Bushfire and ice • Measuring carbon storage

**Year 9**

|  |  |
| --- | --- |
| **Name:** |  |

### Aim

To measure the amount of carbon stored in a local tree and to translate this into the equivalent amount of carbon dioxide.

### Equipment

* Measuring tape
* Excel or equivalent program

Optional: camera and/or GPS

### Procedure

1. Select a local tree with a circumference at least 40 cm.
2. Assign your tree a number so that it can be distinguished from other trees in the area. This can be done by:
   1. using GPS coordinates.
   2. taking a photograph.
   3. drawing its distinguishing characteristics.
3. Measure up the trunk, 1.3 m from the base of the tree.
4. Measure the circumference of the tree (keeping the tape measure level) three times. Record your measurements in Table 1.
5. Determine the average circumference of the tree.
6. Create a graph that can be used to calculate the amount of carbon in your tree.
   1. Enter the data in Table 2 into Excel or an equivalent program.
   2. A screenshot of a computer

      Description automatically generatedHighlight both columns of the graph and select ‘Insert’ and ‘Scatter graph with smooth lines and markers’.
   3. A screenshot of a computer

      Description automatically generatedSelect ‘Add Chart Element’ to add axis titles for the horizontal axis (Diameter of the tree in cm) and the vertical axis (Tree’s biomass in kg).
7. Use the graph to calculate the biomass of your tree.
8. Use the formula below and the biomass of the tree to calculate the total amount of carbon that was stored in the tree.

Total carbon (kg) = total biomass (kg) x 0.5

1. Use the total carbon that was calculated in Step 8 to determine the amount of carbon dioxide that was absorbed from the atmosphere by the tree so that it could grow to its current size.

Carbon dioxide equivalent to biomass = total carbon (kg) x 3.67

### Results

Location and description of the tree:

Table 1: Circumference of the tree measurements in cm

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Measurement 1**  **(cm)** | **Measurement 2 (cm)** | **Measurement 3 (cm)** | **Average circumference**  **(cm)** |
| Circumference of the tree |  |  |  |  |

Table 2: Comparison of tree circumference to its dry weight

|  |  |
| --- | --- |
| **Circumference of a tree (cm)** | **Tree’s dry weight (kg)** |
| 50 | 106 |
| 100 | 668 |
| 150 | 1964 |
| 200 | 4221 |
| 225 | 5771 |
| 250 | 7641 |
| 275 | 9842 |
| 300 | 12410 |
| 325 | 15350 |
| 350 | 18700 |
| 400 | 26674 |

### Discussion

1. Describe why the circumference of the tree trunk was measured at 1.3 m from the ground.
2. Describe why the circumference of the tree trunk was averaged from three measurements.
3. Describe why Table 2 could not be used to measure the amount of carbon in a tree with a circumference larger than 400 cm.
4. Explain how the rate a tree grows would affect the validity of your calculations.
5. As a scientist, use your knowledge of biomass to explain how you could check the accuracy of Table 2.
6. Explain why knowing the biomass of an area may be important in a bushfire area.

### Quick reference guide

Table 3: Relationship between the circumference of the tree and the amount of carbon absorbed from the atmosphere.

|  |  |  |  |
| --- | --- | --- | --- |
| **Circumference of a tree (cm)** | **Tree's dry weight (kg)** | **Total carbon (kg)** | **Total carbon absorbed from the atmosphere** |
| 50 | 106 | 53 | 194.51 |
| 100 | 668 | 334 | 1225.78 |
| 150 | 1964 | 982 | 3603.94 |
| 200 | 4221 | 2110.5 | 7745.535 |
| 225 | 5771 | 2885.5 | 10589.785 |
| 250 | 7641 | 3820.5 | 14021.235 |
| 275 | 9842 | 4921 | 18060.07 |
| 300 | 12410 | 6205 | 22772.35 |
| 325 | 15350 | 7675 | 28167.25 |
| 350 | 18700 | 9350 | 34314.5 |
| 400 | 26674 | 13337 | 48946.79 |

Graph 1: Relationship between the circumference of the tree and the amount of carbon absorbed from the atmosphere.