

Solutions

2.1

- $150 - 60/0.8 = 150 - 75 = 75$ mmHg ✓.

2.2

- Acidosis, hypercapnia, fever, 2,3-BPG.

2.3

- The probe reads saturation (binding); anaemia cuts CONTENT (Hb count) at the same saturation.

3.1

- (a) Hypoventilation: $150 - 80/0.8 = 50$ mmHg; A-a normal.
- (b) Pneumonia: V/Q mismatch/shunt $\rightarrow$ A-a widens.
- (c) Altitude: $P_{IO_2} = 0.21 \times (460 - 47) \approx 87$; alveolar and arterial fall together $\rightarrow$ A-a normal.
- (d) Shunt: A-a wide (bypassed blood unmixed with ventilated).
- (e) Anaemia: P_{O_2} and saturation normal – content disease, no gradient change.
- Consistent mechanism-to-gradient mapping.

3.2

- Flat top (60–100): loading is safe despite small lung swings; steep middle: large unloading for a small tissue drop.
- Content $\approx 1.34 \times 15 \times 0.97 \approx 19.5$ mL/dL loaded; at 75 %: ~ 15 mL $\rightarrow \sim 4.5$ mL delivered per dL ✓.
- At Hb 7.5: content halves (~ 9.7 mL/dL) – saturation still 97 %.