National 5 key areas: Cell Biology.

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| **Key area 1: Cell Structure** | **I know this.** | **I need to go over this.** | **I don’t know this.** |
| Cell ultrastructure and functions — cell wall, mitochondrion, chloroplast, cell membrane, cytoplasm, vacuole, nucleus, ribosome and plasmid using examples from typical plant, animal, fungal and bacterial cells. |  |  |  |
| Cell wall is made of cellulose in plant cells but of different materials in fungal and bacterial cells. |  |  |  |
| **Key area 2: Transport across cell membranes** | **I know this.** | **I need to go over this.** | **I don’t know this.** |
| The cell membrane consists of phospholipids and proteins and is selectively permeable. |  |  |  |
| Passive transport occurs down a concentration gradient and does not require energy. Examples of passive transport are diffusion and osmosis. |  |  |  |
| Diffusion is the movement of molecules down a concentration gradient from a higher to a lower concentration. |  |  |  |
| Osmosis is the movement of water molecules from a higher water concentration to a lower water concentration through a selectively permeable membrane. |  |  |  |
| Animal cells can burst or shrink and plant cells can become turgid or plasmolysed. Relationship between different concentrations of solutions and their effect on cells. |  |  |  |
| Active transport requires energy for membrane proteins to move molecules and ions against the concentration gradient. |  |  |  |
| **Key area 3: DNA and the production of proteins.** | **I know this.** | **I need to go over this.** | **I don’t know this.** |
| Structure of DNA: double-stranded helix held by complementary base pairs. |  |  |  |
| DNA carries the genetic information for making proteins. |  |  |  |
| The four bases: adenine, cytosine, guanine and thymine (A, C, G and T) make up the genetic code. A is always paired with T and C is always paired with G. |  |  |  |
| The base sequence determines amino acid sequence in proteins. A gene is a section of DNA which codes for a protein. |  |  |  |
| Messenger RNA (mRNA) is a molecule which carries a complementary copy of the genetic code from the DNA, in the nucleus, to a ribosome, where the protein is assembled from amino acids. |  |  |  |
| **Key area 4: Proteins.** | **I know this.** | **I need to go over this.** | **I don’t know this.** |
| The variety of protein shapes and functions arises from the sequence of amino acids. |  |  |  |
| Proteins have many functions such as structural, enzymes, hormones, antibodies and receptors. |  |  |  |
| Enzymes function as biological catalysts and are made by all living cells. They speed up cellular reactions and are unchanged in the process. |  |  |  |
| The shape of the active site of an enzyme molecule is complementary to its specific substrate(s). Enzyme action results in product(s). |  |  |  |
| Enzymes can be involved in degradation and synthesis reactions. Examples should relate enzymes to their specific substrate(s) and product(s). |  |  |  |
| Each enzyme is most active in its optimum conditions. |  |  |  |
| Enzymes and other proteins can be affected by temperature and pH. |  |  |  |
| Enzymes can be denatured, resulting in a change in their shape which will affect the rate of reaction. |  |  |  |
| **Key area 5: Genetic engineering** | **I know this.** | **I need to go over this.** | **I don’t know this.** |
| Genetic information can be transferred from one cell to another by genetic engineering. |  |  |  |
| Stages of genetic engineering:  1. Identify section of DNA that contains required gene from source chromosome;  2. Extract required gene; extract plasmid from bacterial cell;  3. Insert required gene into bacterial plasmid;  4. Insert plasmid into host bacterial cell to produce a genetically modified (GM) organism. |  |  |  |
| Enzymes are used in this process. |  |  |  |
| **Key area 6: Respiration** | **I know this.** | **I need to go over this.** | **I don’t know this.** |
| The chemical energy stored in glucose must be released by all cells through a series of enzyme-controlled reactions called respiration. |  |  |  |
| The energy released from the breakdown of glucose is used to generate ATP. |  |  |  |
| The energy transferred by ATP can be used for cellular activities such as muscle cell contraction, cell division, protein synthesis and transmission of nerve impulses. |  |  |  |
| Glucose is broken down to two molecules of pyruvate, releasing enough energy to yield two molecules of ATP. Further breakdown depends upon the presence/absence of oxygen |  |  |  |
| If oxygen is present, aerobic respiration takes place, and each pyruvate is broken down to carbon dioxide and water, releasing enough energy to yield a large number of ATP molecules. |  |  |  |
| In the absence of oxygen, the fermentation pathway takes place. |  |  |  |
| When animal cells ferment, the pyruvate molecules are converted to lactate |  |  |  |
| When plant and yeast cells ferment, they are converted to carbon dioxide and ethanol. |  |  |  |
| The breakdown of each glucose molecule via the fermentation pathway yields only the initial two molecules of ATP. |  |  |  |
| Respiration begins in the cytoplasm. |  |  |  |
| Aerobic respiration is completed in the mitochondria. |  |  |  |
| Fermentation is completed in the cytoplasm |  |  |  |