Exercise walk-through

5.6
Gastrointestinal physiology

University Medicine

Gastrointestinal: nine litres, four stations

1. **Ledger** 9 L/day in (drink 2, food 1, secretions 6): jejunum the workhorse, ileum signs for B12 and bile salts, colon polishes ~1.3 L.
2. **Control Enteric nervous system** (the local plexus) under vagus and gastrin/secretin/CCK.
3. **Failure** Ileal resection: B12 out (years of stores) AND bile salts lost (months) - one segment, two clocks.

Absorption by segment with the nine-litre ledger.

9 L in → ~0.15 L out

ileal failure = B12 deficiency AND bile-salt diarrhoea

Absorption by segment with the nine-litre ledger.

Exercises 2.1–2.3

2.1 Sum the nine litres (input side). [3]

2.2 Which segment absorbs B12, and what must accompany it? [3]

2.3 What drives the migrating motor complex? [3]

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2.1

- $2 + 1 + 1.5 + 2.5 + 0.5 + 1.5 + 1 = 10$ ($\approx 9 \pm$ secretions estimate) ✓.

2.2 Which segment absorbs B12, and what must accompany it? [3]

2.2

- The ileum; intrinsic factor (from the stomach).

2.3 What drives the migrating motor complex? [3]

2.3

- The enteric nervous system's fasting cycle (motilin-timed housekeeping).

Exercise 3.1

3.1 Cholera (fictional epidemic context): litres of painless watery stool.

Explain the secretion mechanism (toxin-welded Gs $\rightarrow$ cAMP $\rightarrow$ Cl^- out, per MED02). Explain why the mucosa remains intact histologically. State the therapy principle. [7]

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3.1

- Toxin ADP-ribosylates Gs → constitutive adenylyl cyclase → maximal cAMP → Cl^- channels open → salt and water pour out.
- The epithelium is intact (no invasion): secretion, not destruction – histology is normal.
- Replace the lost fluid and electrolytes (volume is the killer, not the toxin, which decays).

Exercise 3.2

3.2 After ileal resection (fictional).

Predict the two malabsorption consequences with their timelines. Explain why fat malabsorption worsens over months (bile-salt pool depletion). State one therapy for each clock. [7]

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3.2

- B12 deficiency (years of stores) and bile-salt loss with steatorrhoea AND bile-acid diarrhoea (months).
- The pool recycles ileum→liver→gut ~6×/day: each lost cycle shrinks it until fat digestion fails.
- B12 injections (bypass the gut); bile-salt sequestrants or fat restriction for the diarrhoea.