PIPADOR REVISION

MRCOG Part 1 Revision Notes

The Fetal Period

EMBRYOLOGY • LECTURE 53

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG Part 1 Revision Notes

Lecture 53: The Fetal Period

Embryology • Visual revision edition

COLOUR CODE USED THROUGHOUT THESE NOTES

GROWTH	LUNGS	CIRCULATION / BLOOD	MONITORING	CLINICAL

LEARNING OBJECTIVES — tick off as you go

- ☐ Define the fetal period and describe the pattern of fetal growth.
- ☐ List key milestones in the second and third trimesters.
- ☐ Describe lung development and surfactant.
- ☐ Summarise maturation of heart/blood, brain, kidney, gut, endocrine and reproductive systems.
- ☐ Outline fetal monitoring and apply to FGR, macrosomia, preterm birth, stillbirth, hydrops and liquor problems.

1 Definition and Growth

IN ONE LINE: *Week 9 after fertilisation (gestational week 11) to birth: organs already formed now GROW and MATURE. Gross malformations are less likely, but brain, lung and growth remain vulnerable.*

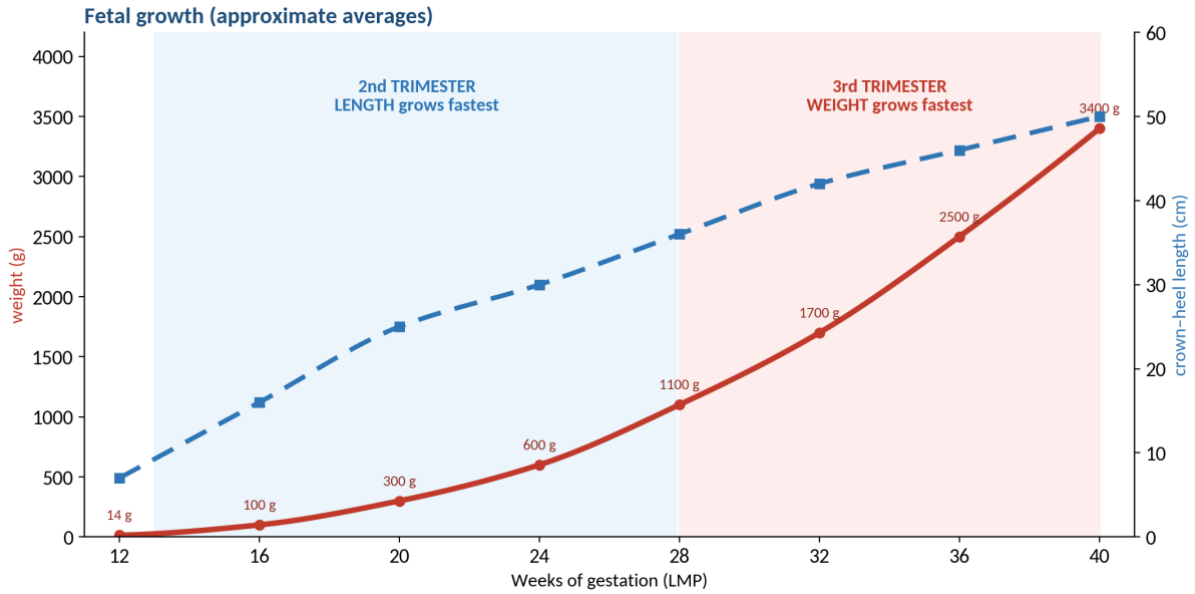


Figure 1. Length leads in the 2nd trimester, weight in the 3rd.

Weeks (LMP)	CRL	Crown–heel	Weight
12	~6 cm	~7 cm	~14 g
20	~16 cm	~25 cm	~300 g
24	~21 cm	~30 cm	~600 g
28	~25 cm	~36 cm	~1100 g

Weeks (LMP)	CRL	Crown–heel	Weight
32	~28 cm	~42 cm	~1700 g
36	~32 cm	~46 cm	~2500 g
40	~36 cm	~50 cm	~3400 g

2 Milestones

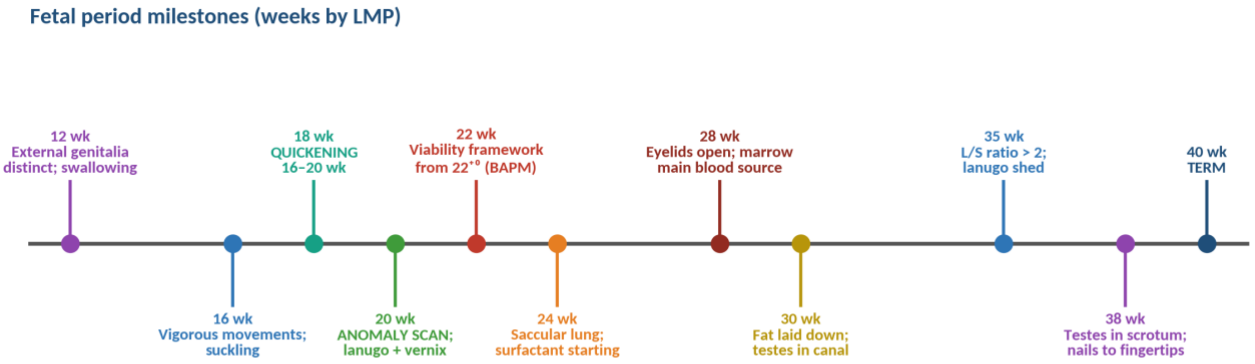


Figure 2. Fetal period milestones.

- **Viability**: the BAPM framework (2019) supports active care from **22^{+0} weeks** in selected cases, after counselling.

3 Lung Development

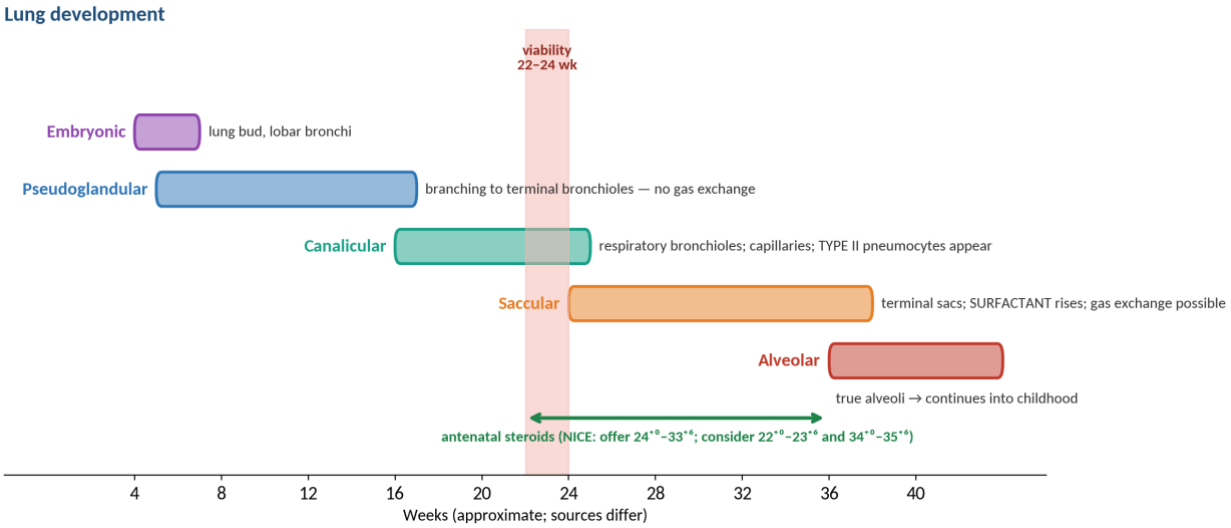


Figure 3. Phases of lung development.

- **Surfactant** (type II pneumocytes): mainly **DPPC** (lecithin) + phosphatidylglycerol + proteins **SP-A to SP-D**; **L/S ratio > 2** ≈ mature (~35 weeks).

EXAM HOOK

Antenatal corticosteroids (NICE NG25): **offer at 24^{+0}–33^{+6}** weeks if preterm birth is likely; **consider at 22^{+0}–23^{+6}** (as part of active care) and **34^{+0}–35^{+6}**. They speed type II pneumocyte maturation and surfactant release.

4 Organ Maturation

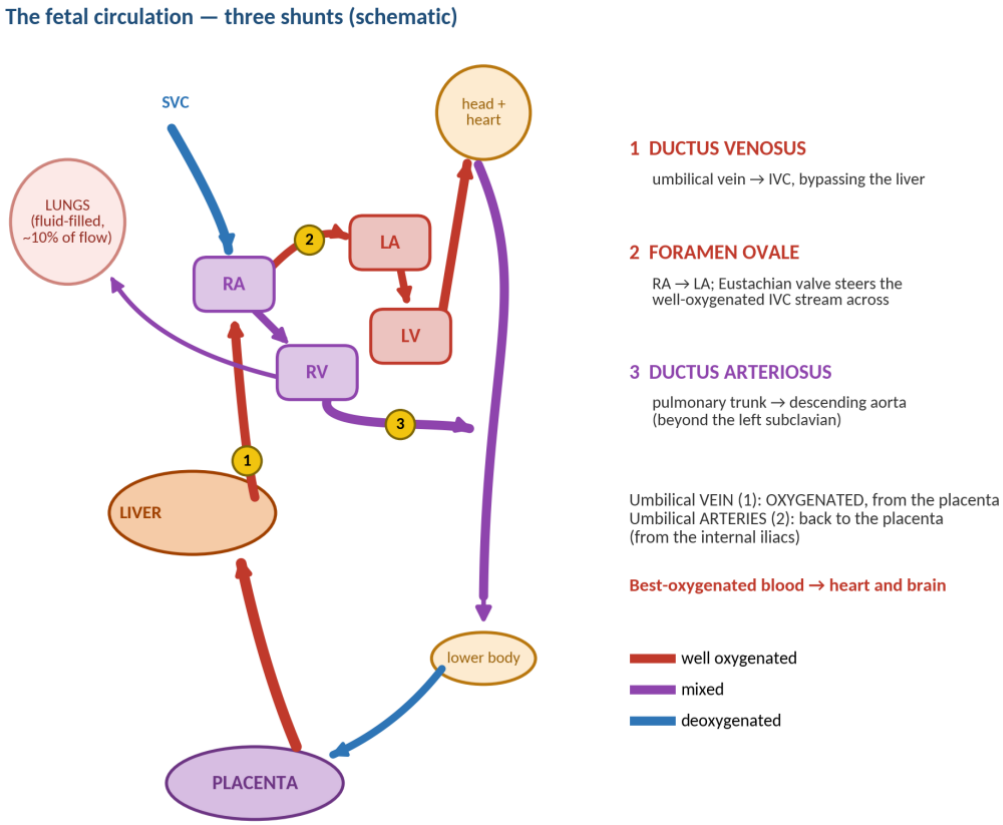


Figure 4. Fetal circulation (from Lecture 35).

System	Key points
Heart + blood	Three shunts (ductus venosus, foramen ovale, ductus arteriosus); RV dominant in utero. Umbilical vein PO_2 ~30 mmHg — compensated by Hb ~17 g/dL, HbF (P50 ~19 vs 26 mmHg) and the double Bohr effect
Brain	Neuronal proliferation peaks in the 2nd trimester; migration largely complete by ~24–26 weeks; synaptogenesis and myelination run from the 3rd trimester into childhood — growth spurt late pregnancy to age 2
Kidney	Urine from ~10 weeks; main source of liquor from ~16 weeks; nephrogenesis ends ~34–36 weeks (preterm babies may have fewer nephrons)
Gut + liver	Swallowing ~12 weeks; meconium from the 2nd trimester; liver the main blood-forming organ until the bone marrow takes over
Endocrine	Pituitary active ~10 weeks; big fetal adrenal zone makes DHEA-S → placental oestriol; fetal thyroid makes T4 from ~10–12 weeks, but maternal T4 stays important for the brain, especially in the first half
Reproductive	Genitalia visible on scan from ~14–16 weeks; testes through the inguinal canal ~28–30 weeks and into the scrotum by ~36–38; ~6–7 million oocytes at 20 weeks
Energy	Glucose (GLUT1) main fuel; glycogen and brown fat laid down late — the preterm baby lacks both

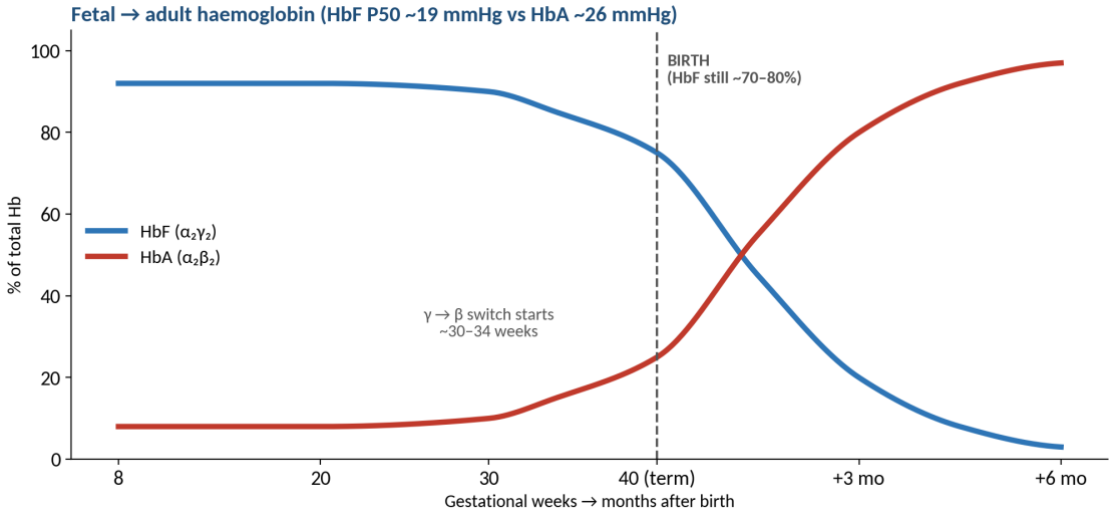


Figure 5. HbF to HbA.

5 Monitoring the Fetus

Tool	Use
Dating scan	CRL at 10^{+0}–13^{+6} (NICE); HC if CRL > 84 mm
Combined screening	NT + PAPP-A + free β-hCG at 11^{+0}–13^{+6}
Anomaly scan	18^{+0}–20^{+6} weeks
Growth scans + Doppler	Serial biometry in higher-risk pregnancies; umbilical artery, MCA, ductus venosus in FGR
CTG	Fetal heart rate + contractions — high-risk antenatal and intrapartum
Biophysical profile	CTG, liquor, breathing, movement, tone — scored 0–10
Fetal movements	Reduced movements → prompt assessment (CTG ± scan)

6 Clinical Correlates

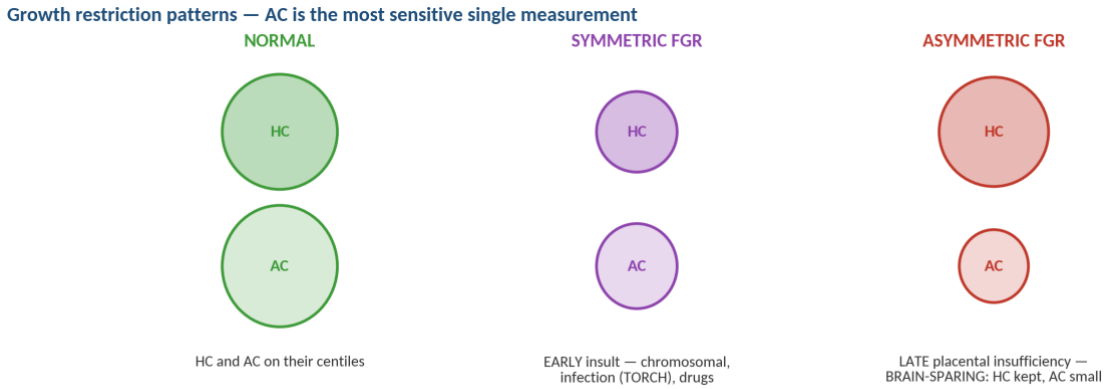


Figure 6. Symmetric vs asymmetric growth restriction.

- **SGA** = EFW or AC < 10th centile. **FGR** (Delphi consensus) = failure to reach growth potential — e.g. EFW/AC < 3rd centile, or < 10th with abnormal Doppler or falling across centiles.

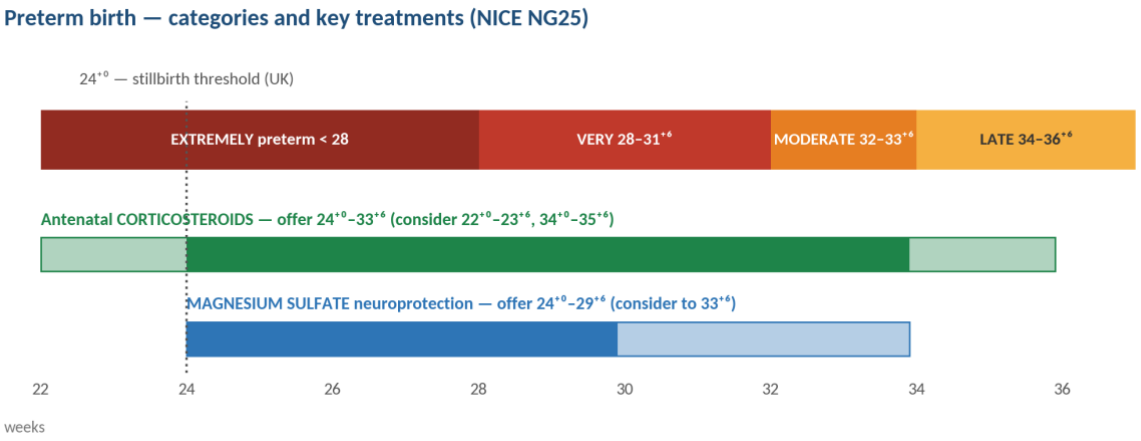


Figure 7. Preterm birth: categories and treatments.

MACROSOMIA + STILLBIRTH

- **Macrosomia**: > 4 kg (or > 90th centile) — diabetes, obesity, post-term; shoulder dystocia, trauma, neonatal hypoglycaemia
- **Stillbirth** (UK): baby born dead from **24+0 weeks** — placental, anomaly, infection, cord, unexplained

HYDROPS + LIQUOR

- **Hydrops**: fluid in ≥ 2 fetal compartments. Immune (red-cell antibodies) vs non-immune (cardiac, chromosomal, **parvovirus B19**, CMV, syphilis, TTTS)
- **Poly**: diabetes, TTTS, gut atresia, neuromuscular
- **Oligo**: PPROM, post-term, FGR, renal anomalies, NSAIDs/ACE-i

★ **PEARL**

Brain-sparing in placental insufficiency keeps the head growing while the abdomen falls behind — hence **asymmetric FGR**, and why **AC** is the key measurement.

Preterm babies miss the **third-trimester stores** — surfactant, glycogen, brown fat, IgG, nephrons.

7 MRCOG Exam Pearls — Last-Minute Page

Numbers to know

Wk 9 / 11 Fetal period (fert. / LMP)	**16–20 wk** Quickening	**22+0** Viability framework	**> 2** L/S ratio — mature
24–33+6 Offer steroids	**24–29+6** Offer $MgSO_4$	**~36 wk** Nephrogenesis ends	**~3400 g** Term weight

HIGH-YIELD CHECKLIST

- ☐ Fetal period = week 9 post-fertilisation (11 by LMP) to birth.
- ☐ Length leads in the 2nd trimester; weight in the 3rd.
- ☐ Lung phases: embryonic, pseudoglandular, canalicular, saccular, alveolar.
- ☐ Type II pneumocytes → surfactant; L/S > 2 ≈ 35 weeks.
- ☐ Steroids offer 24^{+0}–33^{+6}; $MgSO_4$ offer 24^{+0}–29^{+6}.
- ☐ HbF still ~70–80% at birth; switch starts ~30–34 weeks.
- ☐ Nephrogenesis ends ~34–36 weeks; liquor mostly fetal urine from ~16 weeks.
- ☐ Maternal T4 matters for the fetal brain, especially early.
- ☐ SGA < 10th; FGR = failure to reach potential; symmetric vs asymmetric.
- ☐ Stillbirth ≥ 24^{+0} (UK); hydrops ≥ 2 compartments.

Self-assessment — cover the right-hand column

Question	Answer
Five phases of lung development?	Embryonic, pseudoglandular, canalicular, saccular, alveolar
Which cells make surfactant?	Type II pneumocytes
When does NICE offer antenatal steroids?	24^{+0}–33^{+6} weeks (consider 22^{+0}–23^{+6}, 34^{+0}–35^{+6})
Why does HbF help at low PO_2?	Higher O_2 affinity (P50 ~19 mmHg)
Proportion of HbF at birth?	~70–80%
When does nephrogenesis finish?	~34–36 weeks
Main source of amniotic fluid after 16 weeks?	Fetal urine
Symmetric vs asymmetric FGR?	Early insult, all small vs late placental, head spared
UK stillbirth definition?	Baby born dead from 24^{+0} weeks
When is $MgSO_4$ neuroprotection offered?	24^{+0}–29^{+6} weeks (consider to 33^{+6})

8 References

- Sadler TW. Langman's Medical Embryology. 14th ed. 2019.
- NICE NG25. Preterm labour and birth. 2015 (updated 2022).
- BAPM. Perinatal Management of Extreme Preterm Birth before 27 weeks of gestation: A Framework for Practice. 2019.
- Gordijn SJ et al. Consensus definition of fetal growth restriction: a Delphi procedure. Ultrasound Obstet Gynecol 2016.