Year 10
Subject: Biology
Topic/Unit: Topic 4 – Bioenergetics
When: Autumn Term 2

Huntington School
Learn and succeed

Overview: Why this? Why now?
This unit explores how organisms harness and transfer energy to sustain life. Students will examine how plants transform solar energy into chemical energy through photosynthesis and how all living cells release this energy via respiration. Understanding bioenergetics is essential for grasping the interconnectedness of life on Earth and the biochemical foundations of health and growth.

Building on...building to:
The unit builds upon Key Stage 3 concepts regarding plant and animal cell structures, the basic requirements for life, and the effects of exercise. It provides a foundation for later GCSE topics such as Ecology, where energy transfers within ecosystems are analysed, and Homeostasis, which explores internal regulation.

Sequence summary:
1. **The Photosynthetic Reaction:** Introduction to word and symbol equations and the endothermic nature of the reaction.
2. **Rate of Photosynthesis:** Investigation into limiting factors, including light intensity, carbon dioxide, temperature, and chlorophyll.
3. **Required Practical:** Students will carry out an investigation into the effect of light intensity on the rate of photosynthesis in pondweed.
4. **Uses of Glucose:** Exploring how plants convert glucose into starch, cellulose, lipids, and proteins.
5. **Aerobic Respiration:** Understanding the exothermic release of energy in mitochondria.
6. **Anaerobic Respiration:** Comparing respiration in muscles with fermentation in yeast and its industrial importance.
7. **Response to Exercise:** Analysing changes in heart and breathing rates and the concept of oxygen debt.
8. **Metabolism:** Summarising the sum of all chemical reactions in the body.

Key Vocabulary:
Endothermic, exothermic, chlorophyll, chloroplast, limiting factor, inverse square law (HT only), glucose, lactic acid, oxygen debt, fermentation, and metabolism.

Assessments:
Formative assessment will include regular retrieval practice and exam-style questions. A formal write-up of the photosynthesis required practical will assess data analysis and evaluative skills. The unit concludes with a summative test based on the AQA specification.

Able and interested:
Higher Tier students will master the inverse square law and interpret complex graphs featuring multiple limiting factors. Extension activities involve calculating Basal Metabolic Rate (BMR) and evaluating the economic efficiency of commercial greenhouses.

Inclusion, Personal Development and Wider Skills:
Practical activities are designed to foster collaborative teamwork and precision in measurement. Personal development is encouraged through discussions on the health benefits of regular exercise and the components of a balanced diet. Scaffolding, such as writing frames and gap-fill retrieval tasks, supports varied learning needs.

Homework and Independent Learning:
Students will complete a task set on the SPARX online platform. The task is based on the current topic but also includes consolidation on previous topics. It will automatically adjust the level of challenge as the student complete the activities. Teachers may also set consolidation and revision activities.