How are inorganic ions are used in living organisms

Inorganic ions include those of sodium, phosphorus and hydrogen. Describe how these and other inorganic ions are used in living organisms. Inorganic ions in animals and plants are necessary for vital cellular activity. In body tissue they can also be called electrolytes, which are essential for electrical activity needed to support muscle contractions and neuron activation. Ions also effect how pH changes in the blood and other bodily functions. Ions are also incorporated into the structure of biological molecules. Resting potentials require ions as they play a vital role in the process.

In the surface membrane of a cell there are protein carriers. These actively pump Na+ ions out of the cytoplasm to the outside of the cell. At the same time, K+ ions are pumped from the outside in. This active pumping of Na+ and K+ ions requires ATP because the ions are being moved against their concentration gradients. K+ and Na+ ions diffuse back down their concentration gradient but K+ diffuses back out of the cell faster than Na+ can diffuse back in. Which means that there is a net movement of positive ions out of the cell making the inside of the cell negatively charged, relative to the outside.

This charge is the resting potential of the cell and is about -70mV. Ions are also used in action potentials. When a receptor is stimulated, it will create a positiveenvironmentinside the cell. This is caused by a change in the concentrations of Na+ and K+ ions in the cell and happens when there is a change in permeability to Na+ and K+ in the cell surface membrane at the area of stimulation, which causes Na+ channels in that area to open, Na+ therefore floods into the cytoplasm down the concentration gradient. As this happens the membrane depolarizes.

If this depolarisation reaches a certain level, called the threshold level then an action potential has been generated and an impulse will be fired. If it does not reach this level, nothing will happen. Once +40mV is reached the Na+ channels close and K+ channels open. K+ floods out of the cytoplasm so that the overall charge inside goes back down. This stage is called repolarisation. The K+ channels then close, the sodium-potassium pump restarts, restoring the normal distribution of ions either side of the cell surface membrane and thus restoring the resting potential.

In response to this the Na+ channels in that area would open up, allowing Na+ ions to flood into the cell and thus reducing the resting potential of the cells. If the resting potential of the cell drops to the threshold level, then an action potential has been generated and an impulse will be fired. In photosynthesis H+ ions are vital in the production of the energy source that is ATP, which is used in several metabolic processes, such as respiration. The photolysis of water produces H+ ions, electrons and O2.

The excited electrons lose energy as they move along the electron transport chain, this energy is used to transport the H+ ions (protons) in to the thylakoid, which causes a higher concentration of H+ than there is in the stroma, thus causing a proton gradient across the membrane. The H+ then proceed to move down the concentration gradient into the stroma via the enzyme ATP synthase. The energy from this process is called chemiosmosis and combines ADP with inorganic phosphate (Pi) to form ATP. Light energy is then absorbed by photosystem I (PS I) which excites the electrons to a higher energy level.

These electrons are transferred to NADP with H+ ions from the stroma to form reduced NADP. The whole of this process is called non-cyclic photophosphorylation and is part of the ligh-dependent reaction. Reduced NADP is used with ATP to make GALP in the light independent stage of photosynthesis. GALP is either used to replenish ribulose bisphosfphate, a key ingredient for respiration, or make a hexose sugar such as glucose, lipids or amino acids. By means of conclusion, inorganic ions are vital for life on planet Earth. Without ions such as nitrate ions, DNA would not be exist and thus nor would existence.