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| **Photosynthesis reaction** | |
| Photosynthesis | An endothermic process used by plants to convert carbon dioxide and water into glucose and oxygen using energy in sunlight. |
| Word equation | water + carbon dioxide → glucose + oxygen |
| Symbol equation | 6CO₂ + 6H₂O → C₆H₁₂O₆ + 6O₂ |
| Chloroplast | An organelle that contains chlorophyll and in which photosynthesis takes place. |
| Chlorophyll | Green pigment in plants that absorbs light energy used to carry out photosynthesis. |
| Endothermic | A chemical reaction that requires a net input of energy. |

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| **Adaptations of leaves** | |
| Adaptations of leaves for photosynthesis | Broad, thin, veins, cells packed with chloroplasts, waxy cuticle, stomata. |
| Stomata | Small openings on the underside of a leaf through which oxygen and carbon dioxide can move. |
| Guard cells | Cells that control the opening and closing of the stomata. |
| Palisade cells | Layer of cells packed with chloroplasts, where most photosynthesis occurs. |
| Spongy mesophyll | Layer of irregularly shaped cells with air spaces to allow gases to diffuse in and out of cells. |
| Waxy cuticle | A waterproof barrier that protects the leaf and prevents water loss. |
| Gas exchange | The transfer of gases between an organism and its environment. |
| Vascular bundle | Clusters of xylem and phloem tissue in stems. |
| Xylem | Tissue that transports water and dissolved minerals in vascular plants. |
| Phloem | Tissue that transports sugars in vascular plants. |

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| **Rate of photosynthesis** | |
| Factors that affect the rate of photosynthesis | Light intensity  Temperature  Carbon dioxide  Chlorophyll |
| Limiting factor | A factor in short supply that prevents the rate of reaction from increasing. |
| Inverse square law | Intensity of radiation is inversely proportional to the square of the distance. |
| Why carbon dioxide can be a limiting factor | Carbon dioxide is a raw material for photosynthesis. |
| Why light intensity can be a limiting factor | Light provides the energy that is needed for photosynthesis. |
| Why temperature is a limiting factor | If the temperature is too low the enzymes work slowly. If the temperature is too high the enzymes are denatured and do not work. |
| Why chlorophyll is a limiting factor | Chlorophyll is needed to absorb the light energy used to carry out photosynthesis |
| Importance of limiting factors | Farmers and commercial growers can artificially create the idea environment to grow plants. |

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| **Uses of glucose** | |
| Uses of glucose | For respiration, making cellulose, making amino acids, stored as oils or fats and stored as starch |
| Cellulose | A polymer made of glucose used to build plant cell walls. |
| Starch | An insoluble polymer made of glucose that is used for storage. |
| Respiration | The chemical process that takes place in cells and releases energy from glucose in the presence of oxygen. |
| Amino acids | The building blocks of proteins. Formed by combining glucose with nitrate ions. |
| Fats and oils | Storage compounds found in seeds. |

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| **Transport** | |
| Concentration gradient | A difference in concentration between two areas next to each other. |
| Diffusion | The net movement of particles from an area of high concentration to an area of lower concentration. |
| Passive transport | Happens due to the random motion of particles. No energy is required. |
| Osmosis | The movement of water molecules across a partially permeable membrane from a region of higher water concentration to a region of lower water concentration. |
| Active transport | The movement of molecules from a region of low concentration to a region of high concentration. This requires energy. |
| Semi-permeable membrane | A membrane that allows only certain molecules to pass through. |
| Adaptation of root hair cells | A large surface area for absorption. |

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| **Plant disease** | |
| Tobacco mosaic virus | A parasitic fungus that causes black spot on roses. |
| Rose black spot | A virus that affects plants. It causes stunted growth and causes leaves to discolour, curl and have yellow streaks or spots. |
| Chlorosis | Yellow leaves caused by a lack of magnesium which is needed to produce chlorophyll. |
| Plant physical defences | Layers of dead cells around stems, tough waxy leaf cuticles, cellulose cell walls |
| Plant mechanical defences | Thorns or hairs, leaves that droop or curl when touched, mimicry. |
| Plant chemical defences | Production of antibacterial chemicals  Production of poisons |
| How does black spot fungus affect the growth of roses? | Damaged leaves cannot photosynthesise efficiently. |
| How is black spot treated? | Removing infected dropped leaves and burning them. |
| How is rose black spot transmitted? | The fungus produces spores which are released in wet, humid conditions. |
| How can plant disease be identified? | Stunted growth, spots on leaves, discolouration, presence of pests. |