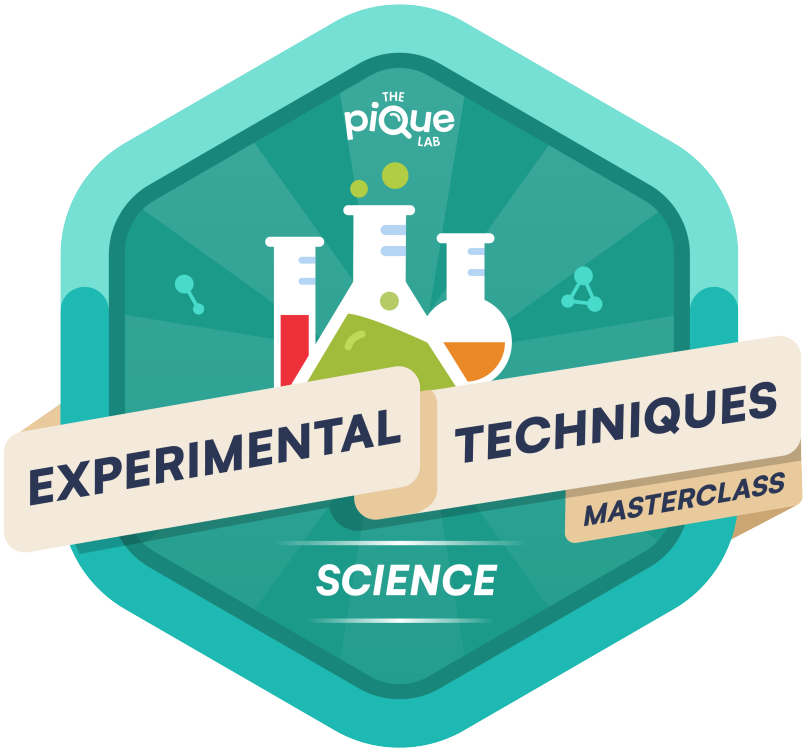
THE PIQUE LAB LEARNING CENTRE

Primary School Science Programme



EXPERIMENTAL TECHNIQUES MASTERCLASS

Answer Booklet

Name: _____

Class: _____

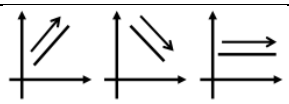
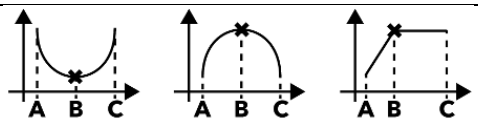
TOPICS COVERED

EXPERIMENTAL TECHNIQUES MASTERCLASS

#1: AIM OF THE EXPERIMENT

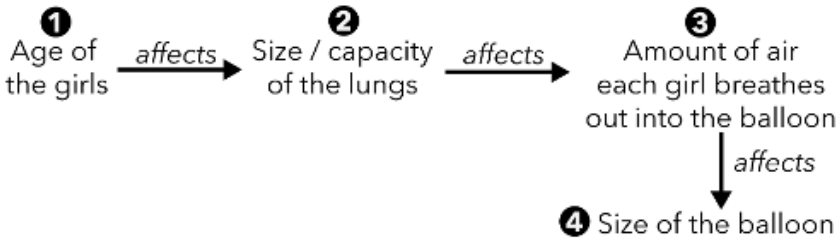
Qn	Answer
TEMPLATE STRUCTURE	(CV) (MV) (MV) (CV)
Example 1	To find out how the brand of insecticide affects the number of fruit flies still alive after 20 minutes.
Q1	To find out if the presence of light affects the germination of seeds.

#2: RELATIONSHIP TYPE QUESTION

<table>
<tr><th>Qn</th><th>Answer</th></tr>
<tr><td>IMPORTANT KEYWORDS</td><td>
<table>
<tr><td>BETWEEN</td><td>AND</td></tr>
<tr><td>between (CV/MV)</td><td>and (MV/CV)</td></tr>
<tr><td>HOW DOES</td><td>AFFECT</td></tr>
<tr><td>How does (CV)</td><td>affect (MV)</td></tr>
</table>
</td></tr>
<tr><td>TEMPLATE STRUCTURE</td><td>
<table>
<tr><td>1 trend  </td></tr>
<tr><td>As ; (CV) ; increases ; decreases
(MV) ; increases ; decreases
remain the same</td></tr>
<tr><td>2 trends  </td></tr>
<tr><td>As ; (CV) ; increases ; A ; B ; B
(MV)
As ; (CV) ; increases ; B ; C ; B
(MV)</td></tr>
</table>
</td></tr>
<tr><td>Example 2</td><td>As the temperature of the water increases until 25 ˚C, the rate of photosynthesis of plant A increases. As the temperature of the water increases beyond 25 ˚C, the rate of photosynthesis of plant A decreases.</td></tr>
<tr><td>Q2</td><td>As the distance between the lamp and the water plant increases, the number of bubbles produced decreases.</td></tr>
</table>

#3: HOW DO WE ENSURE A FAIR TEST?

<table>
<tr><th>Qn</th><th>Answer</th></tr>
<tr><td>TEMPLATE STRUCTURE</td><td>
<u>Fair Test Type #1</u>
A: <u>one changed variable</u> ; <u>(CV)</u> ; <u>(MV)</u>

<u>Fair Test Type #2</u>
<u>3</u> STEPS
1: <u>More than one variable</u>
2: <u>(Extra variable)</u>
3: <u>(Explain how the extra variable affects MV)</u>
</td></tr>
<tr><td>Example 3 ANALYSIS</td><td>
1. <u>Age of the girls</u>
2. How does the …


</td></tr>
<tr><td>Example 3 ANSWER</td><td>
Applying fair test type <u>2</u> template structure:
1. More than one variable has been changed in the experiment.
2. The age of the girls was not kept the same,
3. and this would affect the size of their lungs, which would affect the amount of air each girl breathes out into the balloon, affecting the size of the balloon.
</td></tr>
<tr><td>TEMPLATE STRUCTURE</td><td>
<u>Fair Test Type #3.1</u>
<u>2</u> STEPS
1: <u>toy car</u> ; <u>mass of the toy car</u> ; <u>kept the same</u> ; <u>the time taken for the toy car to reach the bottom of the ramp</u>
2: <u>one changed variable</u> ; <u>the type of surface of the ramp</u> ; <u>results</u> ; <u>fair test</u>
</td></tr>
</table>

TEMPLATE STRUCTURE	**Fair Test Type #3.2** 2 STEPS 1: distance between the magnet and the iron paper clips ; circle "increases" ; the number of iron paper clips attracted ; circle "decreases" 2: distance between the magnet and the iron paper clips ; one changed variable ; the type of magnet ; results ; fair test
Q3	Yes. There is only one changed variable, which is the size of the flowers, that affects the number of butterflies landing on them.
Q4	More than one variable would have been changed in the experiment. The location of each container would not have been kept the same and this would have affected the temperature/wind speed at each location, which would have affected the time taken for the water to evaporate completely.
Q5	As the thickness of each material increases, the rate of heat conduction through the material decreases. Thus, keeping the thickness of the materials the same ensures that there would be only one changed variable, which is the type of material that affects the results, ensuring a fair test.

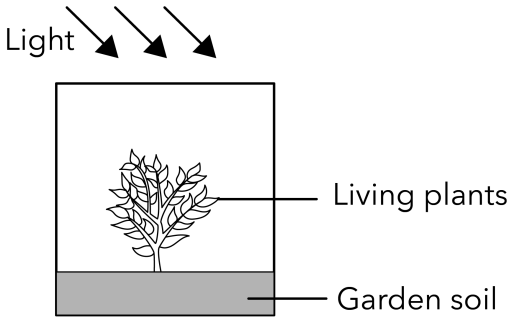
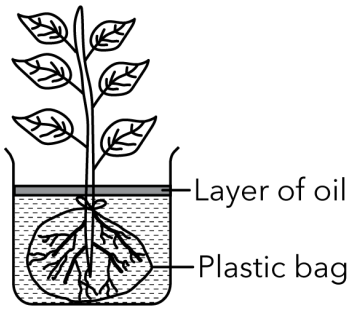
#4: HOW DO WE ENSURE THAT THE RESULTS ARE RELIABLE?

Qn	Answer
TEMPLATE STRUCTURE	(CV) ; at least 3 times ; consistent ; average ; (MV) ; reliable
Example 4	James conducted the same experiment for three attempts to ensure that the results are consistent before taking the average change in James' heart rate for a more reliable result.
Q6a	For each ball, he should carry out the experiment at least 3 times to ensure that the results are consistent before taking the average distance moved by the ball for a more reliable result.
Q6b	When the ball lands on the wet sand, it leaves a depression, helping him measure the actual distance moved by the ball more accurately.

#5: STATING A HYPOTHESIS OF THE EXPERIMENT
&
#6: MAKING A CONCLUSION FROM THE RESULTS OF THE EXPERIMENT

<table>
<tr><th>Qn</th><th>Answer</th></tr>
<tr><td>DEFINITION OF HYPOTHESIS</td><td>prediction ; results ; before</td></tr>
<tr><td>DEFINITION OF CONCLUSION</td><td>interpretation ; results ; after</td></tr>
<tr><td>TEMPLATE STRUCTURE</td><td>
<table>
<tr><td>Method #1: Relationship
As ; (CV) ; (MV)
OR
(CV) ; affect ; (MV)</td></tr>
<tr><td>Method #2: State the property
Material A is an electrical conductor while material B is an electrical insulator.</td></tr>
<tr><td>Method #3: Compare the property
Material X is the best conductor of heat, followed by material Y, then material Z.</td></tr>
</table>
</td></tr>
<tr><td>Example 5</td><td>As the number of bulbs arranged in series increases/decreases, the brightness of each bulb increases/decreases.
OR
The number of bulbs arranged in series does not affect the brightness of each bulb.</td></tr>
<tr><td>Example 6</td><td>As the number of bulbs arranged in series increases, the brightness of each bulb decreases.</td></tr>
<tr><td>Q7a</td><td>Both pure water and tap water are electrical conductors / insulators.
OR
Pure/Tap water is an electrical conductor while tap/pure water is an electrical insulator.</td></tr>
<tr><td>Q7b</td><td>Liquid Y is the best electrical conductor, followed by liquid Z, then liquid X.</td></tr>
</table>

#7: WHAT IS THE PURPOSE OF THE CONTROL SET-UP?

Qn	Answer
TEMPLATE STRUCTURE	compare and confirm / ensure / prove / show ; change ; (MV) ; only ; (CV) *In order to create the control set-up, we remove whatever that is changed.
Example 7A	 **Set-up C**
Example 7B	Set-up C acts as a control set-up to compare and confirm that any change in the rate of photosynthesis of plants is caused only by the amount of light received by the plants.
Q8a	
Q8b	The purpose of the control set-up is to compare and confirm that any change in the water level is caused only by the plant absorbing water through the roots.

#8: COMPLETE STEPS TO CONDUCT AN EXPERIMENT

<table>
<tr><th>Qn</th><th>Answer</th></tr>
<tr><td>a</td><td>The presence of substance A increases/decreases the rate of water uptake by the plant.
OR
The presence of substance A does not affect the rate of water uptake by the plant.</td></tr>
<tr><td>b</td><td>Tick Beakers (500 ml), Red-coloured water, Substance A, A few stalks of white rose with 3-cm-thick (or 5-cm-thick) stem, Half-metre ruler</td></tr>
<tr><td>c</td><td>
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Measure 300 ml of red-coloured water in each of the two beakers.</td></tr>
<tr><td>2</td><td>Add substance A into only one of the beakers.</td></tr>
<tr><td>3</td><td>Place a stalk of white rose with 3-cm-thick (or 5-cm-thick) stem into each beaker.</td></tr>
<tr><td>4</td><td>Using a ruler, measure and record the initial height of water in each beaker.</td></tr>
<tr><td>5</td><td>Leave the set-ups beside the windows in the Science laboratory for 2 hours.</td></tr>
<tr><td>6</td><td>After 2 hours, use a ruler to measure and record the final height of water in each beaker.</td></tr>
<tr><td>7</td><td>Calculate the difference in the heights of water in each beaker.</td></tr>
<tr><td>8</td><td>Repeat steps 1 to 7 two more times.</td></tr>
<tr><td>9</td><td>Compare the average of the results and conclude the experiment.</td></tr>
</table>
*Note: Accept if student wrote any reasonable value of volume of water for the first step
</td></tr>
<tr><td>d</td><td>The presence of substance A increases the rate of water uptake by the plant.</td></tr>
<tr><td>e</td><td>There are more markings (divisions) on a ruler.</td></tr>
</table>