1000
- Unusual bleeding or bruising

CONTRAINDICATIONS

- **Methimazole:** 1st trimester pregnancy (→ switch to PTU)
- **PTU:** 2nd & 3rd trimester (→ switch to methimazole), active liver disease
- **I-131:** pregnancy & breastfeeding (absolute)

DRUG INTERACTIONS

- **Warfarin** — anticoagulant effect ↑ (↑ bleeding risk)
- **Digoxin** — levels may rise as patient becomes euthyroid
- **Beta-blockers** — often co-prescribed (symptom control)
- Iodine-rich foods/supplements — reduce efficacy

Lab	Normal	What it means
Free T_4	0.8–1.8 ng/dL	↑ in hyperthyroid; tracks response faster than TSH
Total T_3	80–200 ng/dL	Especially ↑ in T_3 toxicosis & storm
WBC / ANC	WBC 4.5–11K · ANC >1500	**<1500 WBC = HOLD** (agranulocytosis)
AST / ALT	< 40 U/L	**>3× baseline = HOLD PTU**
TSI / TRAb	Negative	Positive = Graves' disease autoantibody

7 Administration & Safety

ROUTE · TIMING · HIGH-ALERT PRECAUTIONS

- **Methimazole:** PO, **once daily** (long half-life)
- **PTU:** PO, **divided q 8 hr** (short half-life)
- **Iodine solutions (SSKI/Lugol's):** **dilute in juice or milk, drink through a STRAW** — stains teeth, caustic

8 Patient Education

WHAT THEY MUST KNOW

- **Take at the same time daily** — consistent dosing is critical
- **Do NOT stop abruptly** — risk of thyroid storm rebound
- Effects take **4–8 weeks** — don't expect overnight relief
- **Avoid iodine-rich foods**: kelp, seaweed, iodized salt supplements, kelp tablets

- **Timing rule:** give iodine **≥ 1 hour AFTER** PTU/methimazole in storm (prevents gland using iodine as substrate)
- **I-131 radiation precautions:**
  - Limit close contact (> 6 ft) for **3–7 days**
  - Avoid pregnant women & children for 1 week
  - **Flush toilet 2× with lid down**, wash hands well
  - Separate utensils, linens, laundry
  - Increase fluids to flush radioactive iodine
- **High-alert:** verify pregnancy status before I-131 (absolute contraindication)

- **Report IMMEDIATELY:** sore throat, fever, chills, mouth sores, unusual bleeding/bruising, jaundice, dark urine
- **Contraception** — methimazole is teratogenic; notify provider if pregnancy planned/suspected
- Regular TSH follow-up (every 4–6 weeks until stable)
- **I-131:** sleep alone 3–7 days, avoid prolonged close contact, expect lifelong hypothyroidism (levothyroxine replacement)

9 NCLEX Test Traps ⚠

WHERE STUDENTS LOSE POINTS

Trap #1 · Pregnancy switch

PTU in 1st trimester, **methimazole in 2nd/3rd**. Students reverse this. Mnemonic: *"PTU = Pregnancy, Trimester ONE."*

Trap #2 · Sore throat ≠ cold

A complaint of "sore throat & fever" on antithyroids is **agranulocytosis until proven otherwise**. Priority: HOLD drug, draw CBC, notify provider — not Tylenol & rest.

Trap #3 · Iodine timing

In thyroid storm, iodine is given **AFTER** thionamides (≥1 hr). Giving iodine first supplies substrate for more hormone synthesis.

Trap #4 · Storm priority order

First actions in storm: **cooling + beta-blocker (propranolol)** for HR/BP, THEN PTU, THEN iodine, THEN steroids. PTU is not the first intervention.

Trap #5 · Weight gain is GOOD

Weight gain on antithyroids is a **therapeutic response**, not a side effect. Don't pick "call the provider about weight gain."

Trap #6 · Aspirin in storm = WRONG

Never give aspirin for fever in thyroid storm — displaces T_4 from TBG, worsens thyrotoxicosis. Use **acetaminophen**.

Trap #7 · Levothyroxine confusion

Trap #8 · I-131 & pregnancy

Antithyroids treat **hyper**thyroidism. Levothyroxine treats **hypo**thyroidism. Don't mix them up on med reconciliation items.

Always verify **negative pregnancy test** before I-131. Also avoid breastfeeding. This is an absolute, not relative, contraindication.

10 Memory Boosters

MNEMONICS & PATTERNS

"PTU"

Pregnancy (1st trimester)
Thyroid storm
Useless $T_4 \rightarrow T_3$ (blocks conversion)

"SST" — Agranulocytosis

Sore throat
Shivering (chills)
Temperature (fever)
→ HOLD drug, draw CBC

"BAD CAT" — Storm Tx

Beta-blocker (propranolol)
Antithyroid (PTU)
Dexamethasone (steroids)
Cooling (acetaminophen, NOT ASA)
After PTU: iodine (1 hr)
Treat underlying cause

"MAZO-MAMA-NO!"

Methi**MAZO**le + pregnant **MAMA** 1st trimester = **NO** (aplasia cutis). Switch to PTU.

"STRAW & JUICE"

SSKI / Lugol's iodine solution — mix in **juice or milk**, drink through a **straw**. Stains teeth, caustic to mucosa.

"THINK opposite"

Antithyroid effects mirror hyperthyroid symptoms reversing:
↓ HR, ↓ anxiety, ↑ weight, ↓ heat intolerance = **drug working**.

★ Most Tested Drugs in This Class

KEY DIFFERENCES AT A GLANCE

Drug	MOA Twist	First-line when…	Black Box / Top Risk	Key Teaching
Methimazole (Tapazole)	Blocks TPO	First-line for most adult Graves'; once-daily dosing	Agranulocytosis; **teratogenic (aplasia cutis)** 1st trimester	Report sore throat/fever; use contraception; TSH q 4–6 wks

Drug	MOA Twist	First-line when…	Black Box / Top Risk	Key Teaching
PTU (Propylthiouracil)	Blocks TPO + **peripheral $T_4 \rightarrow T_3$**	1st trimester pregnancy; thyroid storm	**BLACK BOX: severe hepatotoxicity;** agranulocytosis; ANCA vasculitis	q 8 hr dosing; watch LFTs; jaundice/dark urine = STOP
Potassium Iodide (SSKI, Lugol's)	Wolff-Chaikoff: ↓ release & vascularity	Pre-thyroidectomy (7–14 d); adjunct in storm; radiation exposure	Iodism; hypersensitivity; short-term use only (gland "escapes" in ~2 wks)	Dilute in juice, **straw**, give **1 hr AFTER** thionamide
Radioactive Iodine (I-131)	β-radiation ablates thyroid tissue	Definitive Tx for Graves' / toxic nodular goiter	**Absolute CI: pregnancy & breastfeeding;** permanent hypothyroidism expected	Radiation precautions 3–7 d; flush 2×, separate utensils, avoid kids/pregnant women
Propranolol (adjunct, not antithyroid)	β-blockade; also ↓ $T_4 \rightarrow T_3$ at high doses	Symptom control (tachycardia, tremor) & thyroid storm	Bronchospasm in asthma; bradycardia; masks hypoglycemia	Given while waiting for thionamide to work

HIGH-YIELD: If the stem says *"pregnant patient, 1st trimester, newly diagnosed Graves'"* → answer is **PTU**. If the stem says *"thyroid storm"* → **PTU** (blocks $T_4 \rightarrow T_3$). Otherwise → **methimazole** (safer LFT profile, once daily).

FINAL SECTION · NCJMM-ALIGNED

🧠 Clinical Judgment Snapshot

If you remember nothing else, remember this. Use this framework for NGN case-study items where you must recognize cues, analyze, prioritize, and act.

#1 PRIORITY RISK

Agranulocytosis **— life-threatening neutropenia leading to overwhelming sepsis. Also:** ***hepatotoxicity with PTU*** **(black box).**

WHAT HARMS THE PATIENT FIRST

Infection **from neutropenia — a seemingly minor sore throat can progress to** ***septic shock*** **within hours in an agranulocytic patient.**

FIRST NURSING ACTION

Patient reports ***sore throat + fever*** **→** ***HOLD the drug***, **draw** ***CBC with differential & LFTs***, **notify provider. Initiate**

neutropenic precautions if ANC low.

THYROID STORM — PRIORITY ACTION SEQUENCE:

1 **Cool** (cooling blanket, acetaminophen — *NOT aspirin*) · 2 **Beta-blocker** (propranolol IV) · 3 **PTU** (loading dose) · 4 **Iodine ≥ 1 hr later** (SSKI / Lugol's) · 5 **Steroids** (hydrocortisone / dexamethasone) · 6 Treat the **trigger** (infection, surgery, DKA, trauma)