ACID -B

$$pH = pK_a + \log\left(\frac{HCO_3^-}{PCO_2 \times 0.03}\right)$$

- The value of pK_a is 6.1, and the normal HCO_3^- and PCO_2 are 24 mmol/L and 40 mmHg respectively. Substitute these,

$$pH = 6.1 + \log\left(\frac{24}{40 \times 0.03}\right)$$

$$= 6.1 + \log 20$$

$$= 6.1 + 1.3$$

$$= 7.4$$

Regulation of pH

- Buffer systems - very rapid (seconds), incomplete
- Respiratory responses -

- Commonly, the AG remains normal in an acidosis that is due to simple loss of HCO_3^- (as in diarrhea and certain renal diseases) because, as a general principle, $[Cl^-]$ increases to meet the drop in HCO_3^- anions, thereby maintaining anionic balance.
- When an acid load is present, HCO_3^- titrates acid and anion gap increases, creating a condition known as 'anion gap metabolic acidosis'.

Major Acid Base Disorders and Compensatory Mechanism

Primary Disorder	Primary Disturbance	Primary Compensation
Respiratory Acidosis	9 PCO_2	9 HCO_3^-
Respiratory Alkalosis	; PCO_2	; HCO_3^-
Metabolic Acidosis	; HCO_3^-	; PCO_2 (hyperventilation)
Metabolic Alkalosis	9 HCO_3^-	9 PCO_2 (hypoventilation)

- The primary compensation (acute compensation) is generally achieved most rapidly through respiratory control of CO_2
- Ultimately the renal system excretes acid or bicarbonate (chronic compensation) to reach the final response to the disturbance
- Mixed disorders are common

Blood Gas Evaluation

What do we get from a blood gas machine?

- pH - measured
- PCO_2 - measured
- PO_2 - measured
- HCO_3^- - calculated (via Henderson Hesselbalch equation)
- Base excess (deficit) - calculated
- Hemoglobin oxygen saturation - calculated
- Gases (carbon dioxide & oxygen) are reported as partial pressures, commonly in unit of mmHg (US), or KPa (International); 1 KPa = 7.5 mmHg (torr)

Blood Gas Sampling

- Arterial vs. venous
- Venous samples are

Sites for Arterial Samples

- Dog: dorso pedal, femoral, anterior tibial, lingual
- Cat: femoral, dorso pedal
- Horse: facial, mandibular, lateral metatarsal, posterior auricular, carotid
- Cow: coccygeal, posterior auricular
- Pig: coccygeal, posterior auricular

Normal Values

	Arterial	Venous
pH	7.35-7.45	7.35
PCO_2	35-45 mmHg	45 mmHg
PO_2	90-100 mmHg	40 mmHg
HCO_3^-		