PIPADOR REVISION

MRCOG Part 1 Revision Notes

Nutrition

PHYSIOLOGY • LECTURE 138

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG PART 1 REVISION NOTES | PHYSIOLOGY

138 Nutrition

Energy balance, macronutrients, metabolism in fed and fasted states, dietary reference values and nutritional assessment

4 kcal/g	9 kcal/g	7 kcal/g	≈ 2000 kcal
Carbohydrate & protein	Fat	Alcohol	Average adult woman per day (UK EAR)

■ **KEY FACTS: Learning objectives**

- Describe energy balance, the components of energy expenditure and the respiratory quotient.
- Describe the macronutrients, fibre and essential nutrients.
- Describe fed, fasting and starvation metabolism.
- Define dietary reference values and assess nutritional status, malnutrition, refeeding syndrome and obesity.

138.1 Energy balance

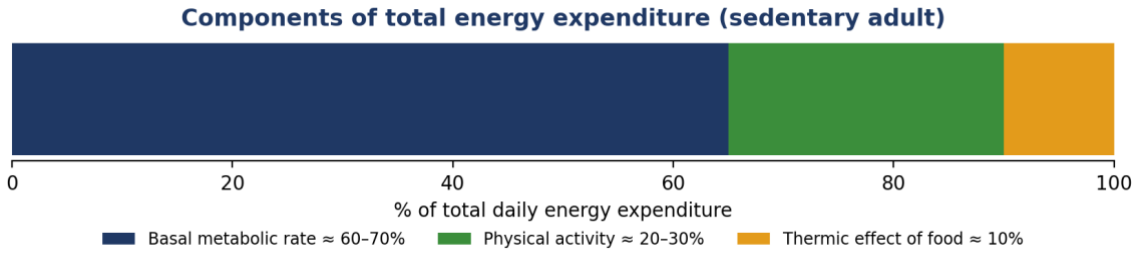


Figure 138.1 — Components of total energy expenditure

Concept	Key points
Basal metabolic rate (BMR)	Energy at complete rest, fasted, thermoneutral. ≈ 1300–1500 kcal/day in women; ↑ with lean mass, thyroxine, fever, pregnancy; ↓ with age, starvation, hypothyroidism. Estimated by Schofield/Harris–Benedict equations
Thermic effect of food	≈ 10% of intake; highest for protein
Physical activity	The most variable component; physical activity level (PAL) = TEE ÷ BMR (≈ 1.4–1.6 sedentary)
Respiratory quotient (RQ)	$VCO_2 \div VO_2$: carbohydrate 1.0, protein ≈ 0.8, fat 0.7; mixed diet ≈ 0.8; > 1 with lipogenesis (overfeeding)
Energy content	Carbohydrate 4, protein 4, alcohol 7, fat 9 kcal/g (1 kcal = 4.184 kJ)

138.2 Macronutrients

Nutrient	Recommended share of energy (UK)	Key points
Carbohydrate	≈ 50% (free sugars < 5%)	Starches and sugars; glycaemic index; brain uses ≈ 120 g glucose/day. Fibre 30 g/day (non-starch polysaccharide) — ↓ constipation, colorectal cancer, CVD
Protein	≈ 10–15%; RNI 0.75 g/kg/day	9 essential amino acids (histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, valine); biological value; nitrogen balance (+ in growth/pregnancy)

Nutrient	Recommended share of energy (UK)	Key points
Fat	≤ 35% (saturated ≤ 10%; avoid trans)	Essential fatty acids: linoleic (n-6) and α-linolenic (n-3) → EPA/DHA (retina, brain — fetal accretion in 3rd trimester); fat-soluble vitamin absorption

138.3 Fed, fasting and starvation

	FED (insulin dominant)	FASTING (glucagon, cortisol, catecholamines)
Glucose	Uptake (GLUT4 muscle/fat), glycogenesis	Glycogenolysis (liver, ≈ 24 h), then gluconeogenesis
Fat	Lipogenesis, storage	Lipolysis → FFAs → ketogenesis (liver)
Protein	Synthesis	Breakdown (alanine, glutamine) for gluconeogenesis

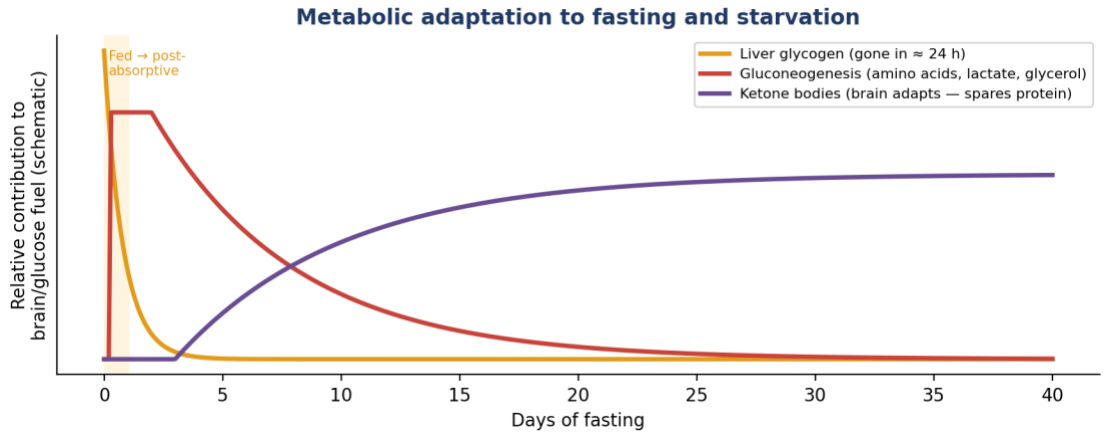


Figure 138.2 — Fuel use during prolonged fasting: ketones spare body protein

Pregnancy amplifies these shifts — **'accelerated starvation'**: after an overnight fast pregnant women develop lower glucose and higher ketones and FFAs than non-pregnant women (Lecture 139). Ketosis (e.g. in **hyperemesis** or prolonged labour) is therefore common.

138.4 Dietary reference values

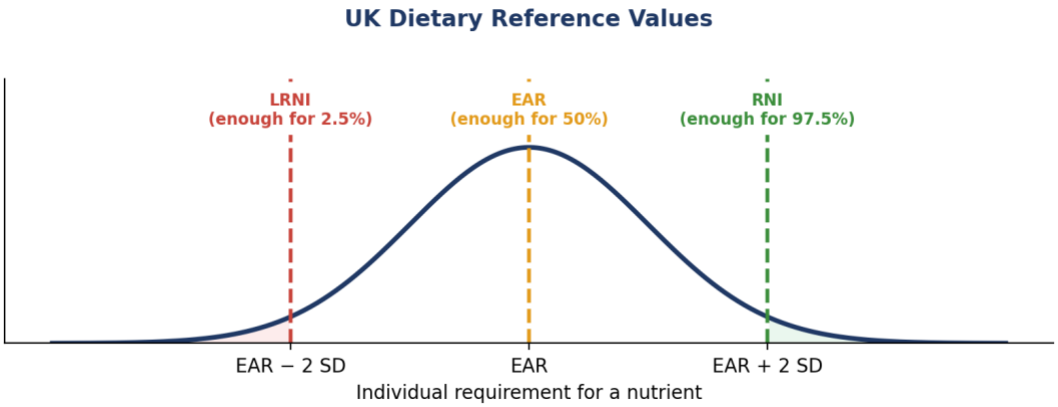


Figure 138.3 — Distribution of requirements and UK Dietary Reference Values

EAR	RNI	LRNI	Safe intake
Estimated Average Requirement (energy)	Reference Nutrient Intake — enough for 97.5%	Lower RNI — intake below = likely deficient	When evidence is insufficient

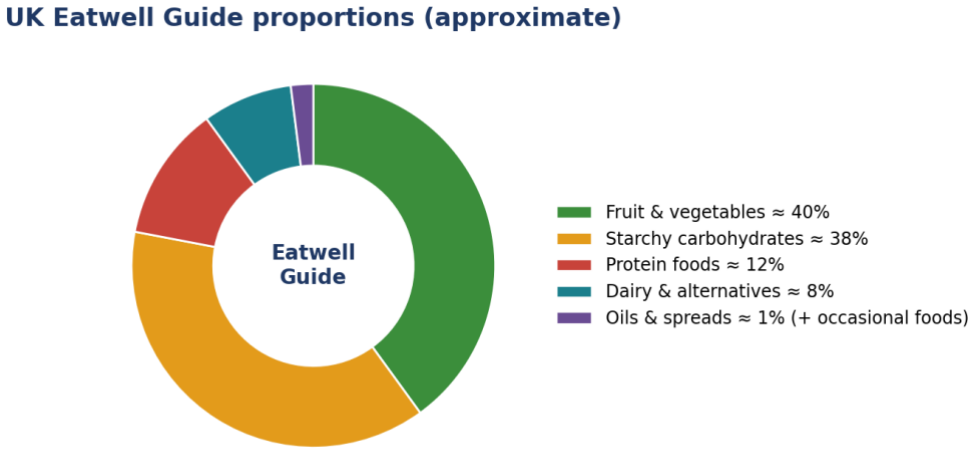


Figure 138.4 — The UK Eatwell Guide

138.5 Nutritional assessment

BMI (kg/m²) — WHO	Category	Obstetric relevance
< 18.5	Underweight	FGR, preterm birth; screen for eating disorders
18.5–24.9	Healthy	—
25–29.9	Overweight	↑ GDM, pre-eclampsia
30–34.9 / 35–39.9 / ≥ 40	Obese class I / II / III	↑ miscarriage, GDM, PET, VTE, stillbirth, CS, macrosomia, NTD; 5 mg folic acid (BMI ≥ 30); RCOG GTG 72

- **Screening**: MUST (Malnutrition Universal Screening Tool) — BMI, unplanned weight loss, acute disease effect. Anthropometry: mid-upper arm circumference, skinfolds, waist circumference (≥ 80 cm women ↑ risk).
- **Biochemistry**: **albumin is a poor nutritional marker** (falls with inflammation and in pregnancy); prealbumin, micronutrient levels.

138.6 Malnutrition, refeeding and obesity

Prolonged starvation: depleted intracellular PO_4, K^+, Mg^{2+} (serum may be normal) ▶ Refeeding → **insulin surge** ▶ Intracellular shift of **phosphate**, K^+, Mg^{2+}; thiamine used up ▶ **Hypophosphataemia** (hallmark), hypokalaemia, hypomagnesaemia, fluid retention ▶ Arrhythmia, heart failure, respiratory failure, **Wernicke's**

■ RED FLAGS

- **Refeeding syndrome** (NICE CG32): high risk if BMI < 16, < 10 kcal/kg/day intake for > 10 days, or > 15% weight loss in 3–6 months. **Start feeding slowly** (≈ 10 kcal/kg/day), **give thiamine and B vitamins before and during feeding**, and replace PO_4, K^+ and Mg^{2+}. Relevant to **severe hyperemesis gravidarum** and anorexia nervosa.

- **Marasmus** (energy deficiency — wasting) vs **kwashiorkor** (protein deficiency with oedema, fatty liver, skin/hair changes).
- **Obesity**: positive energy balance; leptin resistance; insulin resistance; adipose is endocrine (leptin, adiponectin, oestrogen via aromatase — anovulation, endometrial hyperplasia). Bariatric surgery → micronutrient deficiencies (iron, B_{12}, folate, calcium, vitamin D, fat-soluble vitamins); conception advised after **12–18 months**.

138.7 Must-know summary

■ EXAM TIP

- kcal/g: **carbohydrate 4, protein 4, alcohol 7, fat 9**. RQ: **carbohydrate 1.0, fat 0.7, protein 0.8**.
- BMR is the largest component of energy expenditure (≈ 60–70%).
- Essential fatty acids: **linoleic (n-6), α-linolenic (n-3)**; DHA is vital for fetal brain and retina.
- **RNI = EAR + 2 SD** (covers 97.5%); LRNI = EAR − 2 SD.
- Refeeding syndrome: **hypophosphataemia**; give **thiamine** first; feed slowly.

■ MNEMONIC / MEMORY AID

Essential amino acids — 'PVT TIM HaLL': Phenylalanine, Valine, Threonine, Tryptophan, Isoleucine, Methionine, Histidine, Leucine, Lysine.