

Group one:

Climate change through Biology

Section 1

↻ Key Information

Trainees:

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Subject: Biology

Learners: Year 9 (Class 30)

LO: Developing students understanding of greenhouse effect and its impact on climate change using biological investigations and models.

Overall Idea: For students to investigate the effects of greenhouse gasses using investigations. Including key processes in carbon cycle and global warming, seeing effects first hand and then applying those to current and future global impact before linking back to the curriculum.

Section 2

↻ Context

To be taught at KS3 to allow students time to develop their knowledge and understanding of global warming beyond the curriculum. It will give students a good base knowledge moving forward to GCSE/KS4 study and gives an opportunity to bring back to curriculum with the plenary.

Can be taught in any school background. Teacher can adapt to specific areas when scaffolding. For example may add a question in silent debate or independent research on the area they live/study.

Section 3

↻ Learning Skills, Knowledge and Values.

⇒ **Skills**

1. Scientific Inquiry skills:

Formulating questions, making predictions, conducting experiments and analysing data.

2. Critical thinking:

Analysing evidence, drawing conclusions, evaluating information.

3. Practical skills:

Building models conducting experiments

⇒ **Knowledge**

1. Understanding of greenhouse gases

2. Carbon cycle

3. Environmental Impacts

4. Sustainable practices

⇒ **Values**

1. Environmental Awareness

2. Responsibility

3. Collaboration

4. Ethical considerations

Section 4

⇒ **Activities**

⇒ **1. Practical/model carousel**

A carousel of different models/investigations demonstrating global warming effects, carbon cycle and carbon dioxide. Resources in resource tab.

Will be done over 2 x 1 hour lessons or a double lesson.

If 2 x 1 hour lessons do 1A and 1d

in conjunction with each other.

⇒ **1a. Basic Global Warming effects model**

Students are able to model the effects greenhouse gasses have on the temperature of earth. (see resources section)

⇒ **1b. Recreating the Carbon Cycle**

- Each group will be given a large piece of paper and a couple of marker pens.
 - They will then try to 'build' a carbon cycle on their paper using the items in a tray.
 - Students will then present their cycle to the rest of the class, explaining the elements of the cycle to the rest of the class.
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⇒ **1c. Carbon Dioxide in Oceans**

Students will investigate one effect of increased carbon dioxide in the oceans. They will recreate the conditions using indicator, vinegar solution and a straw.

Links can be made to the carbon cycle and how an increase in carbon dioxide can affect the oceans. Increased carbon dioxide leads to an increase in carbon dioxide dissolving into the oceans and creating an acidic environment which affects sea-life. Further links can also be made to respiration as carbon dioxide is a product of it.

⇒ 1d. The Greenhouse Effect on Different Chemicals

This practical links and carries on from practical 1a.

- Teacher will explain the purpose of this practical: Investigate how gases in the atmosphere affect the heat in an enclosed environment.

- Then there will be a demonstration of the practical to the students.
 - Learners to repeat the steps above for themselves, then measure the temperature of the jars after 5 and 10.
 - Learners can then to discuss their findings. What are the implications of their results?
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⇒ 2. Independent Research

Allow students to set up in a computer room after partaking in the carousel and independently research

1. How global warming has affected earth already - using the practicals as a guide in.
2. What will happen if no action is taken.
3. Action currently being taken and any issues with that.
4. Potential action.

Done over 1 hour lesson or next hour in a day sitting.

⇒ 3. Silent debate - how can we prevent further damage to earth from global warming?

Silent debate consists of table groups having A3 paper in middle of desk and taking it in turns to write down ideas that they think would reduce the impact of global warming.

May be scaffolded for some groups with starter questions. examples may include: How could we reduce the amount of greenhouse gasses in the atmosphere?

30 minute task

↔ **4. Whole class discussion**

Finish silent debate with whole class discussion ran by either teacher or nominated student. As a class come up with a list of strategies that they believe if implemented would reduce effects of global warming.

30 minutes - 1 hour dependent on students ideas.

↔ **5. Exam Questions**

Students consolidate learning and link back to curriculum by practicing GCSE exam style questions.

30 minute task

Section 5

↔ **Pedagogy**

Collaborative work - Students will be working in pairs throughout the carousel.

Silent debate - allow students to share thoughts/opinions and develop on each others respectfully.

Whole class discussion - Dialogic teaching.

Working scientifically - allows students to partake in investigations and demonstrate practical skills.

Exam Practice - Plenary.

Live Modelling - included in carousel.

Demonstrating respectful engagement - creating a positive, respectful, safe working environment for peers.

Inquiry based approach

Section 6

↔ **Resources**

↔ **1a. Global warming effects**

Students will use glass jar and plastic as a model to see the effects the greenhouse gas layer (plastic around the jar) has on earth's temperature.



⇒ Methodology 1b - recreating the carbon cycle

Students try to 'build' a carbon cycle on their paper using the items in a tray which will have:

- A toy animal/ person
- A live plant
- Dead leaves or compost
- An empty bottle labelled CO₂ or carbon dioxide
- A bottle with a black substance in labelled crude oil (this could be charcoal in glycerol or similar)
- A piece of coal
- Toy car
- A food box labelled 'factory' (eg. cereal box)

⇒ Methodology 1c. Carbon Dioxide in Oceans

Each group will be given 3 beakers with indicator, vinegar solution and a straw.

The experiment involves an indicator made by boiling red cabbage with water. One beaker of indicator is left as a control to compare the other two too.

The students will mix the vinegar with the indicator to show a colour change. The teacher explains to students that the solution becomes more acidic when the colour change is observed.

Then, students are to blow into the last beaker containing indicator solution and should see a colour change. As humans breathe out carbon dioxide, this shows students the effect of CO₂ dissolving in oceans (the coloured water acting as an analogy for the oceans).



Bill Nye Explains Climate Change, Acidification With Simple Science Experiments | TODAY

⇒ Methodology - 1d. The Greenhouse Effect on Different Chemicals

- Label four jars as Air, Vinegar, Bicarb and CO₂
- Cut cling film big enough to cover the top of each jar, with a bit extra down the sides.
- Place plastic wrap on the air jar and secure it with an elastic band.
- Add 1/4 cup (60ml) of vinegar to the vinegar jar. Cover with cling film and secure with an elastic band.
- Add 1 tablespoon of Bicarb to the Bicarb jar. Cover as before.
- In the CO₂ jar, add 1 tablespoon of bicarb and 1/4 cup of vinegar. Allow the reaction to occur and cover as above.
- Measure the temperature of all four jars.
- Place the jars on the heat source.

Exam Questions - Assessment for learning

This will assess if the students at the end of the lesson have met the lesson objectives and will provide us with data regarding students' learning outcomes.

Q1.
The graph shows changes in temperature and in carbon dioxide concentration in the earth's atmosphere between 1860 and 1990.

(a) Give two human activities which may have helped to increase the concentration of carbon dioxide in the atmosphere.

1 _____
2 _____

(b) (i) Describe the changes in temperature shown by the graph between 1860 and 1990.

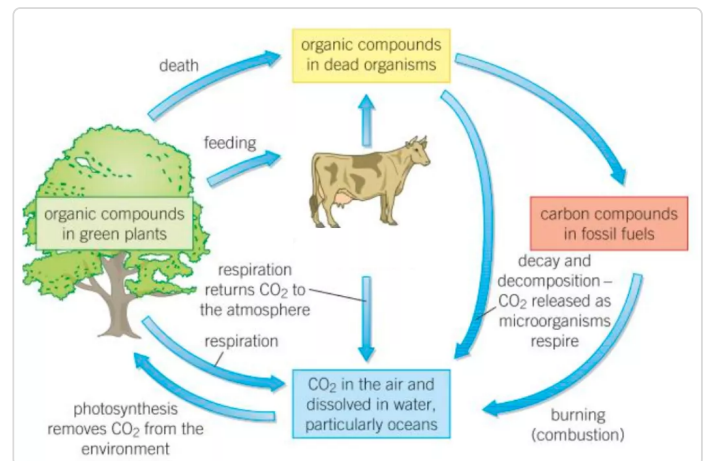
(ii) Do the data in the graph prove that increased carbon dioxide concentrations in the atmosphere caused the changes in temperature you described in part (b) (i)?
Give a reason for your answer.

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Padlet Drive

Global warming exam questions

Carbon Cycle Image



Section 7

Learning Outcomes

Learning outcomes:

Greenhouse gas lesson involves fostering understanding, empathy, and a sense of responsibility towards environmental stewardship.

The outcomes of these lessons would include:

1. **Understanding of Greenhouse Gases**
2. **Awareness of Climate change impacts**
3. **Developed practical skills**
4. **Improving skills to enable green careers**
5. **Advocacy for the planet**

By achieving these learning outcomes, students will not only gain knowledge about greenhouse gases and climate change but also develop a deep sense of responsibility to advocate for the planet and work towards sustainability and an equitable future.

