**Form 3**

**Mandatory Science experiments**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class: \_\_\_\_\_\_\_

**Do not take this booklet home with you**

**It is to be kept in the science lab at all times**

*Remember to use your camera-phone as much as possible to take videos of yourself and your lab partners doing the experiments (it is a great way to revise) and also to paste in any relevant photos.*

**Biology**

|  |  |  |
| --- | --- | --- |
| Page | **Third Year** |  |
| 2 | Show that starch is produced by a photo-synthesising plant. |  |
| 3 | Investigate the conditions necessary for germination |  |

**Chemistry**

|  |  |  |
| --- | --- | --- |
|  | **Third Year** |  |
| 4 | Titrate HCl against NaOH, and prepare a sample of NaCl. |  |
| 5 | Carry out an experiment to demonstrate that oxygen and water are necessary for rusting. |  |
| 6 | Investigate the reaction between zinc and HCl, and test for hydrogen. |  |

**Physics**

|  |  |  |
| --- | --- | --- |
|  | **Third Year** |  |
| 7 | Test electrical conduction in a variety of materials, and classify each material as a conductor or insulator. |  |
| 9 | Set up a simple electric circuit; use appropriate instruments to measure current, potential difference (voltage) and resistance, and establish the relationship between them. |  |

**To show that starch is produced by a photosynthesising plant**



**Date:**

**Lab Partners:**

|  |  |
| --- | --- |
| **Procedure** | **Reason** |
| 1. We placed a plant in the dark for a few days |  |
| 1. We placed aluminium foil over one of the leaves |  |
| 1. We put the plant in strong sunlight for a day |  |
| 1. We put the leaves in boiling water for a minute |  |
| 1. We soaked the leaves in alcohol for a few minutes |  |
| 1. We dipped the leaves in boiling water again and rinse |  |
| 1. We tested for starch. |  |

**Result:**

**OB 58: To investigate the conditions necessary for germination**

**Date:**

**Lab Partners:**

**Procedure**:

We placed cress seeds in cotton wool in each of the test tubes, as shown above.

We then set up the different test tubes as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test Tube |  |  | Missing condition |
| **A** | Dry cotton wool |  | Moisture |
| **B** | Moist cotton wool |  |  |
| **C** | Keep in the fridge |  | Heat |
| **D** | Cooled boiled water | Cover it with oil | Oxygen |
|  |  |  |  |

**Result**:

**Conclusion**:

**Exam Questions**

[2011 OL][2006 OL]

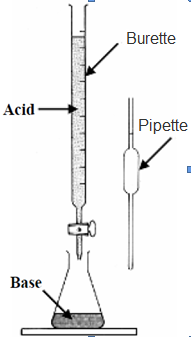
A number of cress seeds were set up as shown in the diagram and left for a few days to investigate the conditions necessary for germination.

Test tubes A, B and D were kept in the laboratory at room temperature.

Test tube C was placed in the fridge at 4 °C.

The seeds in test tube B germinated after 3 days.

1. Why did the seeds in test tube A fail to germinate?
2. Why did the seeds in test tube C fail to germinate?
3. Why do only the seeds in test tubes B germinate?
4. Why is the water in test tube D boiled and cooled before use?
5. Why is this investigation considered to be a “fair test”?
6. Give two of the three conditions necessary for seeds to germinate.

**To titrate hydrochloric acid (HCl) and sodium hydroxide (NaOH) and prepare a sample of sodium chloride (NaCl)**

A titration is a method of finding out the exact amount of acid required to ***just*** neutralise a certain volume of a base.

**Date:**

**Lab Partners:**

Apparatus: As shown in the diagram

Chemicals: dilute hydrochloric acid, dilute sodium hydroxide

**Method:**

1. We set up the apparatus as shown in the diagram.
2. We noted the volume of hydrochloric acid in the burette and put 25 cm3 of sodium hydroxide into the conical flask using the pipette for accurate measurement.
3. We used pH paper to measure the pH of the base.
4. We slowly added the acid into the conical flask until the liquid in the conical flask reached a pH of 7 (the liquid is now neutral).
5. We noted the new reading on the burette. We then took the final reading from the initial reading to calculate the amount of acid required to neutralise the base.
6. We poured the contents of the conical flask into an evaporating dish and allowed the solution cool.

**Result**:

1. It took \_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm3 of HCl to neutralize the base.
2. White crystals of sodium chloride (NaCl) formed in the dish.

**To demonstrate that oxygen and water are necessary for rusting**

**Date:**

**Lab Partners:**

**Procedure**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test-tube** | **Added to test-tube** | | **Reason** | **Missing condition** |
| **A** | Nails | Tap water only |  |  |
| **B** | Nails with | 1. Boiled tap water 2. Oil (on top of water) | 1. To remove any dissolved oxygen 2. To prevent further oxygen entering | No air |
| **C** | Nails with | 1. Calcium chloride 2. Cover the test-tube | 1. To absorb any moisture 2. To prevent further water entering | No water |

1. Leave for a week.

**Result** (what did you notice about which one rusted first?)

**Questions**

* 1. In which test tube A, B, or C did the nail rust?
  2. Why did the nails in this test tube rust?
  3. Why is the water in test-tube B boiled?
  4. What is the function of the oil in tube B?
  5. Why did the nails in C not rust?
  6. What is the function of the calcium chloride in test tube C?
  7. Name one method that can be used to prevent the rusting of iron.
  8. What conclusion can be drawn from this experiment?
  9. Give one condition necessary for rusting to occur.

**To investigate the reaction between zinc and HCl, and test for hydrogen**



**Date:**

**Lab Partners:**

**Method**

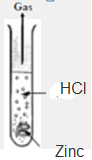
1. We slowly released some hydrochloric acid into a flask containing zinc metal and collected the gas given off in a test tube.
2. We tested the gas by lighting it with a match

**Result**

**zinc + hydrochloric acid → zinc chloride + hydrogen**

Zn + 2HCl → ZnCl2 + H2

**Method Two**



What is the advantage of Method Two?

What is the disadvantage of Method Two?

**Exam Questions**

[2009][2010 OL]

The apparatus shown in the diagram was used to investigate the reaction of zinc with hydrochloric acid.

1. Name the gas given off.
2. Describe a test for this gas.
3. Write a chemical equation for the reaction of zinc with hydrochloric acid.

**Test electrical conduction in a variety of materials, and classify each material as a conductor or insulator.**

1. We set up the circuit as shown.

**Diagram** (use the alternative diagram below to help you)

Include the following components

Power-supply

Switch

Light-bulb

1. We placed various different materials between the points X and Y in the circuit and then turned on the switch.
2. If the bulb went bright then the material was a conductor and if it didn’t then the material was an insulator.

**Results**

|  |  |  |
| --- | --- | --- |
| **Material** | **Conductor?** | **Insulator?** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

|  |  |
| --- | --- |
| Label | Circuit component |
| A | Switch |
| B | Power supply |
| C | Resistor |
| D | Bulb |

**Alternative diagram**

**Set up a simple electric circuit; use appropriate instruments to measure current, potential difference (voltage) and resistance, and establish the relationship between them.**

**Date:**

**Lab Partners:**

1. We set up the circuit as shown.

**Diagram** (use the alternative diagram on the next page to help you)

Include the following components:

Power-supply

Variable resistor

Voltmeter

Ammeter

High-resistance wire

1. We recorded the current (I) and potential difference (V).
2. We adjusted the variable resistor (rheostat) to get a new set of values.
3. We repeated this about 6 times and then plotted a graph of potential difference against current.
4. We got a straight line passing through the origin (0.0) which shows that the potential difference is proportional to the current (this means that if we double the potential difference, the current will double also).
5. We calculated the slope of the graph: this corresponds to the resistance of the wire.

**Results**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Voltage  (Volts) |  |  |  |  |  |  |
| Current (Amps) |  |  |  |  |  |  |

**Graph of Voltage against Current**



|  |  |
| --- | --- |
| **Your graph should look something like this** | **Your diagram should look a little like this** |
|  | **Standard Test Circuit** |