PIPADOR REVISION

MRCOG Part 1 Revision Notes

Haematological Changes in Pregnancy

PHYSIOLOGY • LECTURE 135

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG PART 1 REVISION NOTES | PHYSIOLOGY

135 Haematological Changes in Pregnancy

Red cells, iron and anaemia, white cells, platelets, coagulation and fibrinolysis — and their clinical consequences

↑ 40–50% Plasma volume	↑ 20–30% Red cell mass	≈ 1000 mg Extra iron needed
up to 15 WCC × 10^9/L (≈ 25+ in labour)	↓ ≈ 10% Platelet count	VTE ↑ 4–6× Antenatal (higher postpartum)

■ KEY FACTS: Learning objectives

- Describe red cell, iron and haematinic changes and define anaemia in pregnancy.
- Describe white cell and platelet changes, including gestational thrombocytopenia.
- Describe the coagulation and fibrinolytic changes that create a hypercoagulable state.
- Apply these changes to anaemia, haemoglobinopathy screening, VTE, bleeding disorders and DIC.

135.1 Overview

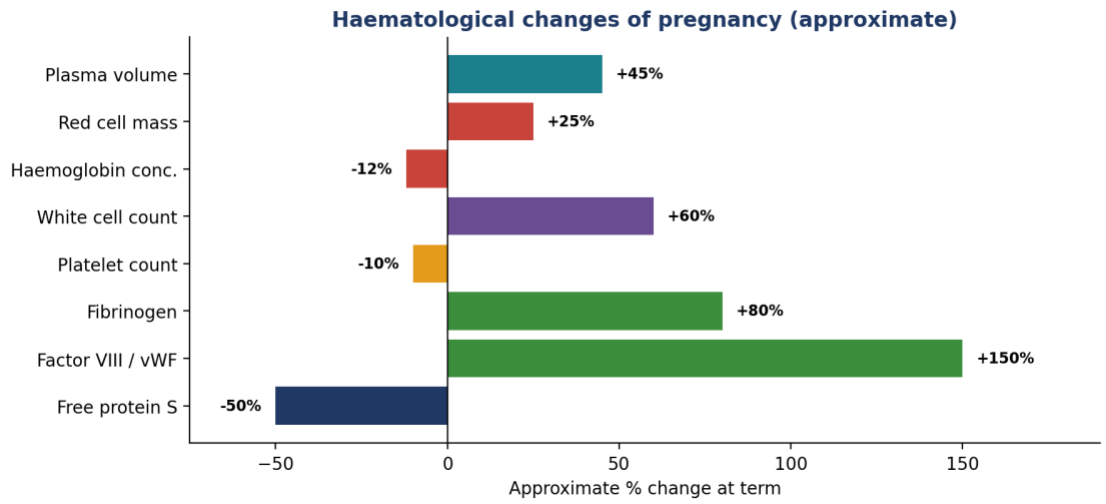


Figure 135.1 — Approximate haematological changes at term (ESR also rises ≈ 3–4-fold and is unhelpful in pregnancy)

135.2 Red cells and anaemia

Plasma volume ↑ 40–50% (peak 32–34 wk) ▶ Red cell mass ↑ 20–30% (↑ EPO) ▶ **Haemodilution** → Hb, Hct ↓ ▶ Physiological 'anaemia'; ↓ viscosity aids placental flow ▶ MCV ↑ slightly (≈ 4 fL); ↑ 2,3-DPG

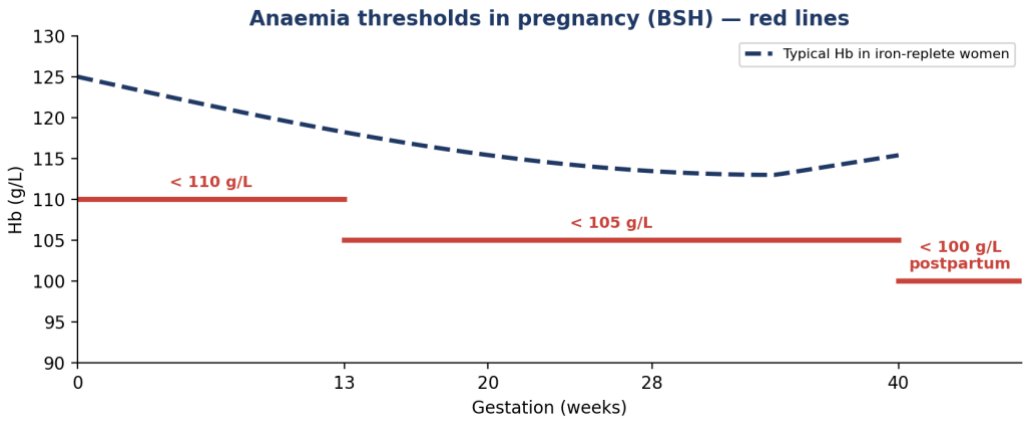


Figure 135.2 — Anaemia thresholds in pregnancy (BSH)

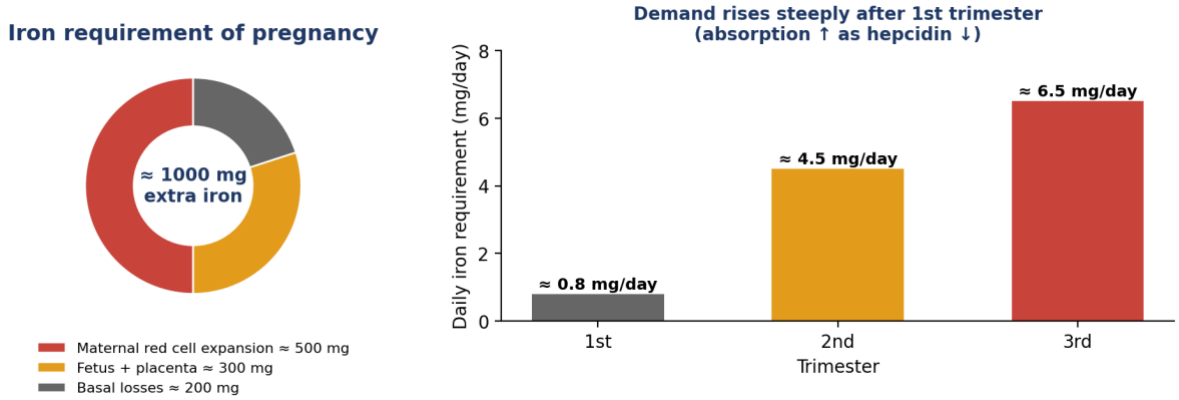


Figure 135.3 — Iron requirements of pregnancy

Topic	Key points (BSH 2019/2020; NICE)
Screening	FBC at booking and 28 weeks. Ferritin < 30 µg/L = iron deficiency (falls physiologically; ↑ with inflammation)
Treatment	Oral iron 40–80 mg elemental, once daily or alternate days (hepcidin rises for ≈ 24 h after a dose); expect Hb rise within 2–4 weeks
IV iron	From the 2nd trimester if oral iron not tolerated/ineffective, or late gestation (≥ 34 wk) with significant anaemia
Non-anaemic iron deficiency	Consider oral iron in women at risk (previous anaemia, multiple pregnancy, short interval, vegetarian, Jehovah's Witness)
Folate	400 µg from pre-conception to 12 weeks; 5 mg if high risk: previous NTD/family history, diabetes, antiepileptics, BMI ≥ 30, sickle cell disease/thalassaemia, malabsorption
Vitamin B_{12}	Serum levels fall in normal pregnancy (dilution, ↓ binding protein) — low values do not always mean deficiency

■ CLINICAL CORRELATION

- **NHS Sickle Cell and Thalassaemia (SCT) screening**: offer by **10 weeks** with the Family Origin Questionnaire; if the woman is a carrier, **test the father** promptly; offer prenatal diagnosis (CVS/amniocentesis) ideally by **12+6 weeks**.
- β-thalassaemia trait: ↓ MCV/MCH, **HbA_2 > 3.5%**, normal ferritin — do not give iron unless ferritin is low. α-thalassaemia trait is suspected with low MCH and normal HbA_2 (DNA testing if partner at risk of α^0).
- **Sickle cell disease** in pregnancy: ↑ crises, VTE, pre-eclampsia, FGR; folic acid 5 mg, aspirin, LMWH antenatally/postnatally as indicated, avoid dehydration, hypoxia and cold.

135.3 White cells and immunity

- **Neutrophilia** (WCC up to ≈ 15 × 10^9/L; **20–30 in labour** and early puerperium) with a left shift — oestrogen and cortisol. A raised WCC alone does not diagnose infection in labour.
- Lymphocyte count is stable but **cell-mediated immunity is modulated** (Th1 → Th2 shift; ↑ regulatory T cells) — ↑ susceptibility/severity of varicella, influenza, listeria, malaria, TB; Th1-mediated autoimmune disease (e.g. rheumatoid arthritis, MS) often improves.

135.4 Platelets and thrombocytopenia

Platelet count falls by ≈ 10% (haemodilution, ↑ consumption, ↑ splenic sequestration) with ↑ platelet turnover and mean volume. Thrombocytopenia (< 150 × 10^9/L) affects ≈ 7–10% of pregnancies.

Cause	Timing / features	Key distinguishing points
Gestational thrombocytopenia (≈ 75%)	3rd trimester; usually > 70–80 × 10^9/L; asymptomatic	Diagnosis of exclusion; no fetal thrombocytopenia; resolves postpartum
Pre-eclampsia / HELLP (≈ 20%)	Late 2nd/3rd trimester	↑ BP, proteinuria, haemolysis, ↑ ALT, ↓ platelets — deliver
Immune thrombocytopenia (ITP)	Any trimester, may pre-date pregnancy	Often < 70; antiplatelet IgG crosses placenta — neonatal count nadir days 2–5; steroids/IVIg if needed
TTP / HUS	Rare; TTP ↑ in 2nd/3rd trimester	Microangiopathic haemolysis, neuro/renal signs; ADAMTS13 < 10% in TTP → plasma exchange
DIC, AFLP, sepsis, SLE, drugs (heparin — HIT)	—	Coagulation abnormal in DIC/AFLP

≥ 75–80	≥ 50	Avoid
Platelets for neuraxial anaesthesia (× 10^9/L)	Vaginal delivery / caesarean section	FBS, FSE, ventouse, rotational forceps in ITP

135.5 Coagulation and fibrinolysis

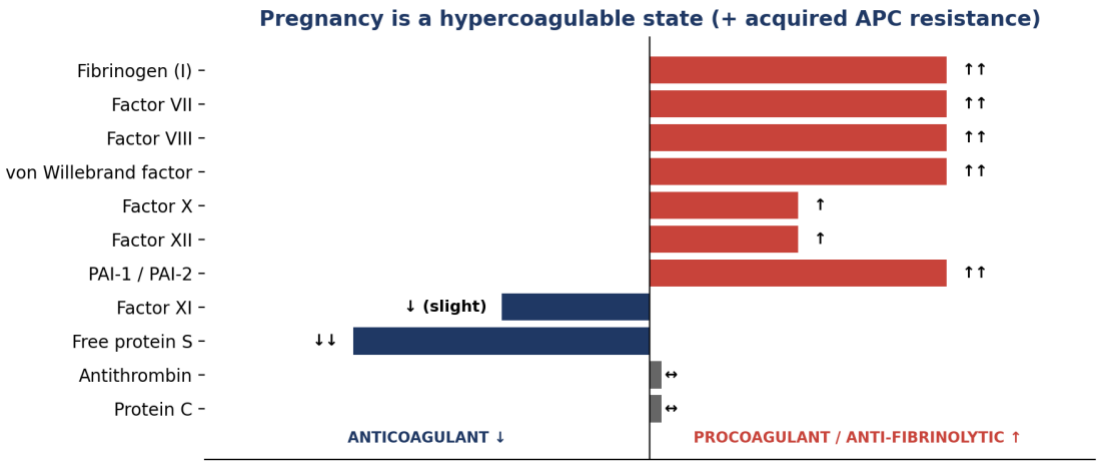


Figure 135.4 — Changes in coagulation factors, natural anticoagulants and fibrinolysis

- **Procoagulant ↑**: fibrinogen rises to **4–6 g/L**; factors VII, VIII, X, XII and **vWF** rise (vWF/VIII 2–3-fold); PT and APTT shorten slightly.
- **Natural anticoagulants ↓**: **free protein S falls ≈ 50% → acquired activated protein C resistance**; protein C and antithrombin largely unchanged.
- **Fibrinolysis ↓**: ↑ PAI-1 (endothelium) and **PAI-2 (placenta)**; fibrinolysis normalises within an hour of placental delivery.

- **D-dimer rises** progressively — not useful to exclude VTE in pregnancy (RCOG GTG 37b).
- Purpose: prepares for **haemostasis at placental separation** (with myometrial contraction — 'living ligatures'). Changes revert by ≈ **6–8 weeks postpartum**.

Virchow's triad in pregnancy	Mechanism
Hypercoagulability	Changes above + acquired APC resistance
Venous stasis	Progesterone-mediated venodilatation; ↓ venous flow velocity ≈ 50% in legs; compression of IVC/left iliac vein (→ ≈ 85–90% of DVTs left-sided)
Endothelial injury	Delivery (especially caesarean), placental separation, pre-eclampsia, infection

■ RED FLAGS

- **VTE (thrombosis and thromboembolism) is a leading direct cause of maternal death in the UK** (MBRRACE-UK). Risk is ↑ 4–6× antenatally and highest in the **first 6 weeks postpartum** (especially after caesarean).
- Risk-assess at booking, on admission and postnatally (**RCOG GTG 37a**); thromboprophylaxis with **LMWH** (does not cross the placenta; warfarin is teratogenic — avoid 6–12 weeks; DOACs avoided).

135.6 Bleeding disorders and DIC

Condition	Change in pregnancy	Implication
vWD type 1	vWF and VIII rise — often normalise by 3rd trimester	Check levels at ≈ 32–36 weeks; levels fall rapidly postpartum → late PPH risk; tranexamic acid, DDAVP (avoid in type 2B)
Haemophilia carriers	FVIII rises (A); FIX changes little (B)	Fetal sex determination (cfDNA); avoid FBS, FSE, ventouse, rotational forceps in at-risk male fetus; cord blood levels
Factor XI deficiency	No rise	Factor cover/TXA for delivery; caution with neuraxial

Trigger: **abruption**, **AFE**, massive PPH, sepsis, pre-eclampsia/HELLP, retained dead fetus, AFLP ▶ Tissue factor release → widespread thrombin generation ▶ Consumption of platelets and factors; fibrinolysis ▶ **↓ Platelets, ↓ fibrinogen, ↑ PT/APTT, ↑ D-dimer** ▶ Treat the cause + targeted replacement (fibrinogen > 2 g/L; Lecture 129)

135.7 Must-know summary

■ EXAM TIP

- Hb thresholds: **110 (1st trimester), 105 (2nd/3rd), 100 g/L (postpartum)**. Ferritin < 30 µg/L = iron deficiency.
- Iron requirement ≈ **1 g**, mainly 2nd/3rd trimesters; absorption ↑ as hepcidin falls.
- **Gestational thrombocytopenia**: late, mild, benign, no neonatal effect.
- Hypercoagulable: **↑ fibrinogen, VII, VIII, X, vWF; ↓ free protein S; ↑ PAI-1/2**; antithrombin and protein C ≈ unchanged.
- D-dimer and ESR rise normally and are unhelpful for diagnosis.

■ MNEMONIC / MEMORY AID

'Up go 7, 8, 10, 12 and Fibrinogen; Down goes protein S'. **Thrombocytopenia — 'Gestational, PET/HELLP, ITP'** cover ≈ 95% of cases.