1. Given the following information, calculate the % shunt
Hb 10 gm%, PB 750 torr, PaO2 80 torr, SaO2 92%, PvO2 36 torr, SvO2 65%
PaCO2 40 torr, FiO2 .40

\[
CaO2 = (Hb \times 1.34 \times SaO2) + (PaO2 \times 0.003) = (10 \times 1.34 \times 0.92) + (80 \times 0.003) = 12.57
\]

\[
CvO2 = (Hb \times 1.34 \times SvO2) + (PvO2 \times 0.003) = (10 \times 1.34 \times 0.65) + (36 \times 0.003) = 8.82
\]

\[
PAO2 = [(PB - 47) \times FiO2] - (PaCO2 \times 1.25) = [(750 - 47) \times 0.4] - (40 \times 1.25) = 231.2
\]

\[
Cc'O2 - CaO2 = \frac{14.09 - 12.57}{14.09 - 8.82} = \frac{1.52}{5.27} = .288 = 28.9\%
\]

2. Given the following information, calculate the Physiological Deadspace (Vd).

Vt 600 mL, PaCO2 55, PEO2 44

\[
V_d = \frac{PaCO2 - PEO2}{PaCO2} \times V_t = \frac{55 - 44}{55} \times 600L = .12L or 120 mL
\]

3. Given the following information, calculate the Vd/Vt ratio.

PaCO2 49mm Hg, PEO2 30 mm Hg

\[
\frac{V_d}{V_t} = \frac{PaCO2 - PEO2}{PaCO2} = \frac{49 - 30}{49} = .39
\]

4. Given an alveolar ventilation of 4 L/min and a cardiac output of 2 L/min, calculate the V/Q ratio.
   A. Is this a high, low or normal ratio? HIGH
   B. What type of V/Q ratio is this? DEADSPACE (RELATIVE)
   C. List a clinical situation that may cause this type of V/Q ratio. HYPOTENSION

5. Given an alveolar ventilation of 2 L/min and a cardiac output of 0 L/min, calculate the V/Q ratio. ∞

6. A. List a clinical condition that may cause this type of V/Q ratio. Pulmonary Embolus
   B. Is this a high, low or normal ratio? HIGH
   C. What type of V/Q ratio is this? TRUE DEADSPACE

7. Given an alveolar ventilation of 10 L/min and a cardiac output of 5 L/min, calculate the V/Q ratio. 2
   A. Is this a high, low or normal ratio? HIGH
   B. What type of V/Q ratio is this? RELATIVE DEADSPACE

8. Given a Vd/Vt ratio of 50% and a tidal volume of 400 mL, calculate:
A. Physiologic Dead space: $0.5 \times 400 = 200 \text{ mL}$

B. Alveolar Ventilation: $400 - 200 = 200 \text{ mL}$

9. Given a Vd/Vt ratio of 70% and a tidal volume of 600 mL, calculate:

A. Physiologic Dead space: $0.7 \times 600 = 420 \text{ mL}$

B. Alveolar Ventilation: $600 - 420 = 180 \text{ mL}$

10. Given the following information (PaCO$_2$ of 50 mmHg, PECO$_2$ of 34 mmHg and Tidal Volume of 600 mL), calculate:

A. Vd/Vt ratio  
\[
\frac{V_d}{V_t} = \frac{PaCO_2 - PECO_2}{PaCO_2} = \frac{50 - 34}{50} = .32
\]

B. Physiologic Dead space: $.32 \times 600 = 192 \text{ mL}$

C. Alveolar Ventilation: $600 - 192 = 408 \text{ mL}$

11. Given an alveolar ventilation of 0 L/min and a cardiac output (Qt) of 5 L/min, calculate the V/Q ratio. 0

A. What type of V/Q ratio is this? TRUE SHUNT

B. List three clinical conditions which could cause this type of V/Q ratio
   I. Atelectasis
   II. Pneumonia
   III. ARDS

C. How would you treat this type of V/Q ratio? Alveolar recruitment

12. Given an alveolar ventilation of 2 L/min and a cardiac output of 6 L/min, calculate the V/Q ratio. 0.33

A. What type of V/Q ratio is this? Shunt (relative)

B. Give a clinical situation that may cause this type of V/Q imbalance Pulmonary secretions

C. How would you treat this type of V/Q imbalance? Maintain patent airway

13. You calculate a patient’s shunt to be 30%.

A. What does this mean to you? Elevated

B. What is the normal shunt? 2 to 5%

14. Given an alveolar ventilation of 5 L/min and a cardiac output of 10 L/min, calculate the V/Q ratio. 0.5

A. What type of V/Q ratio is this? Relative Shunt
B. What type of clinical situation would cause this type of V/Q imbalance? 
   **Sepsis (Increased cardiac output)**

15. Given an alveolar ventilation of 0 L/min and a cardiac output of 0 L/min, what is the V/Q ratio? **0**

A. What effect does this type of V/Q ratio have on a patient? **Death**

B. Name clinical conditions that may cause this type of V/Q imbalance. 
   **Significant unilateral disease with contralateral pulmonary embolus**