Mechanics of Breathing

Atmospheric pressure = 760 mmHg or 1 atm
-4mmHg respiratory pressure means that pressure inside a part of the body is less 4 mmHg less than atmospheric pressure (in this case, 756 mmHg)

Intrapulmonary pressure (intra-alveolar) Ppul = pressure inside an alveolus. This value goes slightly above and slightly below atmospheric pressure while breathing.

Intrapleural pressure Pip = pressure within the pleural cavity is *always* less than atmospheric pressure, even when we are exhaling.

Homeostatic imbalance: if Pip becomes = to Ppul, lungs will collapse. This can occur from a pneumothorax (air enters the pleural cavity from a puncture).

"Quiet" Inspiration:

1. Space in the thoracic cavity is increased by ~500mL by two events:
    a. Diaphragm contracts, moving downward.
    b. External intercostal muscles contract, pulling ribcage out
2. Ppul decreases since volume has increased
    a. –1 mmHg
3. Air rushes in, since atm pressure is now greater than Ppul.

"Forced" Inspiration (eg during exercise):
*SCM, scalenes and back muscles contribute to decrease Ppul even further

"Quiet" Expiration:

1. Diaphragm and intercostals relax, decreasing space in thorax.
2. Ppul increases since volume has decreased
    a. +1 mmHg
3. Air rushes out, since atm. pressure is now less than Ppul.

"Forced" Expiration (eg during exercise)
*abdominal muscles and internal intercostals contribute to increase Ppul even further.

Lung Compliance: ease of expansion of lung tissue. Compliance is decreased in certain disease states, such as tuberculosis. Lack of surfactant also diminishes compliance.

Forces that tend toward collapse of alveolus: surface tension (fluid); and elasticity
Forces that tend toward expansion of alveolus: surfactant; intrapleural negative pressure

Dead Space: air that is not involved in gas exchange because it is in the trachea or bronchii. Increases in some disease states because some of the alveoli develop thickened walls that don't exchange gas; or because many alveoli collapse into one large one and the space is too large for effective gas exchange.