I. ACID BASE BALANCE AND OXYGENATION

1. pH 7.24  
   PaCO₂ 80 mm Hg  
   PO₂ 65 mm Hg  
   HCO₃⁻ 33 mEq/L  
   FiO₂ .40  
   a. Interpret the ABG. PARTIALLY COMPENSATED RESPIRATORY ACIDOSIS WITH MILD HYPOXEMIA  
   b. Is this acute or chronic? CHRONIC  
   c. Calculate the Total CO₂ (CO₂ Content). HCO₃⁻ + (PaCO₂ * .03)  
      33 + (80 * .03) = 33 + 2.4 = 35.4  
   d. Describe the ventilation. Is the patient  
      i. Hyperventilating  
      ii. Hypoventilating  
      iii. Eucapnic

2. pH 7.40  
   PaCO₂ 65 mm Hg  
   PO₂ 55 mm Hg  
   HCO₃⁻ 39 mEq/L  
   FiO₂ .28  
   a. Interpret the ABG. YOU REALLY CAN'T TELL. THE pH SHOULD NEVER GO BACK TO EXACTLY 7.40. IT IS USUALLY ON ONE SIDE OF THE MIDPOINT OR THE OTHER. SO WE REALLY DON'T KNOW FOR SURE IF THIS IS A FULLY COMPENSATED RESPIRATORY ACIDOSIS OR A FULLY COMPENSATED METABOLIC ALKALOSIS. EITHER IS POSSIBLE. MODERATE HYPOXEMIA IS PRESENT.  
   b. What is the HCO₃⁻/H₂CO₃ ratio?  
      \[
      \frac{39}{(65 \times .03)} = \frac{39}{1.95} = 20 : 1
      \]  
   c. Calculate the Total CO₂ (CO₂ Content). 39 + 1.95 = 40.95 = 41.0  
   d. Is this ABG acute or chronic? CHRONIC  
   e. Describe the type of ventilation: Is the patient  
      Hyperventilating  
      Hypoventilating  
      Eucapnic
3. pH  7.34  
   PaCO₂  80 mm Hg  
   PO₂  40 mm Hg  
   HCO₃⁻  42 mEq/L  
   FiO₂  .35  

   a. Interpret the ABG. **PARTIALLY COMPENSATED RESPIRATORY ACIDOSIS WITH MODERATE HYPOXEMIA**  
   
   b. Calculate the HCO₃⁻/H₂CO₃ ratio.  
   \[
   \frac{42}{(80 \times .03)} = \frac{42}{2.4} = 17.5 : 1
   \]
   
   c. Describe the type of ventilation: Is the patient Hyperventilating  
   Hypoventilating  
   Eucapnic

4. pH  7.62  
   PaCO₂  40 mm Hg  
   PO₂  88 mm Hg  
   HCO₃⁻  40 mEq/L  
   FiO₂  .30  

   a. Interpret the ABG. **UNCOMPENSATED METABOLIC ALKALOSIS WITH NORMOXEMIA**  
   
   b. Describe the type of ventilation. **EUCAPNIC**  
   
   c. Calculate the HCO₃⁻/H₂CO₃ ratio.  
   \[
   \frac{40}{(40 \times .03)} = \frac{40}{1.2} = 33.3 : 1
   \]
   
   d. Calculate the Total CO₂ (CO₂ content)  
   \[40 + 1.2 = 41.2\]

5. pH  7.47  
   PaCO₂  20 mm Hg  
   PO₂  110 mm Hg  
   HCO₃⁻  14 mEq/L  
   FiO₂  .21  

   a. Interpret the ABG. **PARTIALLY COMPENSATED RESPIRATORY ALKALOSIS WITH HYPEROXEMIA.**  
   
   b. Calculate the HCO₃⁻/H₂CO₃ ratio.  
   \[
   \frac{14}{(20 \times .03)} = \frac{14}{.6} = 23.3 : 1
   \]
   
   c. Calculate the Total CO₂ (CO₂ content).  
   \[14 + .6 = 14.6\]
6. pH 7.02
PaCO₂ 60 mm Hg
PO₂ 70 mm Hg
HCO₃⁻ 15 mEq/L
FiO₂ .50

a. Interpret the ABG. **MIXED ACIDOSIS WITH MILD HYPOXEMIA.**

b. The oxygen dissociation curve would most likely be shifted to the **RIGHT.**

c. Calculate the A-a gradient assuming the barometric pressure is 760 mm Hg.
   
   \[ \{(760 - 47) \times .50\} - (60 \times 1.25) = 356.5 - 75 = 281.5 = 282 \]

d. Describe the type of ventilation. **HYPOVENTILATION**

e. Does the patient have hypoxia? **POSSIBLY. THE LOW HCO₃⁻ Coupled WITH THE LOW PaO₂ INDICATES IT IS POSSIBLE.**

7. pH 7.45
PaCO₂ 24 mm Hg
PO₂ 90 mm Hg
HCO₃⁻ 16 mEq/L
SaO₂ 55 %
COHb 50%
FiO₂ .35

a. Interpret the ABG. **FULLY COMPENSATED RESPIRATORY ALKALOIS WITH NORMOXEMIA.**

b. Does the patient have hypoxemia? **NO**  Does the patient have hypoxia? **YES, ANEMIC HYPOXIA.**

c. Describe the type of ventilation. **HYPERVENTILATION**

8. pH 7.93
PaCO₂ 23 mm Hg
PO₂ 52 mm Hg
HCO₃⁻ 47 mEq/L
FiO₂ .60

a. Interpret the ABG. **MIXED ALKALOSIS WITH HYPOXEMIA**

b. Describe the type of ventilation. **HYPERVENTILATION**

II. **Answers to Acid-Base Interpretation: Classroom Exercise**

1. Mixed Respiratory and Metabolic Acidosis with hyperoxemia.

2. Uncompensated Metabolic Alkalosis with moderate hypoxemia.
3. Partly Compensated Respiratory Alkalosis with hyperoxemia.
4. Partly Compensated Metabolic Acidosis with hyperoxemia.
5. Uncompensated Respiratory Acidosis with moderate hypoxemia *(Mechanical Ventilation Indicated)*.
6. Uncompensated Respiratory Alkalosis with mild hypoxemia.
7. Partly Compensated Metabolic Acidosis with moderate hypoxemia.
8. Lab Error (PaO₂ + PaCO₂ cannot be greater than 159 on room air)
10. Mixed alkalosis with severe hypoxemia.
11. Partly Compensated Metabolic Alkalosis with severe hypoxemia.
12. Uncompensated Metabolic Alkalosis with moderate hypoxemia.
13. Partially compensated Metabolic Alkalosis with mild hypoxemia.
15. Fully compensated Metabolic Alkalosis with mild hypoxemia.
16. Partially compensated Respiratory Alkalosis with normoxemia.
17. Uncompensated Respiratory Alkalosis with moderate hypoxemia.
18. Uncompensated Metabolic Acidosis with moderate hypoxemia.
19. Fully compensated Respiratory Alkalosis with severe hypoxemia.
20. Lab Error. (PaO₂ + PaCO₂ cannot be greater than 159 on room air)