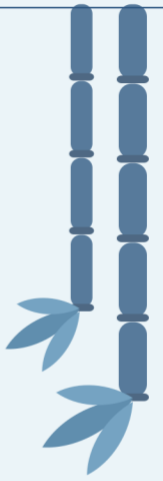




PIPADOR REVISION

MRCOG Part 1 Revision Notes

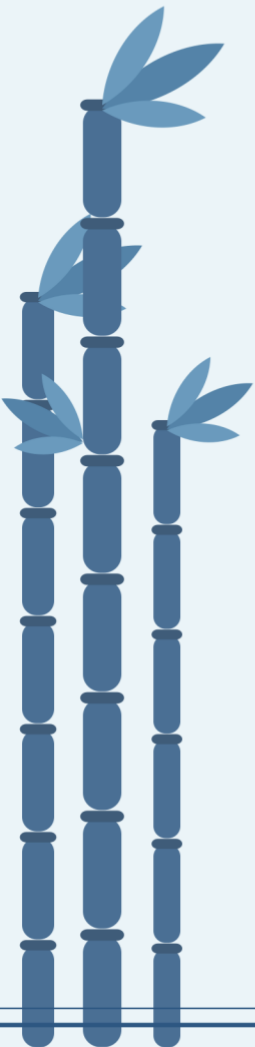


Anatomical Adaptations to Pregnancy

ANATOMY • LECTURE 33

VISUAL EXAMINATION REVISION NOTES

2026 Edition



MRCOG Part 1 Revision Notes

Lecture 33: Anatomical Adaptations to Pregnancy

Anatomy • Visual revision edition

COLOUR CODE USED THROUGHOUT THESE NOTES

GENITAL TRACT

RESPIRATORY

RENAL / GI

ENDOCRINE / HAEM

MUSCULOSKELETAL / SKIN

LEARNING OBJECTIVES — tick off as you go

- ☐ Describe the changes in the uterus, cervix, vagina, ovaries and breasts.
- ☐ Explain the formation of the lower uterine segment.
- ☐ Summarise cardiovascular, respiratory and renal adaptations and their direction of change.
- ☐ Describe gastrointestinal, endocrine, haematological, musculoskeletal and skin changes.
- ☐ Use these to tell normal from abnormal in pregnancy.

1 The Uterus

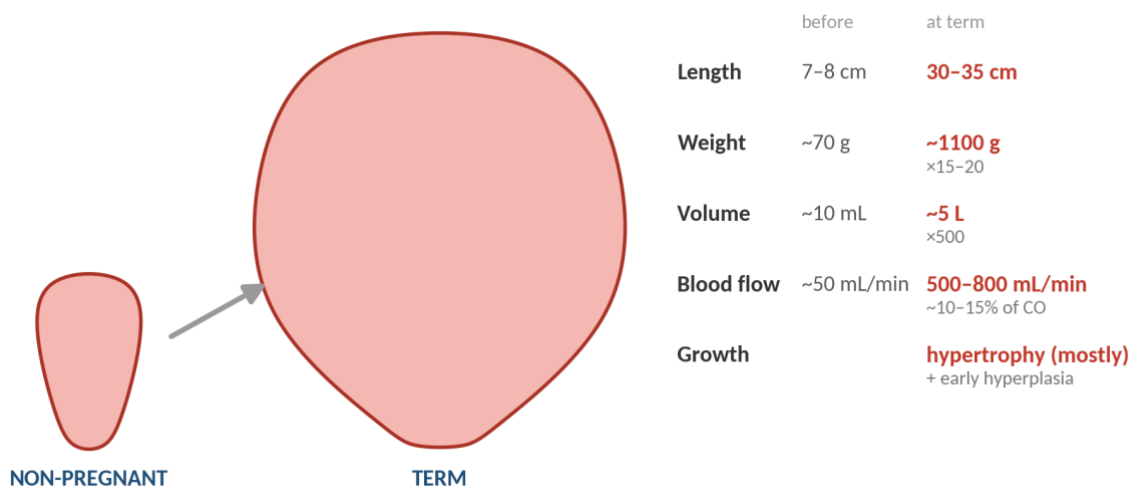
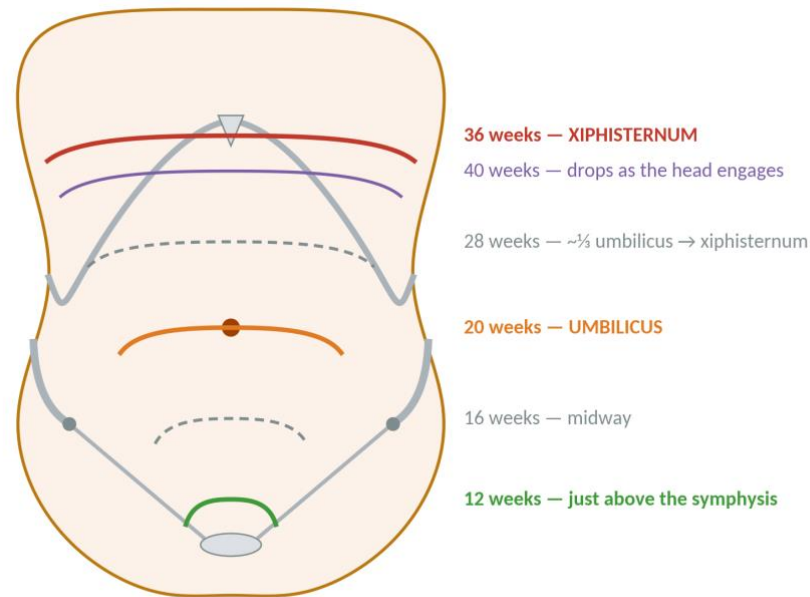


Figure 1. Growth of the uterus.

Fundal height through pregnancy



SFH (cm) $\approx$ gestation (weeks) $\pm$ 2 cm — NICE: measure from 24 weeks.

Figure 2. Fundal height (from Lecture 22).

- Abdominal from **~ 12 weeks**; umbilicus **~ 20 weeks**; xiphisternum **~ 36 weeks**; drops slightly as the head engages (**lightening**). SFH (cm) $\approx$ gestation (weeks) $\pm$ 2 cm — **NICE: measure from 24 weeks**.
- Usually **dextro-rotated** — the rectosigmoid occupies the left side of the pelvis.
- **Spiral arteries** are remodelled by extravillous trophoblast in the first half of pregnancy — they lose their muscular media and become low-resistance channels. **Failed remodelling** underlies **pre-eclampsia** and **fetal growth restriction**.

Upper and lower uterine segments at term (schematic)

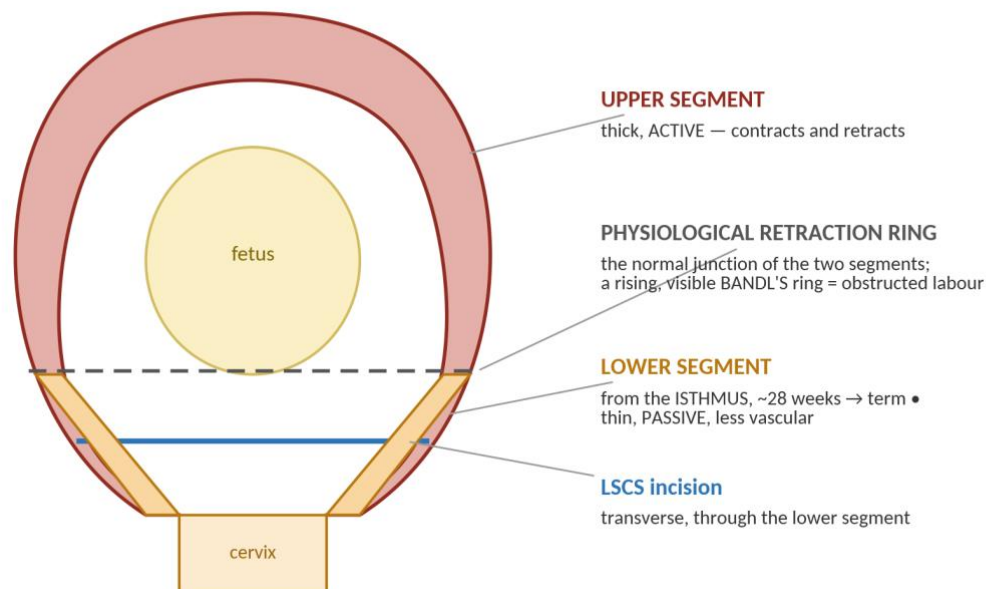


Figure 3. Upper and lower segments.

2 Cervix, Vagina, Vulva, Ovaries and Breasts

Organ	Changes
Cervix	Softens (Goodell's), bluish (Chadwick's), mucus plug (lost as the 'show'), ectropion — the squamocolumnar junction moves out onto the ectocervix → contact bleeding. Hegar's sign: soft isthmus on bimanual, ~6–8 weeks
Vagina	Congested and bluish; more distensible (muscle and elastin hypertrophy); more glycogen → more lactobacilli → pH ~3.5–4.5; more discharge; candida more common
Vulva + perineum	More vascular, oedematous, pigmented; vulval varicosities (usually resolve)
Ovaries + tubes	Ovulation stops; corpus luteum supports the pregnancy until the luteo-placental shift (~7–9 weeks); theca-lutein cysts with high hCG (multiples, molar). Round ligaments hypertrophy — stretch → round ligament pain
Breasts	Tender from 4–6 weeks; bigger; darker, wider areola; Montgomery's tubercles; visible veins; colostrum from ~16 weeks; lactation held back by progesterone (Lecture 31)

3 Cardiovascular, Respiratory and Renal

Approximate change at term vs non-pregnant

CARDIOVASCULAR



RESPIRATORY



RENAL



Figures are typical textbook values — ranges vary between sources.

Figure 4. What goes up, what goes down, what stays the same.

CARDIOVASCULAR

- Heart pushed **up and left**; apex displaced; left-axis deviation on ECG; mild cardiomegaly on X-ray
- **Cardiac output** ↑ **30–50%** (stroke volume, then heart rate +10–20 bpm)
- **SVR falls** (progesterone, oestrogen, prostacyclin, NO) → diastolic BP lowest in the **second trimester**
- **Supine hypotension** from ~20 weeks — IVC compression; use **left lateral tilt**

RESPIRATORY

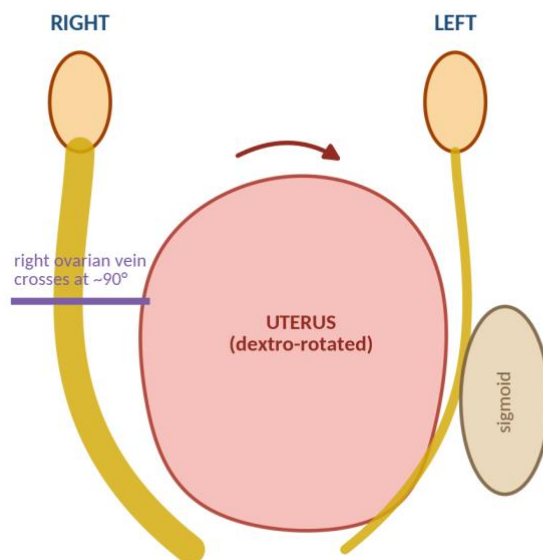
- Diaphragm **up ~4 cm** but moves **more**
- Subcostal angle **68° → 103°**
- **Tidal volume** ↑ **30–40%**, rate unchanged → **minute ventilation** ↑ **~40%** (progesterone)
- **Compensated respiratory alkalosis**: PaCO_2 ~4 kPa (30 mmHg), HCO_3^- ~18–22
- **FRC** ↓ **~20%**; vital capacity unchanged



Subcostal angle widens (red) • diaphragm rises ~4 cm (blue) yet moves MORE • chest wider front-to-back and side-to-side

Figure 5. The chest adapts to a rising diaphragm.

Renal tract	Change
Kidneys	Lengthen 1–1.5 cm
Ureters	Physiological hydroureter from ~12 weeks, right > left
Bladder	Pushed up and forward → frequency
Function	GFR ↑ ~50% → lower creatinine, urea and (early) uric acid; glycosuria may occur

Why the RIGHT ureter dilates more (front view, schematic)**RIGHT > LEFT dilatation**

uterus rotates to the right; the SIGMOID cushions the left ureter; right ovarian vein crosses at right angles

Physiological hydroureter

from ~12 weeks; progesterone relaxes smooth muscle, the uterus compresses at the pelvic brim

Why it matters

urinary stasis → ASYMPTOMATIC BACTERIURIA can progress to pyelonephritis — screen and TREAT

Figure 6. Why the right ureter dilates more.

4 Gastrointestinal, Endocrine and Blood

GASTROINTESTINAL

- Stomach and bowel pushed upwards by the uterus
- **LOS tone falls** (progesterone) → reflux
- Gastric emptying slowed in **labour** (especially with opioids) → aspiration risk at anaesthesia
- Appendix classically pushed up — but RLQ pain still commonest (Lecture 28)
- Constipation, haemorrhoids; **gallbladder stasis** → gallstones

ENDOCRINE

- **Pituitary enlarges** (lactotroph hyperplasia) → vulnerable to **Sheehan's** after massive PPH
- **Thyroid**: modest enlargement only — a goitre is not normal; **hCG** mimics TSH → TSH low in the first trimester; **TBG ↑** → total T3/T4 up, free little changed
- **Calcium**: calcitriol roughly doubles → more gut absorption; PTH stays low-normal
- **CBG doubles** → total cortisol ↑, free cortisol ↑ modestly; **aldosterone ↑** (renin–angiotensin)
- **hPL** and other placental hormones → **insulin resistance**

Haematology	Change
Plasma vs red cells	Plasma +~50%, red cells +~25% → dilutional ('physiological') anaemia
Anaemia thresholds (BSH)	Hb < 110 g/L first trimester • < 105 g/L second/third • < 100 g/L postpartum
White cells	Rise (up to ~14–15 × 10 ⁹ /L; higher in labour)
Platelets	Fall slightly — gestational thrombocytopenia (mild, resolves)
Coagulation	↑ fibrinogen, VII, VIII, IX, X, von Willebrand; ↓ protein S; acquired APC resistance → VTE risk ~4–6×
ESR	Markedly raised — unhelpful as an inflammatory marker

5 Musculoskeletal and Skin

MUSCULOSKELETAL

- **Relaxin + progesterone** loosen pelvic ligaments — symphysis widens by a few mm; **pelvic girdle pain / SPD** if excessive
- Sacro-iliac joints loosen; **lumbar lordosis ↑** → back pain
- **Divarication of the recti** — near-universal late; ~1 in 3 at a year (Lecture 26)
- **Carpal tunnel syndrome** (oedema); meralgia paraesthetica

SKIN + HAIR

- **Pigmentation**: chloasma/melasma, **linea nigra**, areolae, axillae, perineum
- **Striae gravidarum** — pink, then silvery
- **Spider naevi, palmar erythema** (oestrogen)
- Hair: prolonged growth phase, then **telogen effluvium** 2–4 months postpartum
- Varicose veins — legs and vulva

Pre-pregnancy BMI	IOM total weight gain (US guidance)
Underweight < 18.5	12.5–18 kg
Normal 18.5–24.9	11.5–16 kg
Overweight 25–29.9	7–11.5 kg

Pre-pregnancy BMI	IOM total weight gain (US guidance)
Obese ≥ 30	5–9 kg

NICE (UK) does not set weight-gain targets; it advises healthy eating and activity rather than dieting in pregnancy.

★ PEARL — the right ureter

The **right ureter** dilates more: the uterus is **dextro-rotated**, the **sigmoid colon cushions the left ureter**, and the right ovarian vein crosses the right ureter at a right angle.

Asymptomatic bacteriuria must be screened for and treated — untreated, a large minority (~20–30%) develop **pyelonephritis**.

6 MRCOG Exam Pearls — Last-Minute Page

Numbers to know

×15–20 Uterine weight	~5 L Uterine volume at term	+30–50% Cardiac output	+~45% Blood volume
+~50% GFR	+~40% Minute ventilation	–20% FRC	~4 kPa PaCO ₂ in pregnancy

HIGH-YIELD CHECKLIST

- ☐ Uterus: ~70 g → ~1100 g; 10 mL → 5 L; mainly hypertrophy; dextro-rotated.
- ☐ Fundus: 12 wk symphysis, 20 wk umbilicus, 36 wk xiphisternum; SFH from 24 weeks.
- ☐ Lower segment from the isthmus from ~28 weeks; Bandl's ring = obstruction.
- ☐ Goodell's, Chadwick's, Hegar's signs; ectropion.
- ☐ CO ↑ 30–50%; SVR ↓; diastolic BP lowest mid-pregnancy; supine hypotension from 20 weeks.
- ☐ TV ↑, MV ↑, RR same, VC same, FRC ↓; compensated respiratory alkalosis.
- ☐ GFR ↑ 50%; right > left hydroureter; treat asymptomatic bacteriuria.
- ☐ Plasma ↑ more than red cells; Hb thresholds 110 / 105 / 100 g/L.
- ☐ Hypercoagulable: ↑ fibrinogen and factors, ↓ protein S.
- ☐ Pituitary enlarges (Sheehan's); TBG and CBG rise; hPL → insulin resistance.
- ☐ Relaxin loosens joints; lordosis; carpal tunnel; divarication.

Quick-fire self-test — cover the right-hand column

Question	Answer
Main mechanism of uterine growth?	Myocyte hypertrophy
From which part does the lower segment form?	The isthmus
Which respiratory volume falls in pregnancy?	Functional residual capacity
Does the respiratory rate change?	No — tidal volume rises instead
Acid–base state of normal pregnancy?	Compensated respiratory alkalosis
Which ureter dilates more?	Right
When is diastolic BP lowest?	Second trimester

Question	Answer
Hb threshold for anaemia in the third trimester?	< 105 g/L
Why is total T4 raised?	Raised thyroxine-binding globulin
Which coagulation protein falls?	Protein S
Hormone that loosens pelvic ligaments?	Relaxin (with progesterone)

7 References

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