**GENERAL INTEGRATED SCIENCE Unit 3**

**TASK 1 – SCIENCE INQUIRY**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 11 %**

**DATE: Part 1 – Monday 19th February MARK: \_\_\_\_\_ / = \_\_ %**

**Part 2 – Start 19/2/18 – 16/3/18**

**Part 3 – 19/3/18**

**TASK 1**

**This task is divided into three parts.**

Part 1 : Individually design an experiment to test if the salinity of the water a plant receives affects its growth and general health of the plant. Take home assessment.

Part 2 : As a group conduct an experiment to see the effects of water salinity on the growth and health of broad bean plants. (Group activity in class).

Part 3 : Written report. Presentation of results, analysis of results and conclusion. (Individual activity carried out under test conditions)

**Time for the task:**

* **Planning of the investigation – one weekend**
* **Carrying out and Collection of data – four weeks**
* **Evaluation and communication of findings – one hour**

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|  | **Marks Allocation** | **Your Total** |
| **Planning of Experiment** | 15 |  |
| **Carrying out of Experiment and Collection of results** | 10 |  |
| **Processing of data** | 9 |  |
| **Analysis and Evaluation** | 16 |  |
| **Conclusion** | 2 |  |
| **TOTAL** | 52 |  |

**Introduction**

The amount of salt found in soil is referred to as the salinity of the soil. The amount of salt found in the soil can be changed by both natural and human-induced processes. A saline soil is defined as having a high concentration of soluble salt, high enough to affect plant growth. If plant growth is affected then all the related abiotic and biotic factors will also be affected.

What factors bring about change in soil salinity?

* Weathering of parent material containing soluble salts – the weather breaks down the rock releasing the salts into the soil
* Depositing of salt by wind and rain – ocean salt is carried inland by wind and rain, the closer to the ocean the more salt can be deposited
* Land clearing, replacement of natural vegetation with annual crops and irrigation systems. These factors change the height of the underground water table bring it closer to the surface meaning more salt becomes dissolved in the water. Also the plant’s roots grow closer to the surface taking the water out and leaving the salt behind, thus increasing the concentration further

How salt affects plants.

* Reduces the ability of the plant to take up water – harder for water to diffuse into the plant because the salt draws it away from the roots causing dehydration. The harder it is for the plant to draw in water the more stress is put on the plant resulting in poor growth. This effect occurs quickly.
* If the salt enters the plant the accumulation of salt in the leaves affects the leaf’s ability to photosynthesise, grow and divide. This effect takes longer to become evident and may cause the leaves to become bluish in colour, before going yellow/brown and dying.

**Part 1 : Designing an Experiment (15 marks)**

Your task is to design an experiment to investigate how the salinity of the water affects plant growth.

The equipment you have available is as follows:

*100% Pure water Measuring Cylinders*

*5% Salt Solution Shelf in direct sunlight*

*10% Salt Solution Seedling Trays*

*Cotton Wool Measuring Tapes/Rulers*

*Broad bean seeds Normal Laboratory Equipment*

**In your design you must include the following; the marks allocated for each section are shown.**

Hypothesis (2 marks)

Independent Variable (1 mark)

Dependent Variable (1 mark)

Controlled variables (3 marks)

Equipment (2 marks)

Method (5 marks)

Safety Considerations (1 mark)

**Hand in date : Monday 19th February**

**Part 2 Carrying out practical activity and recording results.**

**Hypothesis:** If the salinity of water feed to a plant is increased then the growth of the plant will be reduced.

**Independent variable**: Change the salt concentration of the water feed to the plants – 0% salt (100% water), 5% salt concentration, 10% Salt concentration.

**Dependent variables:** - the height of the plant

* the length of the roots
* number of leaves
* colour of the leaves

Variables measured over a period of 4 weeks, twice a week.

**Controlled Variables**: - Type of seed – bean

* Growing medium – cotton wool
* Place – window sill in sunlight, indoors
* Amount of liquid given to the plants – same
* Timing of watering – twice a week

**Equipment:** Beans x 24

Salt water solutions – 0%, 5%, 10%

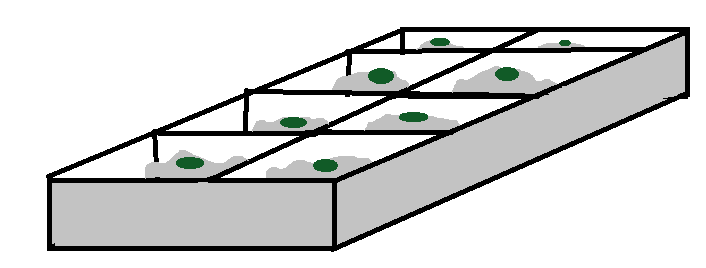
Growing tray x3

Cotton Wool - roll

Measuring Cylinder – 50ml

Measuring tape

**Method (5 marks)**

**Working in groups of three carry out the following practical**

1. Put a layer of cotton wool in each of the four trays. Gently break the fibres apart.
2. Place eight broad bean seeds, evenly spaced, in the tray.
3. Place a layer of cotton wool on top of the seeds.
4. Water the seeds with enough 0% salt solution to ensure the cotton wool is damp, make a note of the amount used. **Note** if the cotton wool is too wet the seeds will go mouldy.
5. Place the tray on the window sill in sunlight.
6. Repeat steps 1-4 with the other two trays, using a different salt solution each time to wet the seeds. Label each tray according to the solution used.

*Each member of the group is responsible for one tray.*

1. Ensure the cotton wool is kept moist during the experiment by watering twice a week, each tray with the same amount of liquid.
2. Twice a week record the length of the stem and the root, the number of leaves and the colour of the leaves. Continue this process for four weeks.

**Recording of results (5 marks)**

Each member of the group is responsible for recording the results of the beans growing in their tray.

Once the experiment is finished each member of the group should process their results to produce a table containing the average heights, root lengths, number of seeds and colour of seeds for each day the recordings were taken. A copy should then be given to each member of the group.

**Part 3 Processing data, analysis of data and conclusion (27 marks)**

Each member of the group should have a copy of the average results for each tray.

1. Draw a graph to show how the stem length changed over the four weeks when grown in the different solutions. (6 marks)

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2. Describe the trends shown in the data represented on the graph. (3 marks)

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3. Comment on the trends shown in the other data recorded in your tables regarding root length, number of leaves and colour of leaves. (6 marks)

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4. Using your background knowledge and the information in the introduction, write a scientific explanation for the changes in stem length shown in your graph. (3 marks)

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5. Using your background knowledge and the information in the introduction, write an explanation for the colour changes recorded in the leaves as the experiment progressed. (3 marks)

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6. Comment on the reliability and validity of your experiment. Include suggestions to improve your experiment and explain why they would improve the reliability or validity of your experiment. (4 marks)

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7. Use your results to write a conclusion for this experiment, include how your results relate to the hypothesis. (2 marks)

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**Mark Scheme**

**Part 1**

**In your design you must include the following; the marks allocated for each section are shown.**

Hypothesis (2 marks)

Independent Variable (1 mark)

Dependent Variable (1 mark)

Controlled variables (3 marks)

Equipment (2 marks)

Method (5 marks)

Safety Considerations (1 mark)

**Part 2**

**Carrying out. (5 marks)**

Set up a tray with the correct number of seeds (1 mark)

Seeds covered with adequate cotton wool (1 mark)

Seeds watered regularly (1 mark)

Amount of water used was measured (1 mark)

Plant checked at regular intervals (1 mark)

**Recording Results. (5 marks)**

Recording stem length (1 mark)

Recording root length (1 mark)

Recording other features (1 mark)

Heading to table or columns clearly labelled (1 mark)

Averages for seeds calculated (1 mark)

**Part 3**

**Graph (6 marks)**

* title
* Axis labelled correctly with units (1 mark)
* Scale on each axis correct (1 mark)
* Points plotted correctly (2 marks)
* Key/legend (1 mark)
* Line graph (1 mark)

**Question 2**

Three trends described one mark each.

* beans in 100% water both roots and stems grew continuously.
* beans in 5% salt grew slower and then stopped growing after week 4.
* beans in 10% grew for first three weeks same as 5% and then stopped growing an died.

**Question 3 – max 6 points**

* the roots in the 100% water grew the best (1), the roots in the salt water only grew half as much as in pure water (1), roots stopped growing in salt water after 4 weeks (1), the leaves increased in number as the plant grew in 100% water (1), the leaves appeared a lot later in the salt water (1), the plants in salt water had less leaves (1), the leaves in salt water were yellow, in water green (1).

**Question 4**

Link the healthy plant growth to the pure water, water needed to break open seed (1), water needed for plant to grow, water needed for plant to photosynthesis, why one in water keeps growing (1). In salt the plant cannot take in water as diffusion difficult due to salt (1), therefore cannot grow so stem shorter (1) (3 points = 3 marks)

**Question 5**

Link unhealthy plants to amount of salt – salt prevents the seeds taking water by diffusion, salt enters the plant the accumulation of salt in the leaves affects the leaf’s ability to photosynthesise (1), grow and divide that’s why less leaves in ones in salt water (1), leaves going yellow due to salt stress and dying (1).

(3 points = 3 marks)

**Question 6**

**Reliability –** make a comment as to how to make experiment more reliable (1) and then say why it would work (1)

**Validity -** make a comment as to how to make experiment more valid (1) and then say why it would work (1) eg use full grown plants and then administer salt water etc, as experiment only really testing effects on seeds not pants

**Question 7**

Includes a result (s) and then links to hypothesis (1), hypothesis must be mentioned in full not just word hypothesis. (1)