Coursework B

Sample Investigation Title

“Qualitatively investigate the effectiveness of three methods of preventing an object containing iron from corrosion”

Report Preparation Worksheet

1. Introduction to the investigation (including a clear statement,identification of the problem/topic to be investigated, background research undertaken in preparation for the investigation: people, books, websites, etc. as sources of relevant information)

(i) Statement/Identification of the problem/topic to be investigated

- In this experiment I'll investigate three ways to prevent iron containing objects from rusting, and try to determine which way is best.

(ii) Background research undertaken in preparation for the investigation; people, books, websites etc. as sources of relevant information

- I googled the internet for "best ways to prevent iron corroding", and found some useful information at www.wikipedia.org/wiki/Rust, www.corrosiondoctors.org and www.metalwebnews.com.
- I looked up my school textbook, Science Matters, and read what it said about corrosion. The experiment titled "To carry out an experiment to show that oxygen and water are necessary for corrosion" was instructive.
- I also reviewed what I had learnt about carrying out experiments and the importance of controls and variables.
- I asked my teacher and my parents if they knew of any good products in use, that may prevent corrosion.

2. Preparation and Planning

(i) Identify any relevant variables and necessary controls

- The variables that I will change are the coatings on the iron nails (my chosen iron containing product). This is my independent variable.
- The variable that I will measure is the length of time taken for corrosion to occur on the nails. This is the dependent variable.
- My control variables will be a) the same size and shape of nail, b) the same material from which nails are made, c) the same volume of water in each test tube and the same size/shaped test tubes. The environmental conditions are also controlled, e.g., same temperature, light etc.,

(ii) List of equipment needed for the investigation

- 4 test tubes, test tube holder, 4 iron nails, measuring cylinder, water, tippex, metal paint, vaseline, safety goggles, disposable gloves.

(iii) List of tasks to be carried out during the investigation

- I will thoroughly clean each with sandpaper to remove any surface coating.
- Equal volumes of water (15 cm^3) of water will be placed in each test tube.
- Each of three nails will be coated with the substances under consideration (vaseline, paint and tippex). The fourth will remain uncoated, to act as a control.
- The nails will be kept in the same environmental conditions and monitored on a daily basis for the appearance of corrosion.
- The length of time required for corrosion to appear in each case will be noted, and the amount of corrosion observed.
- The results observed will be tabulated and graphs drawn.

3. Procedure, Apparatus, Safety, Data Collection/Observations

The following section should be used to describe the procedure followed in the investigation. Labelled diagrams showing apparatus or equipment should be included, where appropriate.

(i) Particular safety precautions required by this investigation

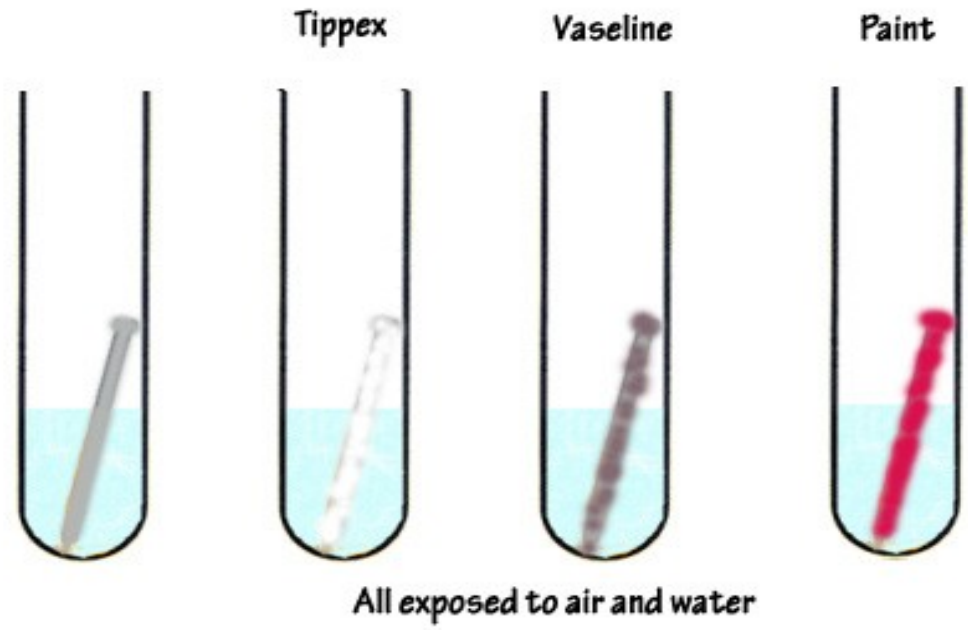
- Safety glasses and gloves were worn to protect eyes and hands, and a lab coat was worn in case of spillage.
- The coating were applied in well ventilated areas, and, when dry, *carefully* placed into the glass test tubes.

(ii) Procedure followed in the investigation?

- The apparatus was set up as in diagram below.

- 15 cm^3 of water was placed in each test tube, and the nails, with dried coatings, were placed in the tubes and monitored on a daily basis. My observations on the appearance of corrosion were recorded in a table and summarised in a chart.

Labelled diagram (where appropriate)



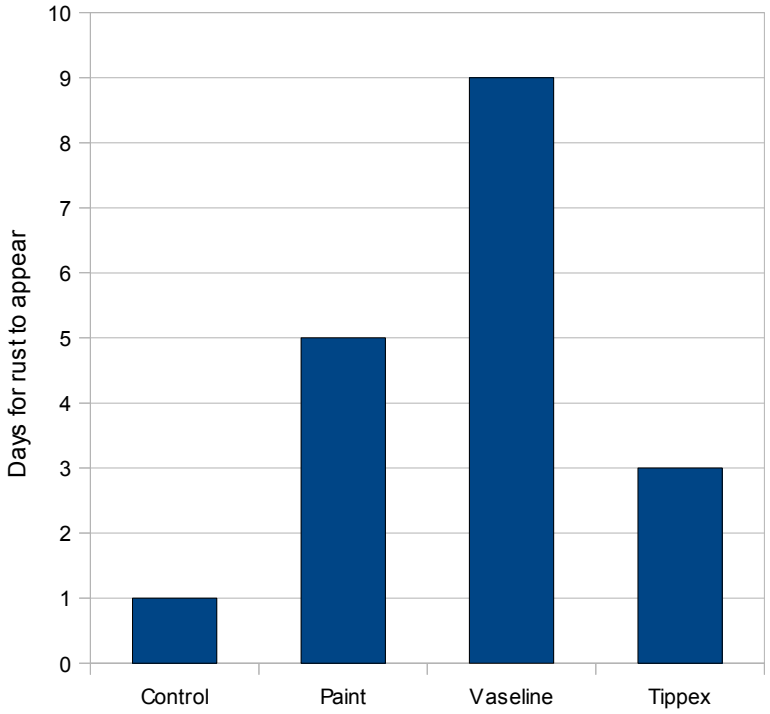
(iii) Procedure followed in the investigation?

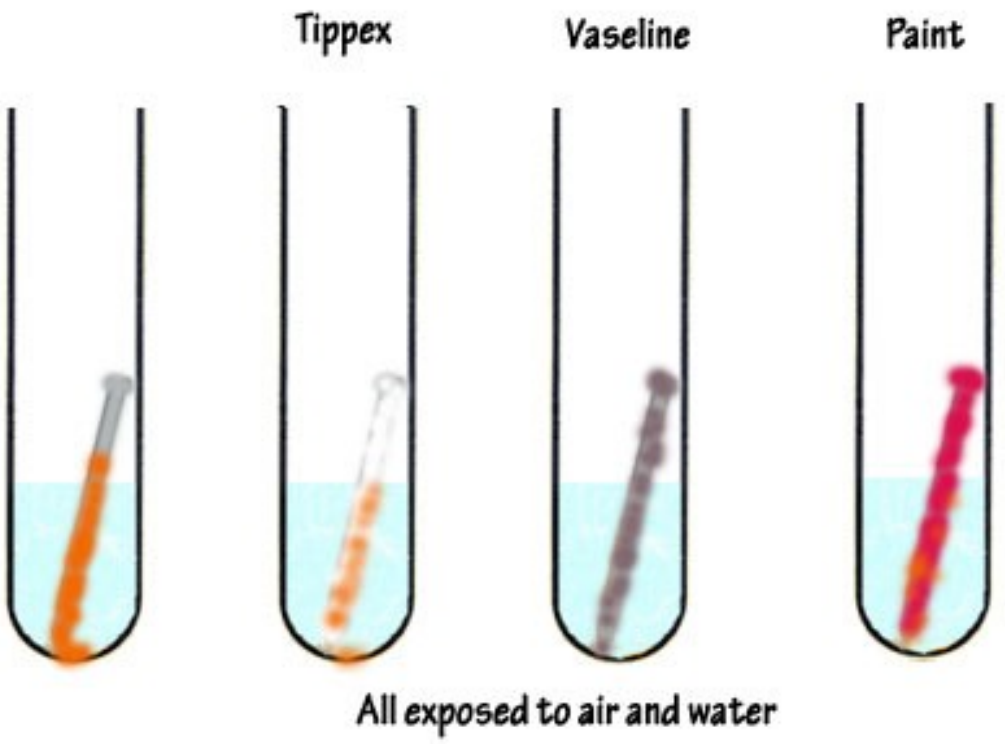
Labelled diagram (where appropriate)

(iv)Recorded Data / Observations

Day	1	2	3	4	5	6	7	8	9
Control	O	✓	✓	✓	✓	✓	✓	✓	✓
Paint	O	O	O	O	O	✓	✓	✓	✓
Vaseline	O	O	O	O	O	O	O	O	O
Tippex	O	O	O	✓	✓	✓	✓	✓	✓

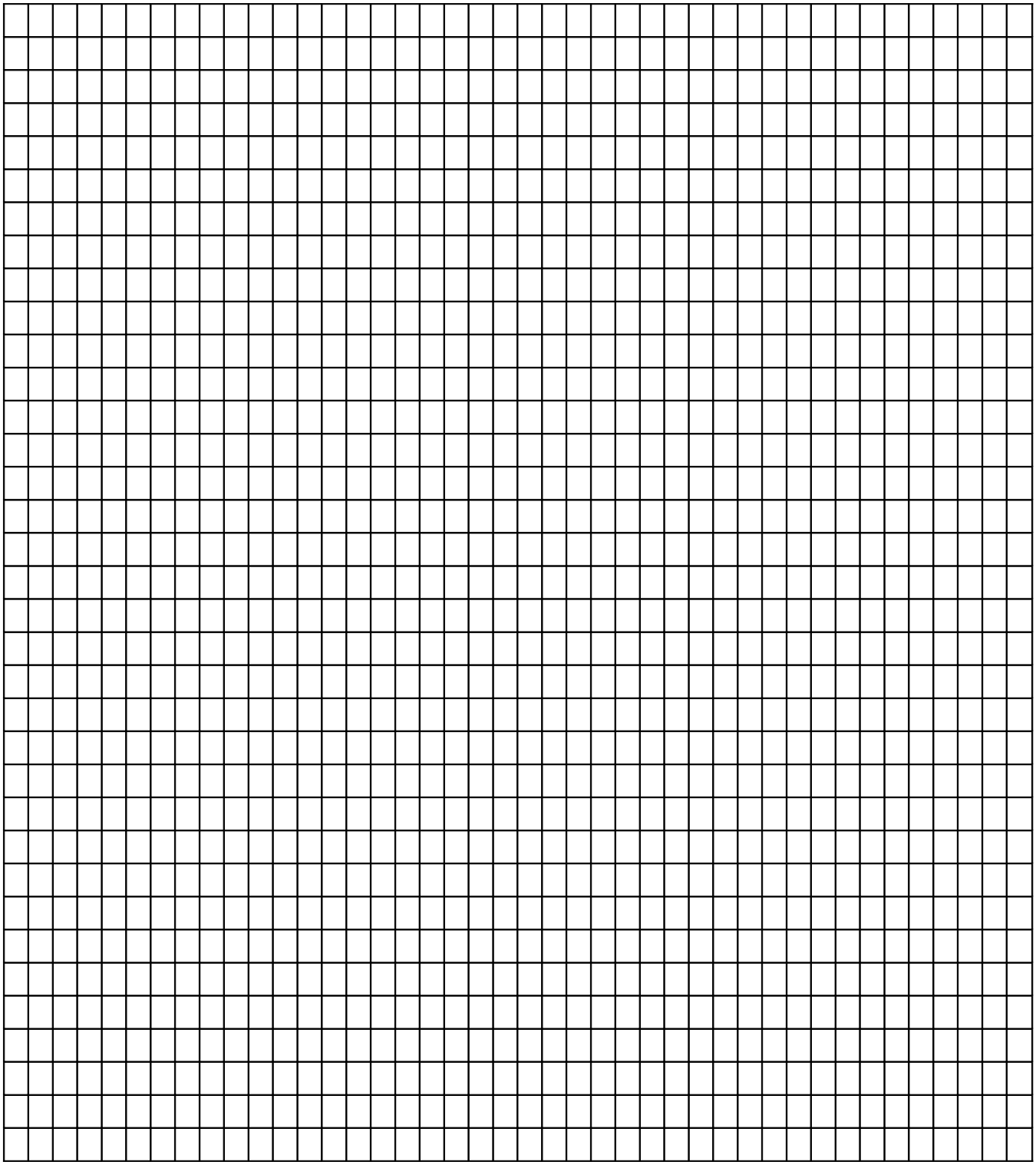
Key: ✓ = Rust observed, O = Rust NOT observed





Appearance of nails after 9 Days exposure to air and water.

- It was difficult to know the exact amount of corrosion on the nails by just looking at them, and the initial appearance of corrosion was difficult to determine exactly.
- The water contained suspended rust particles as the days passed, and the cloudiness of the water from these particles was greater in the tubes containing the nails that had rusted the most.



4. Analysis

(i) Calculations / Data Analysis

- Our investigation showed that vaseline offered the best protection from corrosion of the three methods we checked.
- Tippex offered the least amount of protection

(ii) Conclusion(s) and Evaluation of Result(s)

- The results showed that the three different methods of preventing corrosion, that we tested, were not equally good at doing so.
- Coating the nails with vaseline was better than coating them with paint. Coating them with tippex was the least successful option.
- All three methods were better than having no protection at all.

5. Comment

Comments (e.g. refinements, extensions, sources of error etc.)

- The experiment could be done over a longer period of time to get a better picture of the extent of the corrosion
- The amount of rust formed could be measured, perhaps by filtering the water and weighing the filter paper.
- Other means of protecting against rust could be investigated – eg galvanising or oiling/WD 40.
- Thoroughly painting the nail proved difficult, as the points on which the nail rested tend to lose their coat. Perhaps a second coating should have applied.
- Carefully weighing the nails before the experiment, and each day after allowing them, say, 20 mins to air dry, would give us an indication of the amount of rust on them (iron oxide is heavier than iron)
- Different shaped pieces of iron, perhaps flatter plate shaped pieces, would provide a greater surface of iron on which corrosion could occur and might make it easier to see if corrosion had occurred.
- Although vaseline may have come out best in our test, it would not be suitable in many common situations – e.g. railings. It would come off too quickly by contact.