I. ACID BASE BALANCE AND OXYGENATION

1.

pH	7.24
$PaCO_2$	80 mm Hg
PO_2	65 mm Hg
HCO_3^-	33 mEq/L
FiO_2	.40

a. Interpret the ABG. **PARTIALLY COMPENSATED RESPIRATORY ACIDOSIS WITH MILD HYPOXEMIA**

b. Is this acute or chronic? **CHRONIC**

c. Calculate the Total CO_2 (CO_2 Content). **HCO_3^- + ($PaCO_2$ *.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
$PaCO_2$	65 mm Hg
PO_2	55 mm Hg
HCO_3^-	39 mEq/L
FiO_2	.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 HCO_3^-/H_2CO_3 ratio?

$$\frac{\mathbf{39}}{(\mathbf{65}\times\mathbf{.03})}=\frac{\mathbf{39}}{\mathbf{1.95}}=\mathbf{20:1}$$

c. Calculate the Total CO_2 (CO_2 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
$PaCO_2$	80 mm Hg
PO_2	40 mm Hg
HCO_3^-	42 mEq/L
FiO_2	.35

a. Interpret the ABG. **PARTIALLY COMPENSATED RESPIRATORY ACIDOSIS WITH MODERATE HYPOXEMIA**

b. Calculate the HCO_3^-/H_2CO_3 ratio.

$$\frac{\mathbf{42}}{(\mathbf{80}\times\mathbf{.03})}=\frac{\mathbf{42}}{\mathbf{2.4}}=\mathbf{17.5:1}$$

c. Describe the type of ventilation: Is the patient
Hyperventilating
Hypoventilating
Eucapnic

4.

pH	7.62
$PaCO_2$	40 mm Hg
PO_2	88 mm Hg
HCO_3^-	40 mEq/L
FiO_2	.30

a. Interpret the ABG. **UNCOMPENSATED METABOLIC ALKALOSIS WITH NORMOXEMIA**

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

c. Calculate the HCO_3^-/H_2CO_3 ratio.

$$\frac{\mathbf{40}}{(\mathbf{40}\times\mathbf{.03})}=\frac{\mathbf{40}}{\mathbf{1.2}}=\mathbf{33.3:1}$$

d. Calculate the Total CO_2 (CO_2 content)
40 + 1.2 = 41.2

5.

pH	7.47
$PaCO_2$	20 mm Hg
PO_2	110 mm Hg
HCO_3^-	14 mEq/L
FiO_2	.21

a. Interpret the ABG. **PARTIALLY COMPENSATED RESPIRATORY ALKALOSIS WITH HYPEROXEMIA.**

b. Calculate the HCO_3^-/H_2CO_3 ratio.

$$\frac{\mathbf{14}}{(\mathbf{20}\times\mathbf{.03})}=\frac{\mathbf{14}}{\mathbf{.6}}=\mathbf{23.3:1}$$

c. Calculate the Total CO_2 (CO_2 content).**14 + .6 = 14.6**

6.

pH	7.02
$PaCO_2$	60 mm Hg
PO_2	70 mm Hg
HCO_3^-	15 mEq/L
FiO_2	.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) * .50] – (60 * 1.25) = 356.5 – 75 = 281.5 = 282

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

e. Does the patient have hypoxia? **POSSIBLY. THE LOW HCO_3^- COUPLED WITH THE LOW PaO_2 INDICATES IT IS POSSIBLE.**

7.

pH	7.45
$PaCO_2$	24 mm Hg
PO_2	90 mm Hg
HCO_3	16 mEq/L
SaO_2	55 %
COHb	50%
FiO_2	.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
$PaCO_2$	23 mm Hg
PO_2	52 mm Hg
HCO_3^-	47 mEq/L
FiO_2	.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 (PaO_2 + $PaCO_2$ cannot be greater than 159 on room air)

9. Mixed Respiratory and Metabolic Alkalosis with mild hypoxemia.

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.

14. Mixed Respiratory and Metabolic Acidosis with moderate 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. (PaO_2 + $PaCO_2$ cannot be greater than 159 on room air)