ABG questions – answers

Question 1
a. Respiratory acidosis
b. Acute on chronic (predicted HCO_3 26 if acute, 32 if chronic)

Question 2
a. Respiratory alkalaemia with no compensation
b. Hyperventilation due to anxiety attack

NB: if respiratory alkalosis, consider sepsis, as this may be an early sign.

Question 3
a. Metabolic acidosis with initial compensatory respiratory alkalosis. Expected compensation: CO_2 = 1.5 x HCO_3 = 7+8 = 15. So another process going on – respiratory acidosis due to decreased GCS. Anion gap 34; HAGMA present. Delta gap not present.
b. Methanol poisoning.

Question 4
a. Metabolic acidosis is the primary disturbance. There is also compensation with a respiratory alkalosis.
b. Likely cause is diarrhoea causing low HCO_3.

Question 5
a. Primary disturbance is a metabolic alkalosis with compensatory respiratory acidosis.
b. Volume contraction (vomiting, diuretics, NGT), Cushings, hypokalaemia, alkali ingestion
c. Expected CO_2 = 0.9*HCO_3 +9 = 37. Actual CO_2 is higher than this, so may have respiratory depression?

Question 6
a. Metabolic acidosis with respiratory alkalosis compensation. Expected CO_2 = 7x5 +8 – 15 (close enough).
b. Anion gap 19 (elevated). Delta gap: ΔHCO_3: ΔAnion gap 7:19;there is a lower HCO_3 than expected, so a process causing loss HCO_3 is going on. So three disorders: metabolic acidosis (DKA), respiratory alkalosis (pneumonia), NAGMA (diarrhoea).

Question 7
a. Metabolic acidosis with compensatory respiratory alkalosis.
b. Expected CO_2 same as actual, so compensation is as expected.
c. Anion gap = 54 (elevated). Delta gap: ΔHCO_3:Δanion gap 15:42…so HCO_3 is much higher than expected, meaning loss of H+. A concurrent metabolic alkalosis is present.

Question 8
a. Metabolic acidosis (HAGMA, as AG is 40). Delta gap: ΔHCO_3:Δanion gap 25:40…so more HCO_3 than expected, so H+ is being lost (metabolic alkalosis).
b. Ketoacidosis with vomiting.

Question 9
a. Metabolic acidosis (NAGMA) with respiratory compensation.

b. Expected CO_2 = 21 + 8 = 29. Actual CO_2 is 22. Lower CO_2 than expected, so a respiratory alkalosis is also present. Also, using Delta gap: ΔHCO_3:Δchloride 10:21…indicating higher HCO_3 than expected, so metabolic alkalosis.
c. NAGMA (diarrhoea). Respiratory alkalosis (fever). Metabolic alkalosis (vomiting).

Question 10
a. Respiratory alkalosis (chronic) with metabolic acidosis compensation. AG = 36 (elevated). Delta gap: ΔHCO_3:Δanion gap 9:21…..higher HCO3 than expected, so concurrent metabolic alkalosis.
b. Respiratory alkalosis (cirrhosis). Chronic metabolic acidosis (DKA). Metabolic alkalosis (vomiting).

Question 11
a. Respiratory alkalosis with metabolic acidosis compensation. Delta gap: ΔHCO_3:Δanion gap 14:4 … so HCO3 elevated compared to expected.
b. Respiratory alkalosis (pneumonia). Metabolic acidosis (renal impairment). Metabolic alkalosis (vomiting?).

Question 12
a. Respiratory alkalosis with metabolic acidosis.
b. Compensation with metabolic acidosis (HAGMA).
c. Delta gap: ΔHCO_3:Δanion gap 20:5 … more HCO3 than expected, so metabolic alkalosis present.

Question 13
a. Metabolic acidosis
b. Respiratory alkalosis compensation (expected CO2 32 – well compensated).

** although technically it appears there is no HAGMA, if the Anion gap is corrected for low albumin, a HAGMA is present. To do this, add 0.25 to the AG for every decrease of 1 in albumin from 30, so add (20x0.25) = 5. Anion gap is therefore 12+5 = 17 (elevated).

Question 14
a. Metabolic acidosis
b. Respiratory alkalosis compensation. Expected CO2 = 35, so adequate compensation.
c. Anion gap 22. Delta gap ΔHCO_3:Δanion gap 6:10…so HCO3 is elevated and a metabolic alkalosis is present.

Question 15
a. Blood gas shows a respiratory acidosis with metabolic alkalosis compensation. Anion gap acidosis. Using delta ratio ΔHCO_3:Δanion gap x:14. If 14, then HCO3 should have been 39 (25+14) prior to start of ketoacidosis, assuming single process.

Question 16
a. Aa gradient:
PaO2 = 40% x 713 – (46/0.8) = 285.2-57.5 = 228
Aa gradient = 228-100 = 128 (elevated)
b. Mixed respiratory acidosis and metabolic alkalosis.

Question 17
a. Primary metabolic alkalosis with respiratory compensation.
b. PaO2 = 713 x 0.4 – (42.4/0.8) = 285-53 = 232
Aa gradient = 232-142 = 90 (elevated)

Question 18
a. Respiratory acidosis with metabolic alkalosis
b. Chronic compensation (expected CO2 51)
c. Aa gradient 181 (313-61)

Question 19
a. Primary respiratory acidosis with compensatory metabolic alkalosis
b. Aa gradient = (428-114) – 105 = 209 (elevated)

Question 20
a. Primary metabolic acidosis (NAGMA) with respiratory compensation (expected CO2 39)
b. NAGMA: GI loss (bicarb loss), RTA (bicarb loss), recovery phase of DKA, Addisons, Chloride administration.

Question 21
a. Metabolic alkalosis and respiratory acidosis (chronic)
b. Expected CO2 = 0.9*HCO3 + 9 = 46. Yes, another process is present.
c. Aa gradient 159 (elevated)
d. Chronically unwell with compensation

Question 22
a. Respiratory acidosis and metabolic alkalosis.
b. Aa gradient = 209 (elevated)
c. i. Partially compensated respiratory acidosis ii. Acute on chronic respiratory acidosis iii. Mixed acute respiratory acidosis and small metabolic alkalosis.

Question 23
a. Hepatocellular damage
b. Panadol overdose (delayed presentation, with accidental overuse for pain rather than suicidal intent).

**note that AST is often >> ALT in alcohol abuse