

1. Refer to diagrams whenever you want to
 - set up
 - make measurements
 - identify sources of error
 - also look for any difficulty in obtaining the measurements
2. Read THOROUGHLY — highlight important phrases. Pay attention to diagrams.
3. Ensure that all answer spaces are completed.
4. DO NOT spend more than 20 mins collecting data, so that you will have enough time to spend when processing the data.
5. Use a sharp and dark pencil for graph and diagrams.
6. Raw data are to be written to the correct number of decimal places according to the instrument's precision. (ALL calculated values must be 3 s.f.)
7. Ratio / Fractions should be calculated as a decimal number, to 3 s.f.
8. For graphs,
 - Axes: must be labelled as quantity/unit (example: x/cm, T/s, m/g)
 - Scale: large!! Spacing between first point and last point must be more than half the graph page (horizontally and vertically)
 - Have a sensible ratio for your scale, e.g. 1cm represent 1, 2 units

General precautions and sources of error:

Type of experiment:	Precautions:	Sources of error:
Pendulum	- Use small angle for swinging - Pendulum oscillates along the vertical plane, no wobbling - Human reaction error is incurred when measuring the time	- Extended string -> affects the length - Wobbled swing -> affects the time
Balancing	- Ensure that the metre rule is balanced horizontally by measuring the height at each end using another metre rule to be equal	- Centre-of-mass of ruler may not be at the centre -> affects the distance
Spring	- To ensure that a metre rule is vertical, place a set square against the rule and the bench top or align the metre rule with a vertical feature such as the frame of a door - The pointer of the spring must touch the scale of the	- The spring did not oscillate vertically -> affects the time

	metre rule	
Mirror / Glass block	- Place the pins vertically - Pins are sufficiently far apart (at least 5cm) - Mark with a 'x' on the holes - Place one eye at the same level as the pins when viewing - Place the reflecting surface of the mirror on the line	Thickness of mirror -> affects the reflection -> affects the measured angle Mirror is light -> It moves easily -> affects position of mirror when placed on the line (inconsistent) -> affects the measured angle Pins has thickness -> holes made are larger -> affects the drawing of rays The bevel edge of the glass block -> affects the glass block's position when placed on the drawn outline (inconsistent)
Lens	- Stick the metre rule to the bench using plasticine - Ensure that the torch, object, lens and screen are in one straight line - Ensure that the lens is vertical - Sets light source, object and centre of the lens to the same height - Ensures that the torch light is horizontal	- Image can still appear sharp over a small range of distance -> affects the image distance - The sides of the object are not even -> affects position of the sharp image -> affects image distance - The centre of the lens may not be in line with the centre of the lens holder -> affects the image and object's distance
Electricity	- Do not switch the circuit on for too long - Place one eye directly in front of the pointer reading of the ammeter/voltmeter - Place the jockey vertically and firmly on the wire	- When current flows -> temperature of the resistance wire increases -> resistance of wire changes -> affects the voltage and current - The thickness of the resistance wire is not uniform

		-> cross-sectional area and resistance not uniform -> affects voltage and current -Resistance wire not straightened -> affects the length -Contact of jockey on wire not consistent -> affects the voltmeter and ammeter readings
Heat	- Provide insulation to container - Place thermometer in the middle of the liquid - Stir gently to ensure uniform temperature - Read only when thermometer reading is steady - Place the measuring cylinder on a level surface - Place one eye directly in front of the liquid level in the measuring cylinder	- The water sticks to side of cylinder -> affects the volume - Time lapse between reading of thermometer and reading of stopwatch -> affects temperature reading - Thermometer response time is slower than actual temperature -> affects the temperature reading
Others		- Plasticine stuck to the side of measuring cylinder -> affects the volume reading - Plasticine stuck to the metre rule -> affects the mass - Volume of the string -> affects the measurement of volume of the plasticine - The plasticine is not a perfect cuboid -> affects the determination of its centre