

LAP PHZX EXAMS & QUIZS

FALL-2013

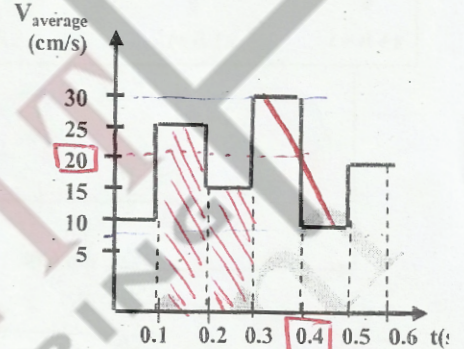


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Q1) The histogram shown, gives the average velocity as a function of time



3d) The distance traveled in the time interval $t = 0.1$ s to $t = 0.3$ s

$$\Delta x = \text{area under curve} = (25 \times 0.1) + (15 \times 0.1)$$

$$= 4 \text{ cm}$$

$$(0.3 - 0.1) \text{ s}$$

$$(15 - 10) \text{ cm/s}$$

$$\text{so } d = (15 - 10) \frac{\text{cm}}{\text{s}} \times (0.3 - 0.1) \text{ s}$$

$$= 1 \text{ cm}$$

e) The magnitude of maximum acceleration is 30

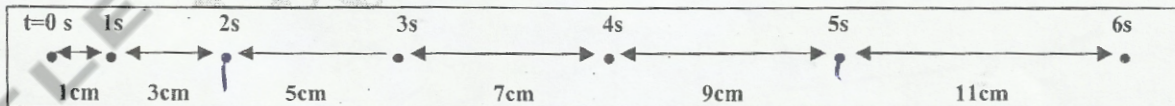
$$|a_{\text{max}}| = \frac{|\Delta v|_{\text{max}}}{\Delta t} = \frac{|10 - 30|}{0.45 - 0.35} = 200 \text{ cm/s}^2$$

f) The instantaneous velocity at $t = 0.4$ s is 70 cm/s

$$V_{\text{inst}} (t = 0.4 \text{ sec}) = \frac{V(0.3 - 0.5)}{2} = \frac{30 + 10}{2} = 20 \text{ cm/s}$$

see the figure up

Q2) For the ticker tape shown below,



Find the average velocity (in cm/s) for the period $t = 2$ s to $t = 5$ s.

$$d = (5 + 7 + 9) \text{ cm}$$

$$t = (5 - 2)$$

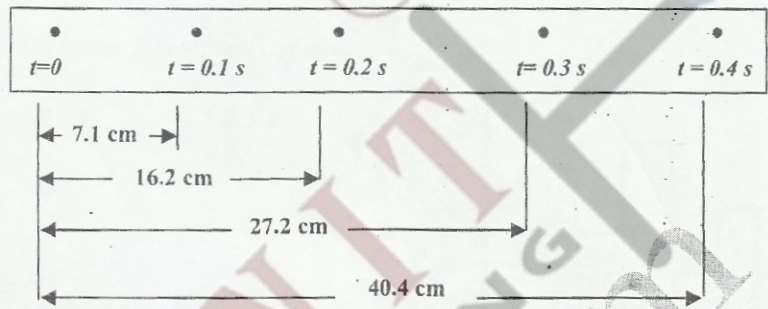
$$v = 7 \frac{\text{cm}}{\text{s}}$$

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Q3) Calculate the instantaneous velocity (in cm/s) at $t = 0.3$ sec.



Zero
2

~~$\frac{27.2 \text{ cm}}{0.3 \text{ s}}$~~

$$V_{inst} (t=0.3) = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} = \frac{x_4 - x_2}{0.4 - 0.2} = \frac{40.4 - 16.2}{0.2} = 121 \text{ cm/s}$$

minimum interval

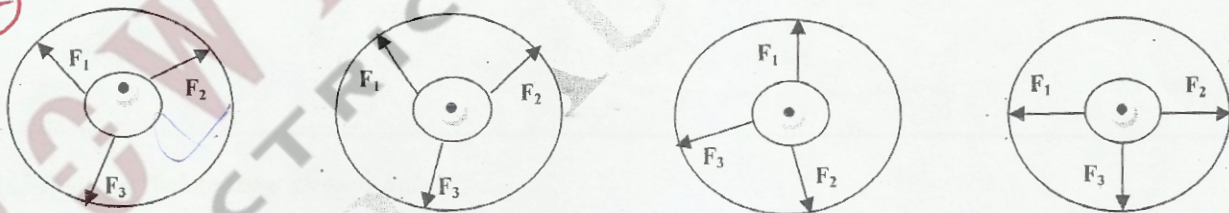
Q4) In accelerated motion of an object registered on a ticker timer tape, the larger the distance between the consecutive points,

4
1

- a) The larger is the acceleration of the object.
- b) The larger is the mass of the object.
- c) The larger is the velocity of the object.
- d) The smaller is the mass of the object.
- e) None of the above.

Q5) Which of the following figures represents the correct experimental arrangement

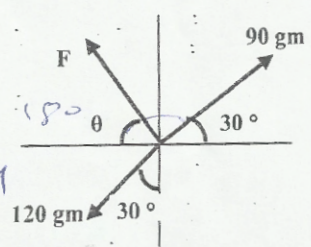
Zero
1



(b) ~~(a)~~ (c) ~~(d)~~

Q6) In the force table experiment the set of the forces shown in the figure are in equilibrium. Find the magnitude of the force "F" in gm.wt and " θ " in degree respectively:

2
2



$$F_x = 90 \cos 30 + 120 \cos 240 = 17.94$$

$$F_y = 90 \sin 30 + 120 \sin 240 = -58.92$$

$$F = \sqrt{(F_x)^2 + (F_y)^2} = 61.59 \text{ gm.wt}$$

$$\theta = \tan^{-1} \left(\frac{-58.92}{17.94} \right) = -73.06$$

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Q1) Suppose we have measured the starting position as $x_1 = 9.3 \pm 0.2$ m and the finishing position as $x_2 = 14.4 \pm 0.3$ m. Find the displacement ($x_2 - x_1$) and the error in the displacement.

Answer:

$$x_2 - x_1 = 14.4 \pm 0.3 - 9.3 \pm 0.2$$

$$= 5.1 (\pm 0.5)$$

Zero
2

Q2) The width (W) of the paper is measured at a number of points on the sheet, and the values of the observation widths (in cm) are: 31.33, 31.15, 31.26, 31.02, 31.20. Calculate the accepted value in W and ΔW

Answer:

$$\bar{W} = 31.19 \text{ cm} = \left(\frac{\sum w}{N} \right)$$

$$(\bar{W} - w)^2$$

- 1 0.0196
- 2 1.6×10^{-3}
- 3 4.9×10^{-3}
- 4 0.0289
- 5 1×10^{-4}

Q3) Write the form of the following numbers correctly if it was incorrect.

The Number	The Correct Form
9.82 ± 0.02685	9.82 ± 0.023
10.0 ± 2	10.0 ± 2.0
4 ± 0.5	4.0 ± 0.5

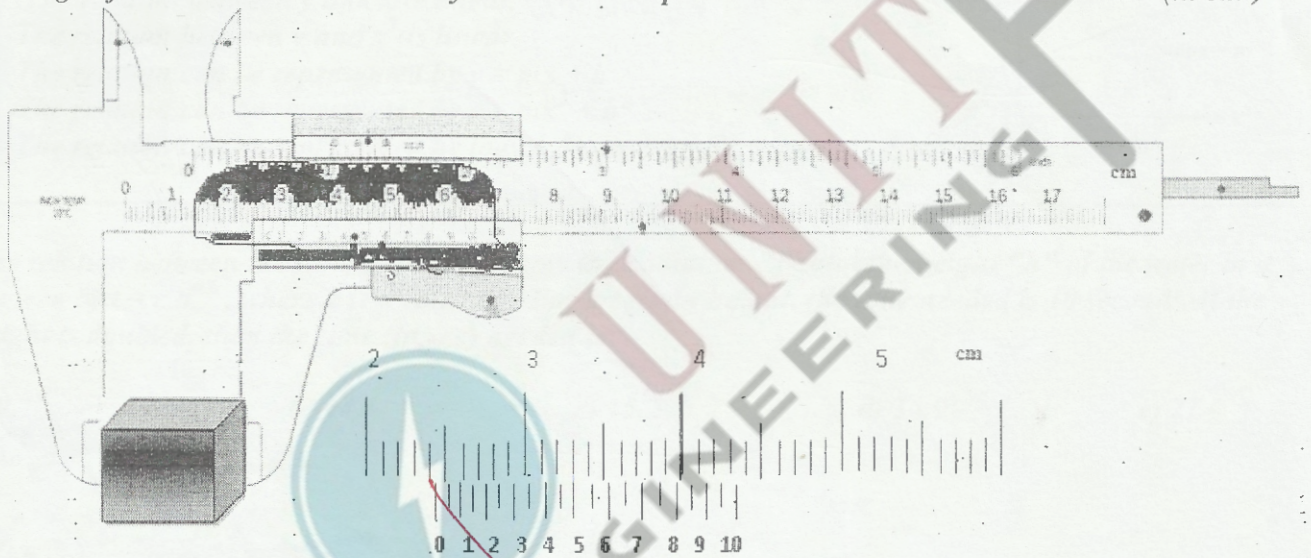
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Q4) The edge of the cube was measured by the vernier caliper as shown below. Calculate $V \pm \Delta V$ (in cm^3).

Zene
4



Answer:

2.45 (± 0.5)

1/2

$$V \pm \Delta V = 14.706 \pm 0.045 \text{ cm}^3$$

$$L = 2.45 \text{ cm}$$

$$L_3 = (2.45)^3$$

$$\Delta L = \frac{0.05}{2} = 0.025 \text{ cm}$$

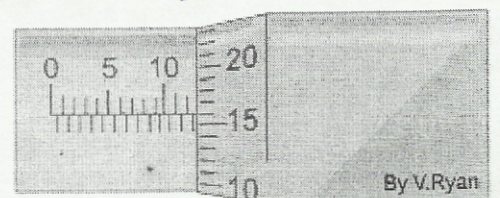
$$\frac{\Delta L}{L} = \frac{0.025}{2.45}$$

(+)

Q5) Find the reading of the micrometer.

Answer:

12.66 mm



12.5
16 =

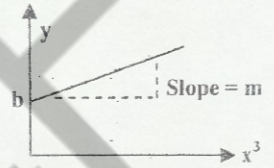
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Q6) Refer to the graph beside, check by true (T) or false (F)

- T The relation between y and x is linear. *x's between y and x³*
- T The relation between y and x^3 is linear.
- T The relation can be represented by $y = mx + b$
- T The relation can be represented by $y = mx^3 + b$
- T The relation can be represented by $\log y = 3 \log x + \log b$



Zero
2.5

Q7) The relation between the time needed to empty the container " t " and the height " h " of the water in it is given by $t = c h^{0.6}$, where c is a constant. For a certain height, the time needed is 10 seconds. If the height is doubled, then the time (in sec) needed is:

- a) 9.7
- b) 14.1
- c) 15.2
- d) 16.9
- e) 21.6

Handwritten solution for Q7:

$$10 = c h_1^{0.6}$$

$$t = c h_2^{0.6}$$

$$\frac{t}{10} = \frac{h_1^{0.6}}{h_2^{0.6}}$$

$$2 = \frac{h_1^{0.6}}{h_2^{0.6}}$$

$$h_2^{0.6} = 2 h_1^{0.6}$$

$$\frac{t}{10} = 2$$

$$t = 20$$

Correct answer -
No solution

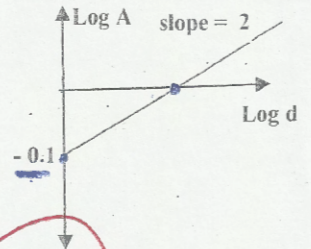
Zero
2

Q8) The relation between the area (A) of several disks and their corresponding diameters (d) are given in the shown graph. The calculated value of π is:

- a) 2.0
- b) 3.14
- c) 0.79
- d) 1.59
- e) 3.18

Handwritten equation:

$$A = \frac{\pi}{4} d^2$$



Handwritten solution for Q8:

$$A = \frac{\pi}{4} d^2$$

$$\log A = \log\left(\frac{\pi}{4}\right) + 2 \log d$$

Graph labels: y-axis is $\log A$, x-axis is $\log d$. Slope = 2. y-intercept = -0.1.

$$\frac{\Delta A}{\Delta d} = \log \frac{-0.1 - A}{-0.1 - A}$$

$$\pi = \frac{C}{D} = \frac{-0.1}{-0.1}$$

Final calculation:

$$\therefore \log\left(\frac{\pi}{4}\right) = -0.1 \implies \pi = 3.18$$