

4.4 Organ histology: circulatory, respiratory and digestive

Name: _____ Class: _____ Date: _____

Total: 24 marks

KEY WORDS alveolus

Objective

Read vessel, airway and gut walls layer by layer and connect layers to pressures and function.

1 Key knowledge and worked examples

■ The grammar

Vessels: intima/media/adventitia – media $\propto$ pressure. Gut: mucosa/submucosa/muscularis externa/serosa. Alveolus: $\sim 0.5 \mu\text{m}$ blood–air barrier.

■ Worked example: the pressure record

The vessel that is mostly media with a round lumen is the artery; the thin-walled wide one is the vein ✓.

2 Practice

2.1 Which gut layer is the absorptive frontline? [3]

2.2 Why is the alveolar wall so thin? [3]

2.3 Name the two directions of the muscularis externa. [3]

3 Exam-style questions

3.1 Compare an artery and a vein in cross-section.

Give three histological differences (media thickness, lumen shape, wall-to-lumen ratio). Explain each from pressure/flow. State which vessel has valves and why. [8]

3.2 A patient is breathless with clear airways (fictional fibrosis case).

Explain why diffusion, not airflow, now limits oxygen (barrier thickening from $\sim 0.5 \mu\text{m}$ to several μm). Predict the exercise pattern. State why bronchodilators do not help. [7]

Solutions

2.1

- The mucosa.

2.2

- Exchange: minimal diffusion distance – one flat cell + basement membrane.

2.3

- Inner circular, outer longitudinal.

3.1

- Artery: thick media, rounder smaller lumen, high wall:lumen.
- Pulse pressure demands elastic/muscular buffering; venous low pressure permits thin walls storing volume.
- Veins – valves against gravity-driven backflow at low pressure.

3.2

- Thickened alveolar walls lengthen the diffusion path: Fick's law – flux falls with distance.
- Early desaturation on exertion (diffusion reserves exhaust first).
- Airway calibre is normal: the lesion is in the wall, not the tube.