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**COURSE: PHYSIOLOGY**

**CHARACTERISTICS OR COMPONENTS OF URINE**

**Primary Components**

Human urine consists primarily of water (91% to 96%), with organic solutes including urea, creatinine, uric acid, and trace amounts of enzymes, carbohydrates, hormones, fatty acids, pigments, and mucins, and inorganic ions such as sodium (Na+), potassium (K+), chloride (Cl-), magnesium (Mg2+), calcium (Ca2+), ammonium (NH4+), sulfates (SO42-), and phosphates (e.g., PO43-)

**Composition of Urine**

* Water (H2O): 95%
* Urea (H2NCONH2): 9.3 g/l to 23.3 g/l
* Chloride (Cl-): 1.87 g/l to 8.4 g/l
* Sodium (Na+): 1.17 g/l to 4.39 g/l
* Potassium (K+): 0.750 g/l to 2.61 g/l
* Creatinine (C4H7N3O): 0.670 g/l to 2.15 g/l
* Inorganic sulfur (S): 0.163 to 1.80 g/l

**physical characteristics of normal urine**

Volume is one of the physical characteristics of urine. Other physical characteristics that can apply to urine include color, turbidity (transparency), smell (odor), pH (acidity - alkalinity), and density.

* **Color**: Typically, yellow-amber but varies according to recent diet and the concentration of the urine. Drinking more water generally tends to reduce the concentration of urine, and therefore cause it to have a lighter color. (The converse is also true.)
* **Smell:** The smell (or "odor", which is the more clinical term, *American spelling "odor"*) of urine may provide health information. For example, urine of diabetics may have a sweet or fruity odor due to the presence of ketones (organic molecules of a particular structure). Generally fresh urine has a mild smell but aged urine has a stronger odor, similar to that of ammonia.
* **Acidity**: pH is a measure of the acidity (or alkalinity) of a solution. The pH of a substance (solution) is usually represented as a number in the range 0 (strong acid) to 14 (strong alkali, also known as a "base"). Pure water is "neutral" in the sense that it is neither neither acid nor alkali, it therefore has a pH of 7. The real significance of pH in terms of physical chemistry is that pH is a measure of the activity of hydrogen ions (H+) in a solution.
* The pH of normal urine is generally in the range 4.6 - 8, a typical average being around 6.0. Much of the variation is due to diet. For example, high protein diets result in more acidic urine, but vegetarian diets generally result in more alkaline urine (both within the typical range 4.6 - 8).
* **Density**: Density is also known as "specific gravity". This is the ratio of the weight of a volume of a substance compared with the weight of the same volume of distilled water*.*
* Given that urine is mostly water, but also contains some other substances dissolved in the "water", its density is expected to be close to, but slightly greater than, 1.0. This is true - the density of normal urine is in the range 0.001 to 0.035.