Quiz

"On the Mechanics of Breathing"

ANSWERS

1. **What force causes air to move into your lungs?**

   Atmospheric pressure, having generated a negative interthoracic pressure relative to atmosphere.

2. **How is inspiration achieved?**

   By contracting the diaphragm, increasing the caudal rostral diameter, by contracting the intercostal muscles, increasing AP diameter (bucket handle).

3. **How do you move air out of your lungs?**

   Passive recoil and or forced expiration.

4. **How is expiration achieved?**

   Relaxation of the diaphragm and intercostal muscles and or contraction of the anterior abdominal wall muscles.

5. **What are the units used to measure the pressures involved in breathing?**

   Cm of water.

6. **What is a respiratory cycle?**

   One inspiration and one expiration.

7. **How long is your respiratory cycle?**

8. **What proportion of the respiratory cycle did you inspire and what proportion of the time did you expire?**

9. **What do you understand by the term inspiratory expiratory ratio (I:E) and what is it for homo sapiens breathing normally?**

   The usual I:E ratio is 1:2

10. **What do you understand by the terms 'minimum inspiratory time constant' and 'minimum expiratory time constant'?**

    The shortest time to achieve an adequate inspiration and an adequate expiration.

11. **What is the inspiratory time and the expiratory time for an adult breathing at a rate of 20 bpm and 60 bpm?**

    20 bpm = 1.0 seconds inspiration and 2 seconds expiration.
    60 bpm = 0.33 seconds inspiration and 0.66 seconds expiration.

12. **What is the Inspiratory time and the expiratory time of a newborn baby breathing 40 bpm and 90 bpm?**

At 40 bpm inspiratory time 0.5 seconds expiratory time 1.0 seconds.
At 90 bpm inspiratory time 0.22 seconds expiratory time 0.44 seconds.

13. **What do you understand by tidal volume of breathing?**

The volume of gas moved in and out in one respiratory cycle.

14. **What do you understand by minute volume of breathing?**

The volume of gas moved in and out in one minute of breathing.
Tidal volume x rate of breathing = minute volume.

15. **In each alveolus is an air filled fluid water interface, what would a 3 year old call it, an air filled space surrounded by a liquid?**
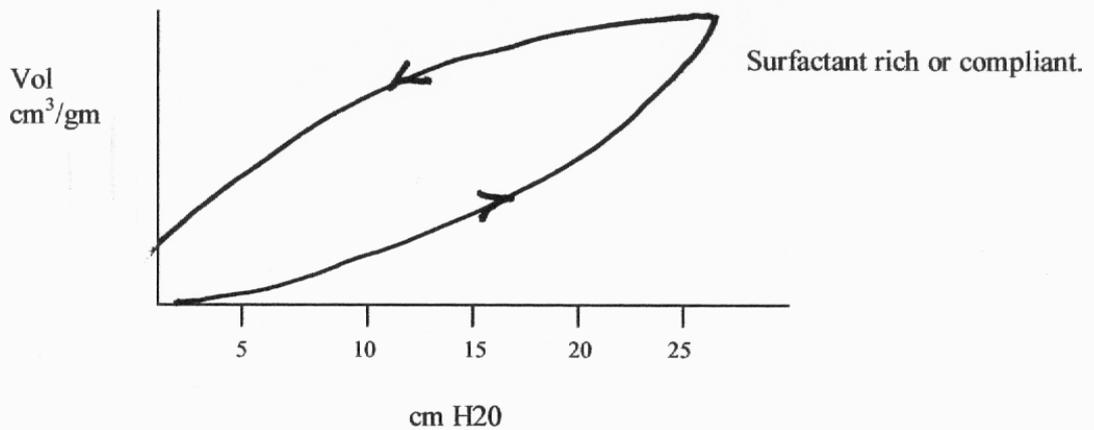
A bubble.

16. **What is the physical law applied to an air filled space surrounded by a liquid and what is its expression?**
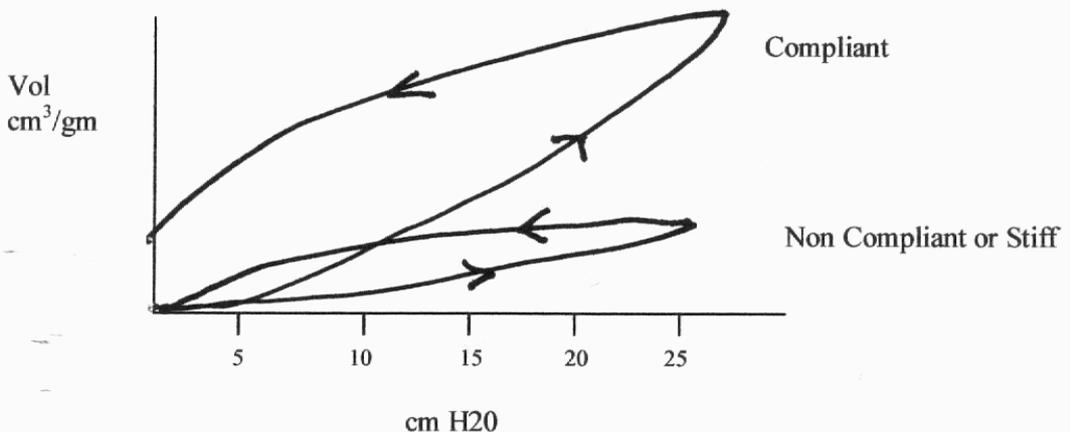
Le Place P = $\dfrac{2T}{r}$

17. **What do you understand by a pressure volume loop as related to the mechanics of the lung and draw one?**

The relationship of the pressure changes and volume changes in the lung during one respiratory cycle.

18. **Draw the pressure volume loop of a surfactant deficient lung?**

SUMMARY

You have understood:

How we breathe as a result of generating negative pressure and passive recoil.

The I:E ratio for homo sapiens is 1:2.

	Adult			Baby

At 20 bpm normal inspiratory time =   **1 sec**   **At 40 bpm normal inspiratory time =**   **0.5 sec**
At 20 bpm normal expiratory time =   **2 sec**   **At 40 bpm normal expiratory time =**   **1.0 sec**

At 60 bpm minimum inspiratory time = 0.33 sec   **At 90 bpm minimum inspiratory time = 0.33 sec**
At 60 bpm minimum expiratory time = 0.66 sec   **At 90 bpm minimum expiratory time = 0.44 sec**

Tidal volume
Minute volume

Le Place's law $P = \dfrac{2T}{r}$

Pressure volume loops
Compliant lungs with surfactant
Non compliant (stiff) without surfactant