**SAQ 1**

An 84 year old man is brought to your emergency department following a high speed car accident. He has signs of multiple left rib fractures. Two hours after arriving in the emergency department he becomes more breathless and distressed.

His observations are:

- GCS 14
- HR 75 bpm
- BP 100/60
- RR 24

His arterial blood gas on room air : results are below

| | | | Reference Range |
|---|---|---|---|
| pH | 7.14 | | (7.35-7.45) |
| $pCO_2$ | 60 | mmHg | (35-45) |
| $pO_2$ | 114 | | |
| $HCO_3^-$ | 17 | mmol/L | (21-28) |
| Lactate | 1.4 | mmol/L | (< 2.0) |
| $FiO_2$ | 50 | % | |
| $Na^+$ | 139 | mmol/L | (135-145) |
| $K^+$ | 4.8 | mmol/L | (3.2-4.3) |
| $Cl^-$ | 116 | mmol/L | (99-109) |
| Glucose | 11.3 | mmol/L | (3.0-6.0) |

**a. List 4 key abnormalities on the above blood gas (2 Marks)**

*½ Mark each up to 2 marks for*

- *Moderate acidaemia - mixed*
- *Hypercarbia / Raised pCO2 / Resp acidosis*
- *Low bicarb / metabolic acidosis*
- *Raised chloride*
- *Raised glucose*

**b. Calculate the patient's expected $pCO_2$ and show the formula used (2 Marks)**

*1 Mark each for:*

- *Formula: Winter's formula Expected $pCO_2 = 1.5 \times HCO_3^- + 8 +/- 2$*
- *Calculation: Expected pCO2 = 25.5 + 8 = 33.5 (Accept 31 – 35)*

**c. Calculate the patient's A-a gradient and show the formula's used (2 Marks)**

*1/2 Mark each for:*

- *A-a gradient = $PAO_2 – paO_2$*
- *$PAO_2 = (760-47) \times FiO_2 – pCO_2 / 0.8$*
- *$PAO_2 = 713 \times 0.5 – 75 = 281.5$ (Accept 280 – 283)*
- *A-a gradient = 281.5 – 114 = 167.5 (Accept 165-169)*

**d. List 8 potential causes for the patient's clinical picture and ABG result (4 Marks)**

*½ Mark each up to 4 marks from:*

- *Flail segment*
- *Pulmonary contusion*
- *Haemothorax*
- *Pneumothorax*
- *Drugs e.g. opiates*
- *Tension pneumothorax*
- *Fluid resuscitation +/- pulmonary odema (raised chloride)*
- *Hypoventilation from pain*
- *Hypercarbia secondary to oxygen Tx / underlying lung disease*

*Question and answers taken adapted from FACEM VAQ 2011.1.8.*