Science Term 1 Revision Notes:

Inquiry Skills:

Variables:
Independent Variable = The one thing you change
Dependent Variable = What you measure
Control Variables = What you keep the same

Research Question:
For experiments = What is the relationship between the Independent and Dependent variables while keeping the Control Variables the same?
For Research Investigations = Is A better/(other comparison) than B?

Examples:
1. How does the amount of sunlight (hours per day) affect bean plants' height (cm) over two weeks when keeping the amount of water the same?
2. Is tap water better than bottled water for plant growth?

Control Groups:
Control groups = A group in the experiment that has all the same variables and method without the independent variables.

Example:
RQ = How does the amount of sunlight (hours per day) affect bean plants' height (cm) over two weeks when keeping the amount of water the same?
Control Group = Plants that have no exposure to sunlight?

Predictions:
Must include:
1. Independent Variable
2. Dependent Variable
3. Expected Relationship
4. Explanation related to Scientific Concepts

Aims:
1. To determine/investigate/find out
2. State Independent Variable
3. State Dependent Variable

Example:
To determine whether the length of a person's thigh muscles affects the distance they can jump.

Designing methods:
Reliable/Precise = Getting the same answer over and over again.

e.g. Repeat investigation, keep method consistent, use precise apparatus (digital equipment)
Valid/Accurate = Getting the correct answer.
e.g. Only changing the one variable, keep all other variables the same, a large sample size

Risk Assessment:
Every investigation must assess and take steps to prevent the hazards that could occur.
Risk = Danger that could occur (e.g. Broken Glass)
Hazard = Injury/Illness that could occur from risk (e.g. Cuts)
Mitigation = What can be done to stop the risk occurring (e.g. Move all apparatus to the centre of the table and handle with care)

Analysis:
Steps to write:

1. Identify pattern/trend/relationship in the data (Increased/Decreased/Linear/Exponential/Sharply/Significantly)
2. Include Data as evidence (e.g. On day 1 the height was 0.5cm, however on day 14 the height was 32cm.)
3. Identify uncertainties in the data. (How Reliable/Precise is the data)
4. Limitations in the data (How Valid/Accurate is the data?)

Patterns/Trends/Relationships:
Trend = General direction of data over time.
Pattern = Recurring arrangements seen in data/ Cycles in how data points are distributed
Relationship = Connections between variables. How one change causes another. (Independent vs Dependent)

Conclusions:
Steps to write:

1. Refer to the data/results of the investigation,(e.g, Since the results show...)
2. From these results, draw your conclusion/answer your research question (e.g. Therefore it can be concluded that..)
3. Summarise the precision/validity of your data(use evidence) from your analysis to support.

Evaluations:
Steps to write:

1. Was your experiment Reliable? Give evidence
2. Identify three mistakes made in the method that caused uncertainty in the data.
3. Give improvements that would fix the three mistakes in the method
4. Was the experiment Valid? Give evidence with Data

5. Identify two variables that you did not control.
6. Give 2 extensions from the two uncontrolled variables. Keep dependent variables the same.

Drawing a Graph:
Tips:

1. The X axis is the Independent variable
2. The y axis is the Dependent variable
3. Scale increases in even increments
4. Origin can start at anything other than 0 using two slashed marks
5. Do not join trend line/line graph to zero
6. Plot points according to the x and y values
7. Use Ruler
8. Use descriptive caption

Example:

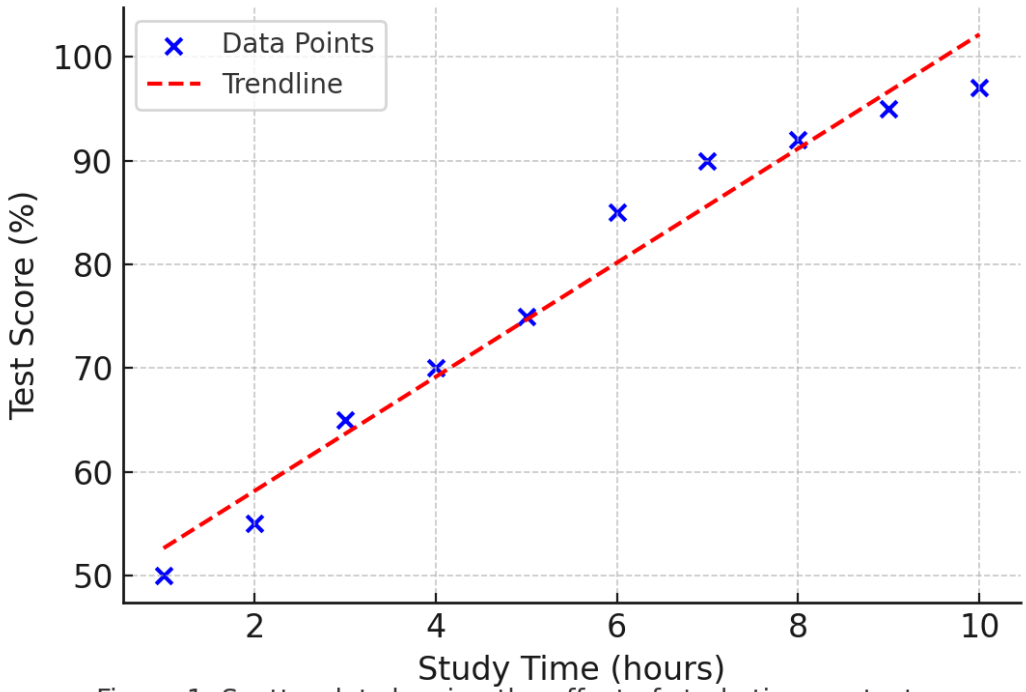

Figure 1: Scatterplot showing the effect of study time on test scores.

Types of graphs:

1. Line Graphs = Shows continuous data. Similar to a scatterplot but dots are connected
2. Scatterplot = Overall relationship with trend line
3. Bar = Numbers vs things (e.g. Numbers of bees and wasps)
4. Pie charts = Segment of a whole. (angle = value of a variable/total x 360)

Marks:

Scientific Inquiry Skills marks:

Graphing:

- 1 mark for each axis label included
- 1 mark for each axis unit included (unit must match label)
- 1 mark for figure caption below graph
- 1 mark for figure caption descriptive
- 1 mark for scale correct on both axes
- 1 mark for correctly plotted points
- 1 mark for correct trendline
- 1 mark for independent variable on the x-axis
- 1 mark for dependent variable on the y-axis
- 1 mark for correct type of graph

Research Questions

- 1 mark for identifying the independent variable
- 1 mark for identifying the dependent variable
- 1 mark for ensuring both independent and dependent variables are measurable
- 1 mark for specifying controlled variables
- 1 mark for providing units (if relevant) for variables

Prediction:

- 1 mark for identifying the independent variable
- 1 mark for identifying the dependent variable
- 1 mark for stating the predicted relationship between variables
- 1 mark for providing a logical explanation for the prediction
- 1 mark for ensuring the prediction is based on relevant science concepts

Drawing Conclusions:

- 1 mark for stating the results (data)
- 1 mark for answering the research question
- 1 mark for summarising the validity/reliability of the results
- 1 mark for providing evidence of the reliability/validity of the results

Content:

The Earth's Spheres

1. Geosphere (Lithosphere)

This encompasses the Earth's solid components—rocks, minerals, and landforms. It includes the crust and the upper mantle, forming the foundation upon which other spheres interact.

2. Hydrosphere

All water on Earth, in various forms—liquid, solid (ice), and vapor—constitutes the hydrosphere. This includes oceans, rivers, lakes, glaciers, and atmospheric moisture.

3. Atmosphere

The layer of gases surrounding Earth, primarily composed of nitrogen and oxygen, is our atmosphere. It protects life by filtering harmful solar radiation and regulating temperature.

4. Biosphere

This sphere includes all living organisms—plants, animals, and microorganisms—and their interactions with the environment.

Interactions Among the Spheres

The Earth's spheres are intricately connected, with changes in one often influencing others:

- Geosphere and Hydrosphere: Water shapes land through erosion and sediment deposition, while minerals from rocks dissolve into water bodies, affecting their chemistry.
- Hydrosphere and Atmosphere: Water evaporates into the atmosphere, forming clouds that eventually precipitate as rain or snow, replenishing water sources.
- Atmosphere and Biosphere: Plants absorb carbon dioxide from the atmosphere for photosynthesis, releasing oxygen essential for animal life.
- Biosphere and Geosphere: Plant roots stabilize soil, preventing erosion, while decomposed organic matter enriches soil fertility.

Carbon Cycle:

1. Atmospheric Carbon

Carbon exists in the atmosphere primarily as carbon dioxide (CO_2) and methane (CH_4), both of which are greenhouse gases influencing the planet's temperature.

2. Photosynthesis and Respiration

Plants absorb CO_2 from the atmosphere during photosynthesis, converting it into organic matter like glucose. This process not only supports plant growth but also releases oxygen into the atmosphere. Animals and plants then utilize this organic matter for energy through respiration, returning CO_2 to the atmosphere.

3. Oceanic Absorption

Oceans play a significant role by absorbing CO_2 from the atmosphere. This dissolved CO_2 can be used by marine organisms to form calcium carbonate shells and skeletons. When these organisms die, their remains contribute to sediment formation on the ocean floor, sequestering carbon for extended periods.

4. Soil and Decomposition

When plants and animals die, decomposers like bacteria and fungi break down their organic matter, releasing CO_2 back into the atmosphere or storing carbon in the soil as organic matter. This soil carbon can remain for years or even centuries, depending on environmental conditions.

5. Fossil Fuels and Human Influence

Over millions of years, buried organic matter can transform into fossil fuels such as coal, oil, and natural gas. Human activities, notably the extraction and combustion of these fossil fuels, release significant amounts of CO_2 back into the atmosphere, altering the natural balance of the carbon cycle.

6. Geological Processes

Volcanic activity releases CO_2 stored in the Earth's mantle into the atmosphere. Additionally, weathering of carbon-containing rocks can transfer carbon to rivers and oceans, where it may eventually become part of marine sediments.

This continuous exchange of carbon among the atmosphere, biosphere, hydrosphere, and geosphere maintains Earth's climate and supports life. However, disruptions to this balance, especially from human activities, can lead to climate change and other environmental challenges.

Climate Change

The greenhouse effect is a natural phenomenon where certain gases in Earth's atmosphere trap heat, preventing it from escaping into space, thereby warming the planet. This process is essential for maintaining temperatures that support life. However, human activities have increased the concentrations of these greenhouse gases, intensifying the effect and leading to global warming.

Key Greenhouse Gases:

- Carbon Dioxide (CO_2): Produced by burning fossil fuels, deforestation, and certain industrial processes.
- Methane (CH_4): Emitted during the extraction and transport of fossil fuels, livestock farming, and decay of organic waste in landfills.
- Nitrous Oxide (N_2O): Released from agricultural and industrial activities, as well as combustion of fossil fuels and solid waste.
- Fluorinated Gases: Synthetic gases used in various industrial applications, including hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF_6).

Evidence of Global Warming:

- Rising Global Temperatures: The Intergovernmental Panel on Climate Change (IPCC) reports that human activities have unequivocally caused global warming, with global surface temperatures reaching 1.1°C above pre-industrial levels in 2011–2020.
- Melting Polar Ice and Glaciers: Accelerated melting of ice sheets in Greenland and Antarctica contributes to rising sea levels.
- Sea-Level Rise: Thermal expansion from warming oceans and melting ice have led to measurable increases in sea levels, threatening coastal

communities.
- Increased Frequency of Extreme Weather Events: There is a documented rise in the occurrence and intensity of heatwaves, hurricanes, and heavy precipitation events.
- Ocean Acidification: Higher CO_2 levels are being absorbed by oceans, leading to increased acidity, which adversely affects marine life, particularly organisms like corals and shellfish.
-

These indicators collectively demonstrate the ongoing impact of the enhanced greenhouse effect, underscoring the urgency for global efforts to reduce greenhouse gas emissions and mitigate climate change.