UNIVERSITY MEDICINE • EXERCISE SHEET

5.4 Respiratory physiology

Name: _____ Class: _____ Date: _____ **Total: 25 marks**

KEY WORDS alveolar gas equation

Objective

Apply the alveolar gas equation and the A–a gradient to sort hypoxaemia, and read the dissociation curve.

1 Key knowledge and worked examples

■ **The tools**

$P_{AO2} = 150 - P_{ACO2}/0.8$; A–a normal 5–15 mmHg; $P_{50} = 26.6$ mmHg, right shift with acid/CO_2/heat/BPG.

■ **Worked example: the two hypoxaemias**

Hypoventilation (P_{ACO2} 80): $P_{AO2} = 50$ with NORMAL A–a ✓ (the bellows). Shunt: normal alveolar, low arterial, WIDE gradient ✓ (the lung).

2 Practice

2.1 Compute P_{AO2} at $P_{ACO2} = 60$, R = 0.8. [3]

2.2 Name the four right-shift factors. [3]

2.3 Why does anaemia not desaturate the probe? [3]

3 Exam-style questions

3.1 Five hypoxaemic patients (fictional): (a) overdose with P_{ACO2} 80; (b) pneumonia with wide gradient; (c) at altitude (barometric 460); (d) shunt; (e) anaemia.

For each, state the mechanism and whether the A–a gradient widens. Show the arithmetic for (a) and (c). [9]

3.2 A patient at P_{AO2} 100 has saturation 97 %; at tissue P_{O2} 40 it is ~75 %.

Explain the curve's shape advantage (flat top loads, steep middle unloads). Compute the oxygen delivered per dL (Hb 15, 1.34 mL/g). Predict the content at Hb 7.5. [7]