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UPDATED TO 2019 SYLLABUS

CAIE IGCSE

PHYSICS (0625)

SUMMARIZED NOTES ON THE ALTERNATIVE TO PRACTICAL SYLLABUS

1. Safety Precautions

- Live wires should not be touched.
- Hot objects should not be touched with bare hands - gloves should be used
- Circuit connections should be checked and approved by the teacher and then only the circuit should be switched on
- While changing components of the circuit the power should be switched off so that one should not experience electric shocks.
- Safety goggles, gloves and other safety components should be used while handling experiments.
- While handling a mercury thermometer one should take care of the mercury spills.

2. Specific Heat Capacity

- **Apparatus:** Solid block, Drill, Thermometer, Heater (of known power), Cotton wool.
- **Procedure:**
 - Drill two holes in the block.
 - Measure the mass of the block.
 - Place the heater in one of the blocks, the thermometer in the other.
 - Use cotton wool to properly insulate/lag the block.
 - Note the initial temperature of block and turn on heater for x seconds
 - Calculate Heat Energy Supplied by heater using formula $Q=Pt$.
 - Note the final temperature of block.
 - *Specific heat capacity* $= \frac{Q}{m \times \Delta t}$.

3. Cooling Rate of Water

- **Apparatus:** Heater, Thermometer, Beaker, Stopwatch, Beaker containing Water.
- **Procedure:**
 - Place heater into beaker and turn it on to raise the temperature of water to 60°C
 - Stir the contents of the water and place thermometer into the beaker.
 - Note the starting temperature and turn on the stopwatch.
 - Take readings of the thermometer and stopwatch at regular intervals (e.g. 60 sec).
 - Draw up a table and plot a graph to conclude your experiment.

4. Picking a Better Insulator

- **Apparatus:** Two large cans, two small cans, cotton wool, polystyrene beads, boiling water, thermometers, stopwatch
- **Procedure:**
 - Put the small cans into the large cans and insulate the small can with (i) cotton wool and (ii) polystyrene beads
 - Pour boiling water into the small cans and place the thermometers in them.
 - Start the stopwatch and take readings of temperature at regular intervals.
 - Record readings in a table for each insulator.
 - The small can that has the higher temperature over the fixed period is better insulated.
 - Hence, object that provides a less temperature loss over the period is the better insulator.

5. Refraction of Light

- **Apparatus:** Ray Box, Rectangular piece of glass, Plain paper, Pencil.
- **Procedure:**
 - Place the Plain paper below the rectangular piece of glass.
 - Project a ray towards the glass.
 - Make two points to mark the incident ray, two to mark the refracted ray and two to mark the emergent ray.
 - Join all the lines, measure the angles and calculate refractive index.
 - Repeat with different angles; Snell's law shown.

6. Resistance and Temperature

- **Apparatus:** Resistor, Battery, Connecting wires, Ammeter, Voltmeter, Oven.
- **Procedure:**
 - Make a circuit with the battery, connecting wires, ammeter and voltmeter, resistor.
 - Measure the resistance of the resistor using the formula $R=V/I$.
 - Heat the resistor in the oven. Place the resistor back into the circuit.
 - Measure the readings again and calculate $R=V/I$.
 - Draw up a conclusion about how the resistance increases as temperature increases.

7. Speed of Sound

- **Apparatus:** Two observers, Gun, Stopwatch.
- **Procedure:**
 - Two observers are set apart at a known distance.
 - One observer has the gun, the other has the stopwatch.

- Observer A fires the gun, Observer B starts the stopwatch when he sees the puff of smoke.
- Observer B stops the stopwatch when he hears the sound and the time is noted.
- $Speed = \frac{Distance}{Time}$ applied.
- The observers swap positions and repeat the experiment.
- The values are averaged and the speed of sound is obtained.

8. Centre of Mass

- **Centre of mass of a plane lamina:**
 - Make a hole in the lamina.
 - Hang it so it can swing freely.
 - Hang a plumb line in the hole and mark the line it passes through.
 - Repeat the procedure again to get another line
 - Their intersection point is the center of mass.
- **Stability of simple objects:**
 - The position of the center of mass affects an object's stability. If the center of mass of an object is low, it is less likely to tip if tilted.
- **To increase stability:** (i) Increase surface area (ii) widen the base of the object.

9. Improving Accuracy

- **To produce more accurate or reliable results:**
 - Repeat experiment, to calculate average reading.
 - Avoiding parallax error, look perpendicular to the ruler.
 - If accuracy in measurement was asked, check for zero error.
- **To draw an image created from lens:**
 - Inverted from the original object.
 - Sides are multiplied by the magnification.
- **Centre of mass experiment (with the lamina):**
 - you view the string directly in front of card.
- **Minimizing heating effect of a current:**
 - Lower current
 - Increase voltage
 - Add a lamp
 - Increase resistance of a resistor
- **To increase accuracy of ray diagrams:**
 - View bases of pins since pins may not be vertical
 - Keep pins further apart and use more pins
 - Avoid parallax, explain action and reason
 - Repeats and average
- **Improvement made to experiments about heating/cooling effect and insulation**
 - Same initial temperature.
 - Same volume of water.
 - Same shape and type of beaker.
 - Same room temperature.
 - Stirring the water in the beakers.

- Record max. temperature
- **Heat loss could be reduced by:**
 - Insulation of beaker.
 - Covering beaker with a lid.
- **How to check if a rule is vertical:**
 - Use of set square or protractor
 - Plumb line
 - Spirit Level
- **Precautions taken in experiments about formation of images by a lens**
 - Use a darkened area
 - Object and lens same height on bench
 - Take more readings
 - Avoiding parallax error in measurement, and look perpendicular to the ruler.
 - Object/lens/screen perpendicular to bench
- **Variables in experiments about springs and stretching effect:**
 - Number of coils
 - Length of spring
 - Diameter\thickness of spring or wire
 - Selection of loads
- **Improvement made to calculating circumference by string method**
 - Avoid parallax error
 - Repeats and average
 - Thinner string
 - Parallel winding of springs
- **Precautions for circuit readings of I and V so that accurate:**
 - For I specifically:
 - Limit current so that temp. doesn't increase
 - Use a tapping meter
 - For I and V: Switch off between readings.
- **Fair test for pendulum experiments:**
 - Length of pendulum
 - Shape of bob
 - No. of swings
 - Amplitude
- **Precautions and procedures in electrical experiments:**
 - Check for a zero error
 - Tap the meter to avoid sticking
 - Initially choose the highest range for the ammeter/voltmeter, then reduce the range for the ammeter so that the deflection is almost full scale
 - Always check polarities before closing the switch (completing the circuit)
 - Always check that connections are clean.
 - Switch off the current when not making a measurement.
 - When measuring resistance use low currents/voltages to avoid heating and changing the resistance you are measuring.

10. Inaccuracies

- **Why angle i is NOT equal to angle r in ray experiment:**

- Thickness of pins
- Thickness of mirror
- Protractor is not precise
- **Inaccuracy of ray box method:** thickness of rays.
- **Inaccuracy of pin method:** pins not straight, or too close, or thickness of lines drawn.
- **Measuring 10 oscillations rather than 1:**
 - Reduce human errors
 - Give more accurate value of time taken (T)
 - Gives an average of T

11. Graphs

- **Drawing graphs:**
 - Label axis
 - Choose a proper scale
 - Well-judged best fit line
 - Thin and neat lines
- **Measuring the gradient:**
 - Draw a triangle on graph
 - Use clear lines
 - Triangle must be larger than half the line
- For 2 values to be **directly proportional**, graph of the values be a straight line from origin.

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