**GENERAL INTEGRATED SCIENCE Unit 3**

**TASK 2 – Testing Water**

**Task Type : Science Inquiry**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 9 %**

**DATE: Tuesday 6th March MARK: \_\_\_\_\_ / = \_\_ %**

**TASK**

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

Part 1 : As a group conduct an experiment to test the water quality of well samples.

Part 2 : Written report - Presentation of results, analysis of results and conclusion. (Individual activity carried out under test conditions)

**Time for the task:**

* **Carrying out and Collection of data – one hour**
* **Evaluation and communication of findings – one hour**

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|  | **Marks Allocation** | **Percentage allocation** | **Your Total** |
| **Carrying out of Experiment and Collection of results** | 8 | 22% |  |
| **Processing of data** | 6 | 17% |  |
| **Analysis of data** | 16 | 44% |  |
| **Evaluation** | 6 | 17% |  |
| **TOTAL** | 36 | 100% |  |

**Introduction**

How abiotic factors affects plants and animals.

* Salt affects the ability of the plant to take up water.
* Too much salt in the water affects the fresh water fish’s ability to maintain its water balance. If the water is salty, water will diffuse out of the fish causing dehydration and subsequent death.
* The pH of the water will explain if the water is acidic, neutral or basic. pH affects the functioning of a living organism’s enzymes.
* Oxygen is essential for respiration. Too little oxygen in the water this can lead to growth of anaerobic organisms which can result in accumulation of toxic gases, out of control algae blooms etc which can cause the death of the water way.
* As the temperature of a water way changes it can cause evaporation leading to increase in such things as salinity, pH change and loss of dissolved oxygen.

You are just building a new property in the country and you wish to create a natural pond environment for the local animals and plants. You have three wells on the property that could be used to fill the pond but to ensure a healthy pond the water must contain the correct abiotic factors to ensure living organisms can remain healthy.

Your task is to carry out a series of practical tests on the water from each of the wells to determine the most suitable supply for your pond.

**Experimental procedure**

You are going to test each water supply to determine:

* pH
* dissolved oxygen concentration (normal supply is appro 8.36 mg/L at room temperature)
* temperature
* salinity
* water clarity (dissolve particles prevent light shining through)

To carry out these tests you have the following equipment:

* samples of water from each well
* pH sensor
* dissolved oxygen probe
* salinity sensor
* temperature probe
* light source
* data logger to process recordings
* general laboratory equipment

**How to use the probes.**

***Temperature probe* *-*** insert the probe into the data logger. Click on lab quest and the probe will register. Next insert the probe into the water sample and record the temperature. Clean the probe and repeat with other samples.

***pH probe -*** follow the same procedure for the temperature probe. Ensure the probe is cleaned in distilled water between samples. When finished the probe must be inserted upside down into the buffer solution.

***Salinity probe -*** Rinse the probe in distilled water and blot dry with paper towel and then connect to the data logger. Click on the Lab Quest and check the probe is reading. Insert the tip into the sample and gently swirl round until you get a reading, takes about 10secs. Do not completely submerge the probe. Rinse the probe again in distilled water before taking the reading of the next sample.

***Dissolved Oxygen probe -*** Cover the outside of the beaker containing the water sample with black paper to block out the light and make a cover for the top with a hole for the probe. Connect the probe to the data logger and connect in the same way as the other probes. Insert the probe into the water but do not let it touch the bottom. Leave for 2 minutes. (It works by shinning a light source through the water). Record the reading, and then check the next sample

***Water clarity* -** Place a sample of the water in a test tube. On the data logger select home, then LabQuest App, select sensors and sensor set up. Click light sensor and press ok. Check the light sensor is reading. Hold the test tube up tight against the light sensor (rectangular glass section on front face of data logger) record the reading. Repeat using the other samples. The lower the reading the more dissolved particles in the water – less clear.

**Part 1**

**Use the probes to collect data on the abiotic properties of the three water samples. (8 marks)**

You will be assessed on your ability to use equipment appropriately, how you conduct yourself in a laboratory and how you collect your data.

**In the space below construct a table for your results. (6 marks)**

On your table indicate the readings of abiotic factors that are suitable for living organisms to survive.

**Part 2 Processing data, analysis of data and evaluation. (22 marks)**

1. Describe the trends shown in the data in your table. (6 marks)

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2. Discuss which water supply would be best to fill the pond. Give reasons for your choice relating to organisms and the abiotic factors that affect them. (6 marks)

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3. State which abiotic factor(s) make the other two samples less suitable. (4 marks)

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

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**Answer Schedule**

During the experiment the following will be assessed:

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| **Characteristic** | **Mark scheme** | **Marks** |
| Appropriate use of probes | Plans an investigation to collect appropriate data – *goes about collection of data in a methodical way. (2)*  Provides a sequenced experimental procedure that lacks specific detail -  *Collection of data is more random than ordered (1)*  Provides a clear and logical experimental procedure with sufficient detail to allow the investigation to be repeated by others. | 1 - 2 |
| Identifies several controlled variables with specific detail – *rinses the probes before and after use (1), rinses the probes between samples (1)* | 1 - 2 |
| Plans an investigation to collect appropriate data – *collecting appropriate data from the probes to record in a table (1)*  *If data is an outlier, test repeated / acknowledge that all data appropriate so not necessary to repeat (1)* | 1 - 2 |
| Scientific method | Equipment cleaned appropriately after experiment | 1 |
| Safety | Adequate safety measures are used throughout the experiment | 1 |
| **Total** |  | **/8** |

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| **Characteristic** | **Marking Scheme** | **Marks** |
| Organisation of data (Table) | Presents data in a range of forms, including appropriate table, and identifies relationships.   * Suitable headings for table (1) * Table is clear and well laid out (ruler & cells) (1) * Suitable readings for abiotic factors are identified in some way (1) | 3 - 6 |
| Presents data using basic tables and graphs and identifies simple relationships.   * Data presented in table form but not headed / cells incomplete * Some attempt to identify suitable readings but unclear | 1 - 2 |
| **Total** |  | **/6** |

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| Characteristic | Mark Scheme | Marks |
| Question 1  Analysing Trends in data  *(level of depth in student’s response determines the maximum marks they can achieve)* | Analyses experimental data to accurately describe trends and uses evidence to make and justify conclusions:   * Describes the trends for each abiotic factor accurately (3) * Comments on if the reading is suitable/not suitable for living organisms eg too high or too low no reasoning needed (1) * Comments on temperature not relevant as samples not in natural environment/ when in the pond they will all be the same temperature (1) | 5 – 6 max |
| Describes trends in the data and uses evidence to make conclusions   * Comments on the values for each biotic factor indicating if they are high or low but does not necessarily link to other samples | 3 - 4 max |
| Describes trends in data and draws general conclusions   * General comments made but not about all abiotic factors | 1 - 2 max |
| **Total** |  | **/6** |

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| **Characteristic** | **Mark Scheme** | **Marks** |
| Question 2  Relating Scientific knowledge to results | Communicates information and concepts logically, using correct scientific language, conventions and representations   * Links the amount of oxygen to be same or above the normal * Links oxygen needed for fish to **respire** and plants * Links pH to be neutral as better for **enzymes** * Water needs to be clear for sunlight to reach plants for **photosynthesis**/ fish to find food/ animals to drink without getting sick/**dehydrated** * Links salinity needs to be low otherwise plants cannot absorb water needed through **transpiration**, fish/animals will dehydrate * Temperature will be determined by the pond environment not where the sample came from (1)   *1 mark for linking each abiotic factor to the needs of living organisms, needs correct scientific terminology for processes of living organisms.* | 5 - 6 |
| Communicates information and concepts generally using scientific language and representations. Makes some errors in the use of conventions.  *As above but with some errors in linking factor to needs, does not use scientific terminology but refers to the scientific concept* | 3 - 4 |
| Communicates information and concepts, without detail, using some scientific language and conventions.  *Points out which is best but does not justify why in scientific terms, some factors may be missed out.* | 1 - 2 |
| **Total** |  | **/6** |

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| **Characteristic** | **Mark Scheme** | **Marks** |
| Question 3  Link abiotic factor to death of living organism | States which factor makes each water supply unsuitable and why.  *Eg Sample two is not suitable because it is too salty and the fish will dehydrate. (2)*  *Sample three is not suitable because it is acidic and that will kill the plants and animals as it must be neutral (2).* | 1 - 4 |
| **Total** |  | **/4** |

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| **Characteristic** | **Marking Scheme** | **Marks** |
| Question 4  Evaluation | Evaluates experimental method and makes specific relevant suggestions to improve the design of the investigation.  Reliability  ***The water samples have been sitting in a container which may change the abiotic factors such as oxygen because the container is closed, would have been better to sample from the well as this would give a closer value to what you would expect in the pond.***  ***The water sample may have the correct levels of abiotic factors for living organism to survive, but when it is put into the pond it may change, need to test when it is put into the pond as the soil may be salty and this will change the salinity of the water.***  *Two factors identified (2), why they would affect the outcome (2) and what could have been done to make the readings more accurate/appropriate (2)* | 5 - 6 |
| Evaluates experimental method and makes general suggestions to improve the design of the investigation.  ***The water samples have been sitting in a container which may have affected them (1), would have been better to sample from the well as more accurate (1).***  ***The water sample may be fine, but when it is put into the pond it may change (1), need to test when it is put into the pond (1)***  *Two factors identified with a general suggestion but no science link or reasoning* | 3 - 4 |
| Describes difficulties experienced in conducting the investigation and suggests general improvements.  ***The probes reading kept changing, taking several readings (1)***  ***Water was in a container not the well so temperature was different, measure the well. (1)*** | 1 - 2 |
| **Total** |  | **/6** |