PIPADOR REVISION

MRCOG Part 1 Revision Notes

The Reproductive Cycle

PHYSIOLOGY • LECTURE 144

VISUAL EXAMINATION REVISION NOTES

2026 Edition

144

MRCOG PART 1 REVISION NOTES | PHYSIOLOGY

The Reproductive Cycle

The HPO axis, ovarian and endometrial cycles, menstruation, assessment of ovulation, puberty and menopause

24–38 days	≈ 14 days	36 h	> 80 mL
Normal cycle length (FIGO)	Luteal phase — relatively fixed	LH surge onset → ovulation	Objective heavy menstrual loss

■ KEY FACTS: Learning objectives

- Describe the hypothalamic–pituitary–ovarian axis, GnRH pulsatility and feedback.
- Describe hormonal, ovarian and endometrial events of each phase of the cycle.
- Explain menstruation, the luteal–follicular transition and the window of implantation.
- Describe cervical mucus and temperature changes and their clinical use; outline puberty and menopause.

144.1 The hypothalamic–pituitary–ovarian axis

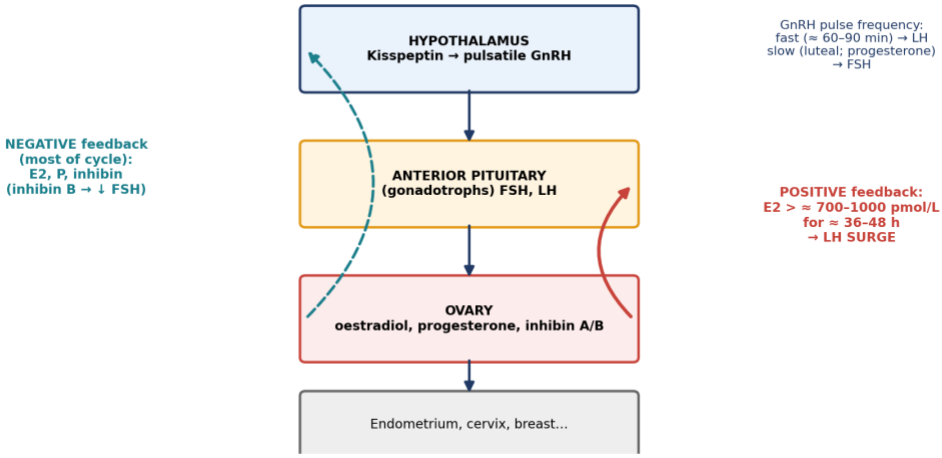


Figure 144.1 — HPO axis with negative and positive feedback

- **GnRH** (decapeptide) is released in **pulses** into the hypophyseal portal system — driven by **kisspeptin/neurokinin B/dynorphin (KNDy) neurons**. **Continuous GnRH (agonist depot) downregulates** receptors → hypogonadism (used in endometriosis, prostate cancer, IVF).
- Fast pulses (≈ every 60–90 min, follicular) favour **LH**; slow pulses (≈ every 3–4 h, luteal — progesterone) favour **FSH**.
- **Positive feedback**: oestradiol above ≈ 700–1000 pmol/L for ≈ 36–48 h triggers the **LH surge** (requires progesterone priming in the pituitary just before).

144.2 The ovarian and endometrial cycle

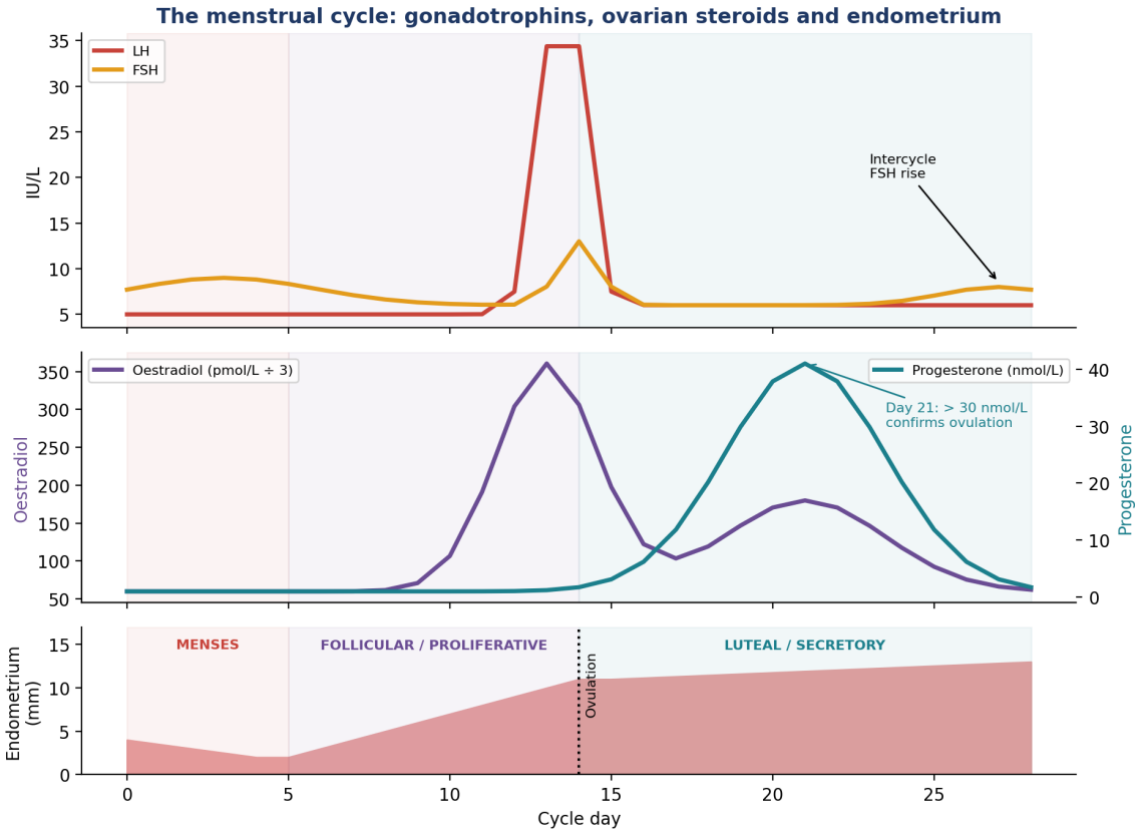


Figure 144.2 — Hormones, endometrial thickness and phases across a 28-day cycle

Phase (days)	Ovary / hormones	Endometrium	Cervix / other
Menstrual (1–5)	Low E2/P; FSH rising → recruitment	Functional layer shed; repair from basalis	—
Follicular / proliferative (≈ 6–13)	Dominant follicle selected; E2 rises, inhibin B; FSH falls	Proliferation (oestrogen): straight tubular glands, mitoses; 4 → 10 mm	Thin, clear, stretchy mucus (spinnbarkeit), ferning — sperm-permeable
Ovulation (≈ 14)	LH surge → ovulation ≈ 36 h later; brief E2 dip	—	Mittelschmerz; maximal mucus
Luteal / secretory (15–28)	Corpus luteum: progesterone (peak ≈ day 21), E2, inhibin A	Secretory: subnuclear vacuoles (day 17), luminal secretion, stromal oedema, spiral arteries coil, predecidualisation (day 23+)	Thick mucus (hostile); BBT ↑ 0.3–0.5 °C (progesterone)
Luteolysis (≈ 24–28)	No hCG → CL regresses → ↓ E2, P, inhibin A → FSH rises	Progesterone withdrawal → menstruation	Premenstrual symptoms

144.3 Menstruation

Corpus luteum regresses (no hCG) ▶ **Progesterone withdrawal** ▶ ↑ **$PGF_2\alpha$**, endothelin → spiral arteriole **vasoconstriction**; ↑ MMPs, inflammatory cells ▶ Ischaemia and breakdown of **functionalis**; shedding (≈ 30–40 mL; 3–7 days) ▶ Haemostasis: platelet plugs, vasoconstriction; **re-epithelialisation** from basalis (oestrogen)

■ CLINICAL CORRELATION

- **NSAIDs** (↓ PGs) reduce menstrual loss ≈ 25–30% and dysmenorrhoea; **tranexamic acid** (antifibrinolytic) ≈ 50%; **LNG-IUS** most effective medical treatment for HMB (NICE NG88).
- **Asherman syndrome**: damage to the basalis (curettage, infection) → intrauterine adhesions, amenorrhoea.

144.4 Window of implantation

The endometrium is receptive for ≈ 4 days (≈ **days 20–24**, LH + 7–10): **pinopodes**, integrin **αvβ3**, **LIF**, HOXA10/11, glycodelin. **Decidualisation** of stroma (progesterone; prolactin and IGFBP-1 secretion) and uterine NK cells prepare for invasion (Lecture 145). Asynchrony of embryo and endometrium is a cause of implantation failure.

144.5 Assessing ovulation

Test	Principle	Notes
Mid-luteal serum progesterone	> 30 nmol/L ≈ ovulation (some use > 16–28)	Take 7 days before the expected period (day 21 of a 28-day cycle; day 28 of a 35-day cycle)
Urinary LH kits	Detect surge → ovulation within 24–36 h	Timing intercourse; false positives in PCOS (↑ LH), POI
BBT charting	Progesterone thermogenic: biphasic chart	Retrospective; not recommended (NICE)
Follicle tracking (TVS)	Follicle growth to 18–25 mm, collapse	Ovulation induction monitoring
Endometrial biopsy	Secretory change	Rarely used now

144.6 Puberty and menopause

	Puberty	Menopause
Trigger	Reactivation of pulsatile GnRH (kisspeptin; leptin/adequate body fat) — first at night	Exhaustion of follicles (≈ 1000 remain); mean age 51 in UK
Sequence	Thelarche (≈ 10–11 yr) → pubarche (adrenarche — DHEAS) → growth spurt → menarche (≈ 12–13 yr, Tanner 4); early cycles often anovulatory	Perimenopause: ↓ inhibin B → ↑ FSH, irregular cycles; ↓ AMH (undetectable)
Hormones	↑ LH, FSH, oestradiol	FSH ↑↑, LH ↑, ↓ oestradiol (oestrone from adipose aromatisation becomes main oestrogen)
Abnormal	Precocious: < 8 yr (girls); delayed: no breast development by 13 or no menarche by 15	POI < 40 yr; early menopause 40–45 yr

Level	Causes of amenorrhoea	Hormone pattern
Hypothalamic	Weight loss, exercise, stress (functional hypothalamic amenorrhoea), Kallmann	↓ FSH/LH, ↓ E2
Pituitary	Hyperprolactinaemia (prolactinoma, dopamine antagonists), Sheehan's, tumours	↓ FSH/LH (↑ prolactin)
Ovarian	PCOS (commonest), POI, Turner	PCOS: normal FSH, ↑ LH/androgens; POI: ↑↑ FSH
Outflow tract	Asherman's, cervical stenosis; primary: imperforate hymen, transverse septum, MRKH	Normal hormones
Other	Pregnancy (always exclude), thyroid disease, CAH	—

144.7 Must-know summary

■ EXAM TIP

- Pulsatile GnRH is essential; continuous GnRH **suppresses** gonadotrophins.
- **Luteal phase ≈ 14 days** — cycle-length variation is in the follicular phase.
- LH surge needs sustained E2 (positive feedback); ovulation ≈ **36 h** after surge onset.
- Oestrogen: proliferative endometrium + thin stretchy mucus; progesterone: secretory endometrium + thick mucus + ↑ BBT.
- Menstruation = **progesterone withdrawal → $PGF_2\alpha$ vasoconstriction → shedding of functionalis**.

■ MNEMONIC / MEMORY AID

'Day 21 progesterone' = 7 days before the period (luteal phase is fixed at ≈ 14 days). **Fast pulses → LH ('Fast Lane'); Slow pulses → FSH**.