PIPADOR REVISION

MRCOG Part 1 Revision Notes

Carbohydrates: Sources

BIOCHEMISTRY • LECTURE 213

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG PART 1 REVISION NOTES | BIOCHEMISTRY

213 Carbohydrates: Sources

Dietary sources, fibre and glycaemic index, digestion and absorption, glycogenolysis and gluconeogenesis, pregnancy and the fetus

≈ 50%	< 5%	30 g/day	≈ 120 g/day
Of energy should come from carbohydrate (UK)	Free sugars (of energy)	Fibre (UK target)	Brain glucose use

■ KEY FACTS: Learning objectives

- Describe dietary sources of carbohydrate, fibre and the glycaemic index.
- Describe digestion and absorption of carbohydrates.
- Describe endogenous sources of glucose (glycogenolysis, gluconeogenesis) and their regulation, including in pregnancy and the fetus.

213.1 Dietary sources

Source	Main carbohydrate	Notes
Cereals, bread, rice, pasta, potatoes	Starch	Main energy source; wholegrain → fibre, lower GI
Fruit, honey	Fructose, glucose, sucrose	Intrinsic sugars (whole fruit) vs free sugars (juice)
Table sugar, confectionery, soft drinks	Sucrose	Free sugars < 5% of energy (SACN); sugar tax
Milk, dairy	Lactose	Human milk ≈ 7% lactose (main infant carbohydrate)
Vegetables, legumes, wholegrains	Fibre (non-starch polysaccharides, resistant starch)	Laxation, ↓ colorectal cancer, CVD, T2DM; fermented to short-chain fatty acids

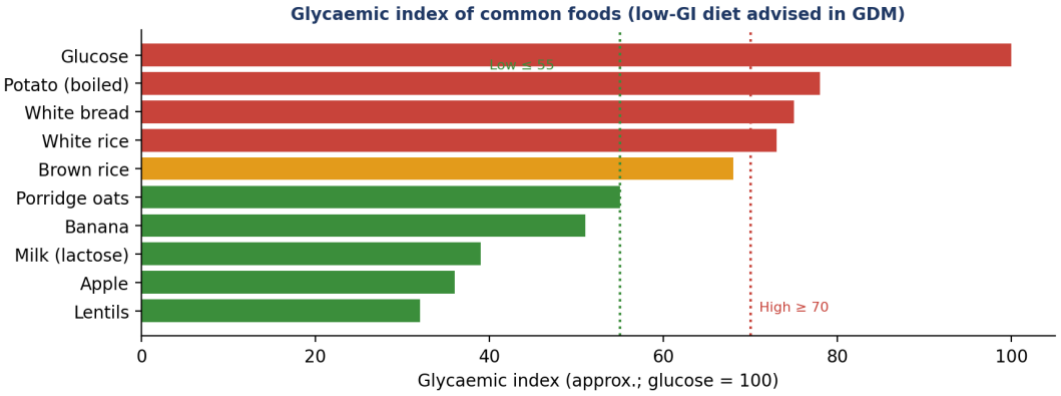


Figure 213.1 — Glycaemic index of common foods

Glycaemic index (GI): blood glucose response to 50 g available carbohydrate relative to glucose (100). Reduced by fibre, fat, protein, acidity, less processing. **Glycaemic load** = GI × carbohydrate amount. **Low-GI diets** are recommended for **gestational diabetes** (NICE NG3) and help limit postprandial peaks and fetal macrosomia.

213.2 Digestion and absorption

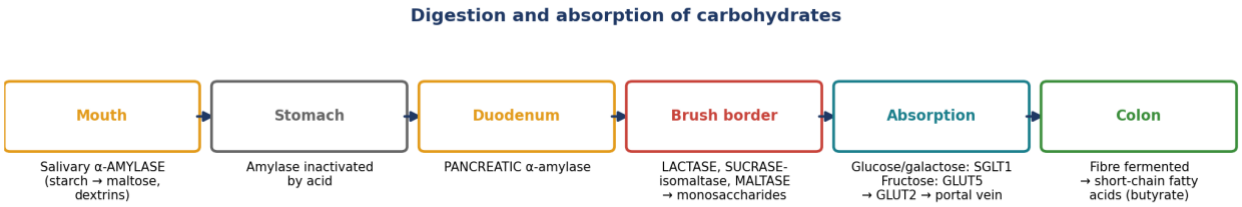


Figure 213.2 — Carbohydrate digestion and absorption

- Only **monosaccharides** are absorbed. **SGLT1** (Na^+-coupled; glucose, galactose) is the basis of **oral rehydration solution**; **GLUT5** (fructose); **GLUT2** basolateral exit to the portal vein (Lecture 137).
- **Lactose intolerance**: primary (adult lactase non-persistence — common worldwide), secondary (gastroenteritis, coeliac), congenital (rare); undigested lactose → osmotic diarrhoea, fermentation (bloating, H_2 breath test).

213.3 Endogenous sources of glucose

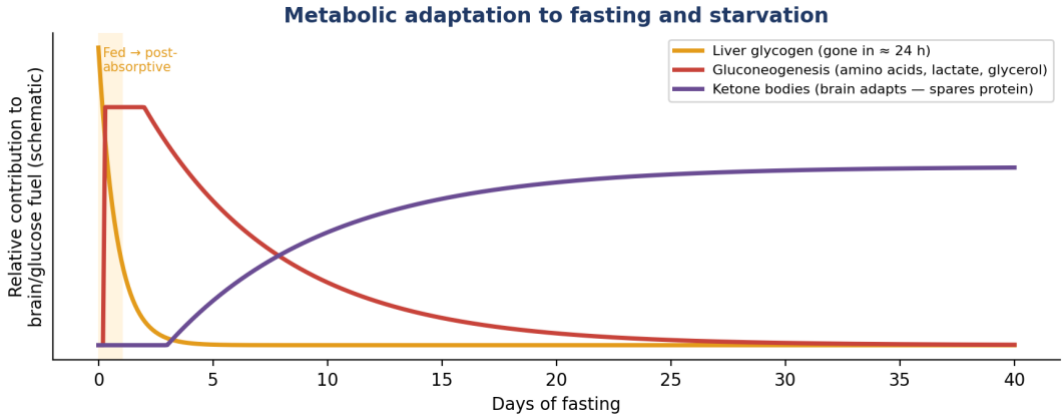


Figure 213.3 — Fuel use during fasting

Process	Site	Substrates / regulation
Glycogenolysis	Liver (blood glucose — glucose-6-phosphatase); muscle (local only — lacks glucose-6-phosphatase)	Glucagon (cAMP/PKA) and adrenaline → glycogen phosphorylase; liver glycogen lasts ≈ 12–24 h of fasting
Gluconeogenesis	Liver (≈ 90%), kidney (↑ in prolonged fasting)	Lactate (Cori cycle), alanine (glucose–alanine cycle), glycerol, propionate — NOT even-chain fatty acids. Bypasses irreversible glycolytic steps: pyruvate carboxylase (needs biotin), PEPCK, fructose-1,6-bisphosphatase, glucose-6-phosphatase. ↑ by glucagon, cortisol; ↓ by insulin. Costs ATP
Glycogenesis	Liver, muscle	Insulin → glycogen synthase (fed state)

213.4 Pregnancy and the fetus

Situation	Glucose source / physiology
Maternal fasting	Accelerated starvation — continuous fetal glucose uptake lowers fasting glucose; ↑ lipolysis and ketones sooner (Lecture 139)
Maternal fed state	Insulin resistance (late pregnancy) → higher, prolonged postprandial glucose — 'facilitated anabolism' for the fetus

Situation	Glucose source / physiology
Fetus	Glucose from mother via placental GLUT1 (≈ 80% of fetal energy); minimal fetal gluconeogenesis; fetal liver/muscle/heart glycogen laid down in 3rd trimester (insulin, cortisol)
Neonate	At cord clamping, glucose supply stops → glucagon/catecholamine surge → glycogenolysis, then gluconeogenesis; nadir at 1–2 h. Hypoglycaemia risk: preterm/FGR (low glycogen), infant of diabetic mother (hyperinsulinism), hypothermia, sepsis — early feeding

213.5 Must-know summary

■ EXAM TIP

- Starch is the main dietary carbohydrate; fibre 30 g/day; free sugars < 5% of energy.
- Low-GI diet for GDM; GI ↓ with fibre, fat, protein.
- Absorption: **SGLT1** (glucose/galactose), **GLUT5** (fructose), GLUT2 out.
- Liver glycogen (glucose-6-phosphatase) maintains blood glucose; muscle glycogen is for local use.
- Gluconeogenesis from lactate, alanine, glycerol (**not even-chain fatty acids**); fetus relies on placental glucose; neonatal hypoglycaemia in preterm/FGR/IDM.

■ MNEMONIC / MEMORY AID

Gluconeogenesis substrates — 'GLAP': Glycerol, Lactate, Alanine (amino acids), Propionate.