Igcse Physics 0625 0972

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Contents

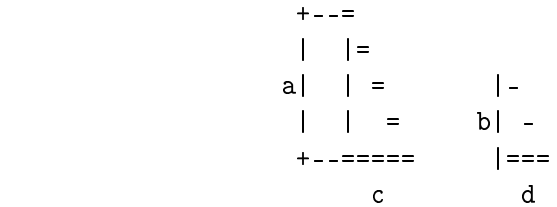
Month	Week	Dates	Sessions	Plan
June	1	*<2024-06-24 Mon>*	Introduction	Units and measurements
		<2024-06-25 Tue>		Lengths
				Weights
				Volume
				Density
				Length
			Measurements	Repeatability
				Accuracy
				Errors
July	2	*<2024-07-01 Mon>*	Measurements	Measuring time
		<2024-07-02 Tue>		Estimation
				Practical examples
	3	*<2024-07-08 Mon>*	Practical	Observing pendulums
				Swinging on rope
		<2024-07-09 Tue>		Measuring densities
				Measure Density of a human
		TBD	Recall	Practice problems and quiz

1 Physics

1.1 Units, Measurements and Accuracy

1.1pt

1. Measure a height of a building. Measure length of the shadow of the building. Measure length of a shadow of a meter stick.



$$\frac{a}{b} = \frac{c}{d} \therefore a = \frac{b * c}{d}$$

1. Measure circumference|of the earth. Find which city has zero shadow day today and measure a shadow of long stick. Use Eratosthenes's method to calculate circumference of Earth.

2. Measuring density of a human. Dunk a child in a drum of water?

1.2 Lecture 1 - 2 (June 24th, 25th):

1.2.1 Equipment:

Needles, Tennis balls, Measuring stick Vernier caliper, protractor Weighing machines,

1.2.2 Brief: Introduction to physics

Introduced scientific method and its application to physics. We touched briefly about scope of physics and its day to day relevance. We touched upon fundamentals of mathematics required for physics (the language of physics/science). Children learned about measuring different quantities like length, weight, volume. Fundamental units (length, time, weight) as well as derived units (density). were introduced.

1.2.3 Transscript:

What is physics? Physics is a branch of science, Its roots are in curiocity of the man to find out answer to the question. The question of The life, the universe and everything in it.

Scientific method.

1. Make a hypotheses, based on observed data.

2. Find the limitations.

3. Create an experiment to verify the hypotheses.

4. If the experiment succeeds, confidence on the theory increases.

5. If the experiment fails???? hypotheses MUST BE WRONG or at least missing something.

In physics we deal with Daily objects (Juggle tennis balls)
To absolute large, the end of the universe
And to the beginning and end of the TIME.

To absolute small, (show the needle and ask to look at the pointed tip)

$$\text{Size of a needle point? : } 10^{-3}m$$

$$\text{Size of hydrogen atom : } 0.5 * 10^{-10}m$$

$$\text{Size of carbon atom: } 1.54 * 10^{-10}m$$

This gives us

$$2 * 10^{7} \text{ Hydrogen atoms or}$$

$$6.66 * 10^{6} \text{ Carbon atoms}$$

How do we measure something?
Units
Recall Maitreyi's stick

1.2.4 Fundamental Units:

Length :

$$m$$

Mass :

$$kg$$

Time :

$$sec$$

1.2.5 Derived units

Volume :

$$m^3$$

Density :

$$\frac{kg}{m^3}$$

1.3 Lecture 3 - 4 : July week 1 (1st and 2nd)

1.3.1 Brief: Accuracy of measurements and measuring time

We discussed multiple ways of increasing accuracy of measurements. We discussed how to measure time. Direct measurements involve clocks. Principles of clocks (pendulum). Solved problems regarding pendulum and discussed properties of pendulum.

1.3.2 Instruments

1. Accuracy of instruments
2. Increasing accuracy
3. Measurement of time

1.3.3 Direct measurements:

Measuring interval of pendulum

1.3.4 Indirect measurement:

Measuring thickness of a paper. Measuring diameter of a sub mm tube.

1.3.5 Homework:

1. Read chapter 1 and take notes in rough book of main points. and solve in chapter problems for chapter 1.
2. Solve in chapter problems in rough book (Not end of chatper problems).

1.4 Lecture 5 -6 :

1.4.1 We did practicals of the concepts learned so far.

Conducted experiments on pendulum and verified the observations/conclusions by swinging ourselves on the rope. We also used a small boy and dunked him in water to measure density of a human body. Recalled the Archimedes experiment

1.4.2 Practicals

Observing pendulums Swinging on rope Measuring densities Measure Density of a human

1.4.3 Transcript

Experiments:

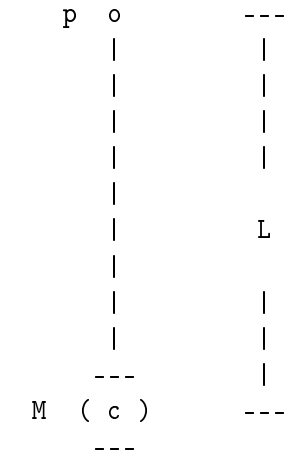
1. Pendulum

   Apparatus: Pendulum with variable length and weight. Long rope (for children to swing on)

Hypothesis 1: Pendulum period will increase with increase in wieght

Hypothesis 2: Pendulum period will increase with its length

Hypothesis 3: Period will decrease if we release it from higher height



Lets call time taken by pendulum to perform one complete swing : T

Mass of pendulum is : M

Height at which the pendulum is released from : h

H1 ->

$$T \propto M$$

H2 ->

$$T \propto L$$

H3 ->

$$T \propto h$$

Experiment

Testing H1: Keeping length of pendulum same, change the weight (mass) M attached at the end.

Testing H2: Keeping mass of pendulum same, change the length L.

Testing H3: Keeping both length and mass of pendulum same, change the height at which we release the pendulum.

Important Note : The length of pendulum is from the pivot (P) to center of gravity of the weight (c). So if stacking up weights on top of each other to increase the mass remember to readjust the length so that it stays constant.

We verified our observations by swinging on a rope ourselves.

Observations:

For given length L = l (?? we didn't measure l). The period of pendulum was 1.6 seconds No matter how much we changed M or h the period T did not change/

When we decreased L where l' $<$ l : T also decreased

Conclusion

H1 and H3 are wrong.

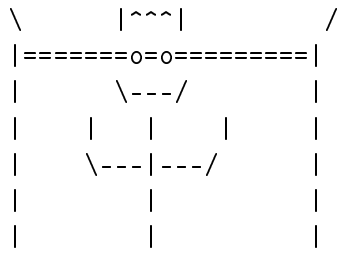
Where as H2 is correct in the form that if we increase the length of pendulum the period increases and vise versa.

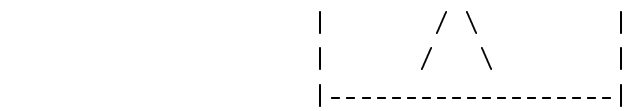
Extra work: How much does T increase or decrease if L is increased or decreased by 1 cm? (Precise answer is not expected but general thought about how it will behave) Hint: Use the table in the 1st chapter questions which describes a student doing experiment with the pendulum.

2. Density

   Apparatus:

   Large barrel and small person . Enough water to fill the barrel. A smaller measured water container to fill up specific quantities of water. (10 liter water container with markings at 1/2 , 1/4th)





Procedure:

Fill the barrel, let the person sit in the barrel. Fill the barrel with water fully. Let the water stabilize. Let out the person.

Observe the water level and slowly fill it up measuring using the marked container.

Observations:

We used 33.5 liters of water to fill the barrel completely again.

Arsh (the person used) has weight of 32.55 kg.

Calculations

$$\rho = \frac{m}{v}$$

$$m = 32.55 liters$$

$$33.5l = 0.0335 m^3$$

$$\rho = \frac{32.55}{0.0335} \frac{kg}{m^3}$$

$$= 971.64 \frac{kg}{m^3}$$

3. Home work: Arsh has weight of 32.55 kgs and volume we measured was 33.5 liters. Calculate his density.

   Find out standard density of a human body from you biology teacher or any other sources.

   Now that you know the density of a human body. What do you think happens when we jump in the water?

   (a) We sink immediately

(b) We float

Can we control if we sink or float? What are the various ways used to make body sink in water ? or float on water? Explain the mechanism by which it works.