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| **Subject Science - Year 8 Medium Term Plan/SOW** | | | | | | **The Academy of St Francis of Assisi** | |
| **Unit:** | **Title: Ecosystems 2** | | | | | **Number of lessons in sequence** | 15 lessons |
| **Overarching Curricular Goals (Aims)**  **BIG Questions**   1. How does the body transfer energy from food by respiration? 2. What is the difference between aerobic and anaerobic respiration? 3. How do plants produce food by photosynthesis? | | **In this unit students will:**  **Respiration**  Students will know the word equation for respiration and be able to explain the importance of respiration in living organisms. Students will be able to plan an investigation into the effects of exercise on breathing rate. Student will be able to describe and explain the effects of exercise on the respiratory and circulatory system. Students will know the word equation for anaerobic respiration, they will be able to explain the importance of anaerobic respiration and compare aerobic and anaerobic respiration. Students will be able to describe the process of fermentation and explain why fermentation is important in the brewing and baking industry.  **Photosynthesis**  Students know the reactants and products of photosynthesis and how to write a word equation. They will be able describe a test for oxygen to see whether photosynthesis has occurred. Students will be able to design an investigation to measure the rate of photosynthesis. Students will be able to identifying factors to change, measure and control to test a hypothesis. They will be able to draw conclusions from data collected and analyse graphs to identify limiting factors of photosynthesis. Students will be able to describe how leaves are adapted for their function and look at the features of stomata in detail. They will be able to explain how features enable the leaf to do its job. Students will be able to label the xylem and phloem and describe their role in transporting water and sugars within the plant. Students will be able to describe how mineral ions promote healthy growth in plants. Students will investigate how mineral ion concentration effects plant growth and relate deficiency diseases to a lack of a specific mineral ion. | | **Links to National Curriculum**  **Links to & building upon prior learning Including KS2 if Yr7** | Plants KS2 lessons.  <https://teachers.thenational.academy/units/plants-d1e9>  **KS2 NC Links**  **Plants**  Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. Investigate the way in which water is transported within plants.  **KS3 NC Links**  **Photosynthesis**  The reactants in, and products of, photosynthesis, and a word summary for photosynthesis. The dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere. The adaptations of leaves for photosynthesis.  **Cellular respiration**  Aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life. A word summary for aerobic respiration. The process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration. The differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism  **Photosynthesis and respiration**  Photosynthesis as the key process for food production and therefore biomass for life. The factors affecting the rate of photosynthesis. The importance of cellular respiration; the processes of aerobic and anaerobic respiration | | |
| **Outcomes/**  **Success Criteria** | | **Knowledge**  **Respiration**  Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules. Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable. Yeast perform anaerobic when oxygen is unavailable this process is known as fermentation. Yeast fermentation is used in brewing and bread making.  **Photosynthesis**  Chlorophyll is a green pigment in plants and algae which absorbs light energy. Plants and algae use energy from light, together with carbon dioxide and water to make glucose (food) through photosynthesis. They either use the glucose as an energy source, to build new tissue, or store it for later use. Plants have specially-adapted organs that allow them to obtain resources needed for photosynthesis. Iodine is used to test for the presence of starch. Fertilisers: Chemicals containing minerals that plants need to build new tissues.  **Skills**  **Respiration**  Use word equations to describe aerobic and anaerobic respiration. Explain how specific activities involve aerobic or anaerobic respiration. Suggest how organisms living in different conditions use respiration to get their energy. Describe similarities and differences between aerobic and anaerobic respiration in animal’s plants and yeast. Describe the process of fermentation  **Photosynthesis**  Describe ways in which plants obtain resources for photosynthesis. Explain why other organisms are dependent on photosynthesis. Sketch a line graph to show how the rate of photosynthesis is affected by changing conditions. Use a word equation to describe photosynthesis in plants and algae. Suggest how particular conditions could affect plant growth. Suggest reasons for particular adaptations of leaves, roots and stems. Compare the movement of carbon dioxide and oxygen through stomata at different times of day. Explain why minerals are required for healthy growth in plants.  **\* See individual lessons for enquiry skills.** | |
| **2/3 tier vocabulary.** | | **Differentiation/Scaffolding/Support.** | **Stretch and challenge opportunities in class, enrichment and home learning.** | **Opportunities for wider reading/Listening/watching.** | | | |
| Algae  Producer  Photosynthesis  Chlorophyll  Stomata  Iodine  Nitrates,  Phosphates  Potassium  Magnesium  Deficiency  Fertiliser | | **Knowledge Support:**   * Key facts. * Knowledge organisers.   **Reading support**:   * Explicit vocabulary delivery * Glossary of terms * Visualizer to support whole class reading. * Keyword discussion and annotation.   **Skills support:**   * Support sheets * Practical guidance sheets. * Practical scaffolding. * Demonstrations and discussions. * Writing frames. | Stretch and challenge embedded into every lesson (see PowerPoints)  **Home learning / enrichment**  Seneca Learning KS3 Science  <https://app.senecalearning.com/classroom/course/419c7523-d408-4bc7-9b96-f7f12abdacae>  Oak academy  <https://classroom.thenational.academy/subjects-by-key-stage/key-stage-3/subjects/science>  BBC Bitesize  <https://www.bbc.co.uk/bitesize/levels/z98jmp3>  **Scholarship:**  **Ynes Mexia - botanist known for her vast collection of plant specimen.**  [**https://teachers.thenational.academy/lessons/scientist-case-study-ynes-mexia-c4u32t**](https://teachers.thenational.academy/lessons/scientist-case-study-ynes-mexia-c4u32t)  **George Washington Carver -** **Crop rotation led to the improved crop yields of farmers in the United States during the 1800's.**  [**https://classroom.thenational.academy/lessons/george-washington-carver-cdjp6r**](https://classroom.thenational.academy/lessons/george-washington-carver-cdjp6r) | **Oak Academy Online lessons.**  **Aerobic respiration**  [**https://classroom.thenational.academy/lessons/aerobic-respiration-crt64e**](https://classroom.thenational.academy/lessons/aerobic-respiration-crt64e)  **Anaerobic respiration**  [**https://classroom.thenational.academy/lessons/anaerobic-respiration-6cu3cc**](https://classroom.thenational.academy/lessons/anaerobic-respiration-6cu3cc)  **Exercise and respiration**  [**https://classroom.thenational.academy/lessons/the-effects-of-exercise-on-respiration-cgrk6t**](https://classroom.thenational.academy/lessons/the-effects-of-exercise-on-respiration-cgrk6t)  **Exercise and breathing rate**  [**https://classroom.thenational.academy/lessons/how-does-the-intensity-of-exercise-affect-breathing-rate-an-investigation-c8v3jc**](https://classroom.thenational.academy/lessons/how-does-the-intensity-of-exercise-affect-breathing-rate-an-investigation-c8v3jc)  **Plant roots**  [**https://classroom.thenational.academy/lessons/plant-roots-70u38t**](https://classroom.thenational.academy/lessons/plant-roots-70u38t)  **Photosynthesis**  [**https://classroom.thenational.academy/lessons/photosynthesis-64t3cc**](https://classroom.thenational.academy/lessons/photosynthesis-64t3cc)  **Uses for glucose**  [**https://classroom.thenational.academy/lessons/uses-of-glucose-60wkae**](https://classroom.thenational.academy/lessons/uses-of-glucose-60wkae)  **Rate of Photosynthesis**  [**https://classroom.thenational.academy/lessons/rate-of-photosynthesis-6tk66t**](https://classroom.thenational.academy/lessons/rate-of-photosynthesis-6tk66t)  **The leaf**  [**https://classroom.thenational.academy/lessons/the-leaf-6dh36d**](https://classroom.thenational.academy/lessons/the-leaf-6dh36d)  **Transport in plants**  [**https://classroom.thenational.academy/lessons/transport-in-plants-6gt66d**](https://classroom.thenational.academy/lessons/transport-in-plants-6gt66d) | | | |

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| **Unit Title** | **Sequence of learning Lesson title, theme, big question.** | **Key concepts/outcomes/knowledge and skills.** | **Assessment/ including specific content/ knowledge/skills tested.** | **HWK. To be in books clearly marked** | **Furthering Cultural Capital.** | **Recall of prior or future topics –** | **Lesson resources including or hyperlink to supporting websites/resources/books/texts & individual lessons.**  **5xT+L essentials to be included in individual lessons,** |
| 9.3 Respiration | 9.3.1 Aerobic respiration  This lesson goes through the word equation for respiration and explains the importance of respiration.  (2 lessons) | **Know**  - State the requirements for aerobic respiration.  - Give the name of the process by which energy is released in cells.  - Plan an experiment to measure breathing rates.  **Apply**  - State the word equation for aerobic respiration.  - Describe the process of respiration.  - Plan an investigation to measure the effect of exercise on breathing rates.  **Extend**  - Explain how the reactants for respiration get into the cells.  - Explain the process of aerobic respiration.  - Plan an investigation to explain the effect of exercise on respiration rates. | Systems of the body (prior learning) Entrance quiz  Aerobic respiration assessment task  Aerobic respiration exit quiz | Aerobic respiration  <https://classroom.thenational.academy/lessons/aerobic-respiration-crt64e>  Aerobic respiration – homework booklet  Exercise and respiration  <https://classroom.thenational.academy/lessons/the-effects-of-exercise-on-respiration-cgrk6t> |  | Systems of the body (prior learning) Entrance quiz | Systems of the body entrance quiz.  Aerobic respiration PPT  Aerobic respiration assessment task.  Aerobic respiration exit quiz.  Practical:  Investigating the effect of exercise on  breathing rates  Skill sheets: Planning  Investigations and Recording results  Ecosystems students book (optional) |
| 9.3.2 Anaerobic respiration  (2 lessons)  This lesson goes through the word equation for anaerobic respiration, the importance of anaerobic respiration and then compares aerobic and anaerobic respiration. | **Know**  - State the products of anaerobic respiration.  - State one difference between aerobic and anaerobic respiration.  - Identify one source of error in data collected.  **Apply**  - State the word equation for anaerobic respiration.  - Describe the differences between aerobic and anaerobic respiration.  - Evaluate data collected, suggesting possible sources of error.  **Extend**  - Explain the uses of the products from anaerobic respiration.  - Explain the differences between the two types of respiration.  - Evaluate data collected, showing awareness of potential sources of random and systematic errors. | Aerobic respiration entrance quiz  Anaerobic respiration assessment task  Anaerobic respiration exit quiz | Exercise and breathing rate  <https://classroom.thenational.academy/lessons/how-does-the-intensity-of-exercise-affect-breathing-rate-an-investigation-c8v3jc>  Exercise and breathing rate – homework booklet. |  | Aerobic respiration entrance quiz | Aerobic respiration entrance quiz  Anaerobic respiration PPT  Anaerobic respiration assessment task  Anaerobic respiration exit quiz  Practical:  Investigating the rate of fermentation  Skill sheets:  Calculating means  Drawing graphs |
| 9.3.3 Biotechnology  (1 lesson)  This lesson students will learn the word equation for  Fermentation and how bread, beer, and wine are made. | **Know**  - State what is meant by fermentation.  - Name the organism used to make bread, beer, and wine.  - Make observations about the rising of bread dough in an investigation.  **Apply**  - Write the word equation for fermentation.  - Describe how bread, beer, and wine are made.  - Carry out an investigation to investigate the effect of temperature on fermentation, recording measurements and drawing a conclusion.  **Extend**  - Explain how the process of fermentation works in relation to the word equation.  - Explain why temperature is important in the making of bread, beer, and wine.  - Carry out an investigation to investigate the effect of temperature on fermentation, using results to draw a conclusion, and suggest one way to minimise error. | Anaerobic respiration entrance quiz  Biotechnology assessment task  Biotechnology exit quiz | Anaerobic respiration  <https://classroom.thenational.academy/lessons/anaerobic-respiration-6cu3cc>  Anaerobic respiration - homework booklet |  | Anaerobic respiration entrance quiz | Anaerobic respiration Entrance quiz  Biotechnology PPT  Biotechnology assessment task  Biotechnology Exit Quiz  **Practical**: The effect  of temperature on  fermentation |
| 9.4 Photosynthesis | 9.4.1 Photosynthesis  In this this lesson students will look at the reactants and products of photosynthesis and learn how to write it as a word equation. Students will then look at how you can test whether photosynthesis has occurred.  (2 lessons) | **Know**  - State where photosynthesis occurs in a plant.  - State the products of photosynthesis.  - State how to test for the presence of oxygen.  **Apply**  - Describe the process of photosynthesis.  - State the word equation for photosynthesis.  - Carry out an experiment to prove that oxygen is produced during photosynthesis.  **Extend**  - Explain the importance of photosynthesis in the food chain.  - Explain how the plant obtains the reactants for photosynthesis.  - Carry out and record observations for an experiment to prove that oxygen is produced during photosynthesis. | Interdependence entrance quiz  Photosynthesis assessment task  Know, Apply and Extend questions  Photosynthesis exit quiz | Photosynthesis  <https://classroom.thenational.academy/lessons/photosynthesis-64t3cc>  Photosynthesis – homework booklet. | George Washington Carver - Crop rotation led to the improved crop yields of farmers in the United States during the 1800's.  <https://classroom.thenational.academy/lessons/george-washington-carver-cdjp6r> | Ecosystems –interdependence quiz. | Photosynthesis PPT  Photosynthesis assessment task  Food chains and food webs Entrance quiz.  Practical:  Producing oxygen  Students discuss ideas to support the statement  ‘Photosynthesis is vital for all life’. |
| 9.4.2 Leaves  In this lesson students are going to describe how leaves are adapted for their function and look at the features of stomata in detail. Students will then explain how features enable the leaf to do its job  (1 lesson) | **Know**  - Name the main structures of a leaf.  - State the function of the chloroplasts in a leaf.  - Use observations from the underside of a leaf to label a diagram.  **Apply**  - Describe the structure and function of the main components of a leaf.  - Explain the distribution of the chloroplasts in a leaf.  - Make observations of stomata from the underside of the leaf, and record observations as a labelled diagram.  **Extend**  - Explain how the structures of the leaf make it well adapted for photosynthesis.  - Explain the role of chloroplasts in photosynthesis.  - Make observations of stomata from the underside of the leaf, and record as a labelled diagram with annotations. | Photosynthesis entrance quiz  Leaves assessment task  Leaves exit quiz | The leaf  <https://classroom.thenational.academy/lessons/the-leaf-6dh36d>  The leaf – homework booklet. | Ynes Mexia - botanist known for her vast collection of plant specimen.  <https://teachers.thenational.academy/lessons/scientist-case-study-ynes-mexia-c4u32t> | Entrance and exit quizzes focus on previous learning for both big ideas across year 7 and 8. | Photosynthesis entrance quiz  Leaves PPT  Leaves assessment task  Leaves exit quiz  **Practical**: Observing  the stomata of a leaf |
| 9.4.3 Investigating photosynthesis and uses for glucose  In this lesson, students will learn about the 4 uses of the glucose produced during photosynthesis. They will then look at how to carry out an investigation to prove whether photosynthesis has taken place. In order to do this, they will firstly need to identify hazards and risks and suggest appropriate ways to reduce them then they will make observations and describe results in order to draw conclusions related to photosynthesis.  (2 lessons) | **Know**  - Carry out an experiment to test for the presence of starch in a leaf.  - List the factors that affect the rate of photosynthesis.  - State two experiments which can be used to prove photosynthesis has taken place.  **Apply**  - Carry out and record observations for an experiment to test for the presence of starch in a leaf.  - State the relationship between temperature, light intensity, and availability of carbon dioxide and the rate of photosynthesis.  Describe 4 uses for glucose in a plant.  **Extend**  - Carry out and record observations for an experiment to test for the presence of starch in a leaf, explaining results obtained.  - Describe why low temperature, shortage of carbon dioxide, and shortage of light limit the rate of photosynthesis.  - State and explain which method of investigating photosynthesis could be used to measure the rate of photosynthesis. | Leaves entrance quiz  Investigating photosynthesis assessment task  Investigating photosynthesis exit quiz | Rate of Photosynthesis  <https://classroom.thenational.academy/lessons/rate-of-photosynthesis-6tk66t>  The rate of photosynthesis – Homework booklet. | BBC Bite size  Investigating photosynthesis – starch and chlorophyll  <https://www.bbc.co.uk/bitesize/guides/zq239j6/revision/6> | Entrance and exit quizzes | Leaves entrance quiz  Investigating photosynthesis Exit quiz  **Practical**:  Testing a leaf for starch  **Practical:**  Investigating how light intensity affects the rate of photosynthesis. |
| 9.4.4 Plant minerals  (Set up at the start of the topic).  In this lesson students will learn the mineral needed for healthy plant growth. They will investigate the effect of mineral ion concentration on seedling growth.  (2 lessons) | **Know**  - Name the minerals required by plants.  - State that nitrates are essential for plant growth.  - Record measurements of plant growth.  **Apply**  - Describe how a plant uses minerals for healthy growth.  - Explain the role of nitrates in plant growth.  - Record measurements in a table, and calculate arithmetic means of results.  **Extend**  - Explain deficiency symptoms in plants.  - Explain how proteins are made for plant growth.  - Record measurements in a table, and calculate arithmetic means of results, giving answers to the correct number of significant figures. | Investigating photosynthesis entrance quiz.  Plant minerals assessment task.  Plant minerals exit quiz. | Plant roots  <https://classroom.thenational.academy/lessons/plant-roots-70u38t>  Plant roots – homework booklet |  | Entrance and exit quizzes | Investigating photosynthesis Entrance quiz.  Plant minerals PPT  Plant minerals assessment task.  Plant minerals Exit quiz PPT or word.  **Practical**:  Investigating the effect of fertilisers on the growth  of seedlings |
|  | Ecosystems checkpoint / progress lessons |  | 9.4 Photosynthesis entrance quiz.  Checkpoint / progress task.  9.4 Photosynthesis exit quiz | Photosynthesis review lesson  <https://classroom.thenational.academy/lessons/mid-topic-review-60tk0t>  Photosynthesis homework booklet - complete using the video above.  Photosynthesis Homework PowerPoint. |  | Entrance and exit quizzes | Ecosystems entrance quiz 1  Ecosystems Checkpoint  Ecosystems checkpoint PPT  Ecosystems exit quiz 1 |
|  | Ecosystems revision lessons |  |  |  |  |  | Ecosystems entrance quiz 2  Ecosystems revision grid  Ecosystems exit quiz 2  Ecosystems students book  Ecosystems Knowledge organisers |
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1. Which process uses energy taken in by a plant cell?
2. What is the name of the process which takes place in the mitochondria and releases energy?
3. What is the name of the polymer which glucose is stored as in the roots, leaves and stem of a plant?
4. What is the name of the chemical added to a leaf to test for the presence of starch?
5. What colour change would you expect to see if starch is present?

Oxygen and glucose are examples of what in the photosynthesis reaction?