Q16 List the constituents of plasma and the functions of plasma proteins (Sept 2012)

Plasma comprises about 18% of extracellular fluid, or 5% of bodyweight. It is the noncellular part of the blood, being about 60% of blood volume. It is 93% water, 6% proteins and 1% other solutes.

The constituents of plasma include:

- Water
- Proteins
  - Albumin
  - Fibrinogen
  - Regulatory proteins
    - Coagulation factors
    - Complement proteins
  - Globulins
    - $\alpha_1$ ($\alpha_1$ anti trypsin, $\alpha_1$-fetoprotein, serum amyloid A)
    - $\alpha_2$ (haptoglobin, ceruloplasmin, Protein C, thyroxin-binding globulin)
    - $\beta$ (transferrin, plasminogen, $\beta_2$ microglobulin, C-reactive protein)
    - $\gamma$ (immunoglobulins)
- Nutrients – vitamins, glucose
- Gases – oxygen, CO2, nitrogen
- Hormones
- Electrolytes – Na, K, Cl, Mg
- Products of metabolism – urea, creatinine, nitrogenous wastes,

**FUNCTIONS OF PLASMA PROTEINS**

- Maintenance of oncotic pressure → capillaries have semi permeable membranes impermeable to large proteins. Bulk direction of flow depends on the interaction of the 4 starling forces $NFP = K[(Pc-Pi) - \delta(\pi_c-\pi_i)]$ where $k$ is the diffusion coefficient (surface area x hydraulic permeability) and $\delta$ is the reflection coefficient
- Transport/carrier function → hormones, energy substrates, drugs
- Proteolytic → complement, kinins, fibrinolysis
- Coagulation → contains many circulating coagulation factors
- Buffering action → contains HCO3 and CO2 as well as plasma proteins and haemoglobin, all of which have buffering actions
- Enzymes (eg; plasma cholinesterase)
- Immune response → contains immunoglobulins
- Metabolism → albumin and other proteins provide a source of amino acids to tissues for fuel