

PHYSICS - 111

Final Exam
Time: 1 H 45 min

2nd Sem.2009/2010
May, 17, 2010

Student Name: _____	Student No.: _____
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ضع إشارة (X) في كل من المربع المقابل لمدرس شعبتك ودائرة على رقم الشعبة.

الشعبة	المدرس		الشعبة	المدرس	
5,14	صافي صافي	<input type="checkbox"/>	1,2,3,10	زياد سعيد	<input type="checkbox"/>
6,7	تيسير عاروري	<input type="checkbox"/>	12	غسان أنضوني	<input type="checkbox"/>
8,9	هشام هدمي	<input type="checkbox"/>	4,11,13	يعقوب عنيني	<input type="checkbox"/>

تعليمات:

- (1) لا تفتح ورقة الامتحان حتى يسمح لك بذلك.
- (2) اكتب اسمك ورقمك في أعلى هذه الصفحة.
- (3) اختر الجواب الأكثر قربا للجواب الصحيح وانقله على هذه الصفحة، وذلك بوضع إشارة (X) في الخانة المناسبة.
- (4) السؤال الذي له أكثر من إجابة يعطى علامة صفر.
- (5) يجب إعادة أوراق الامتحان كاملة.
- (6) عدد الأسئلة 30 سؤالا، وعدد الصفحات 9، تأكد من وجودها جميعا.

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1) If the sample standard deviation of 169 measurements of a measured quantity is 8, then the standard deviation of the mean of the above measurements is:

- a) 2
- b) 1
- c) 11
- d) 0.6
- e) None of these

$$\frac{8}{\sqrt{169}}$$

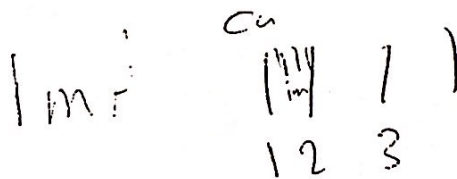
2) The internal resistance of the voltmeter compared to (بالمقارنة مع) the resistance in the circuit must be

- a) very small
- b) similar to the resistance
- c) can take any value
- d) less than the resistance
- e) None of these

كبيرة

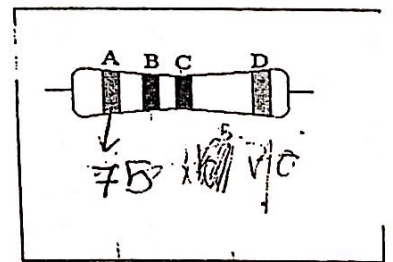
3) For an ammeter with 1 mA as the smallest marked scale division, measurements should be estimated to the nearest:

- a) 0.05 mA
- b) 1 mA
- c) 0.2 mA
- d) 0.1 mA
- e) 2 mA



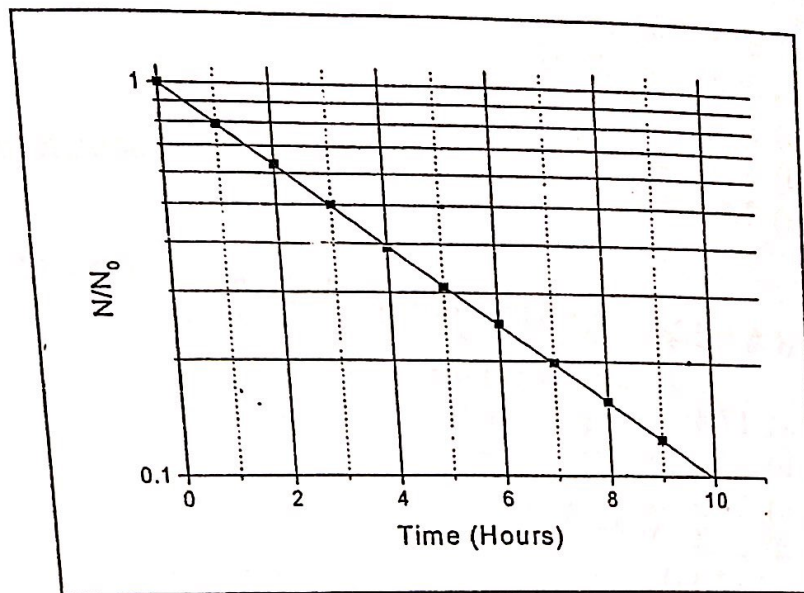
4) For the carbon resistor shown in the figure, if A: Violet(7), B: Green(5), C: Green(5), D: Silver (10%). Its value is:

- a) $(2.7 \pm 0.1) \text{ M}\Omega$
- b) $(7.5 \pm 0.8) \text{ M}\Omega$
- c) $(7.2 \pm 0.7) \text{ M}\Omega$
- d) $(7.2 \pm 0.7) \text{ K}\Omega$
- e) None of these



7.5 10% 10%

The following two questions are related to the exponential law of decay $N = N_0 e^{-\lambda t}$, where N is the number of nuclei (انوية) at time t . If N vs t is plotted on a semi-log graph paper, the following graph is obtained. Answer the following two questions



5) The decay constant λ is equal to

- a) 0.32 hr^{-1}
- b) 0.09 hr^{-1}
- c) 0.10 hr^{-1}
- d) 2.30 hr^{-1}
- e) 0.23 hr^{-1}

$$\text{half-life} = \frac{\ln(2)}{\lambda}$$

6) The half-life time of the decay is:

- a) 0.38 hours
- b) 0.69 hours
- c) 3.0 hours
- d) 1.0 hour
- e) 0.16 hours

7) In Ohms experiment, a student measures the voltage across a resistor and the current passing through it. These are 4.9 volts, 36 mA respectively (على التوالي). The value of the resistor should be written as

- a) 136.1Ω
- b) 130Ω
- c) 140Ω
- d) 150Ω
- e) 100Ω

$$\frac{4.9 \text{ V}}{36 \times 10^{-3} \text{ A}} = 136.1 \Omega$$

8) If $x = 35.3 \pm 0.2$ cm, then $\ln(x)$ is equal to

- a) 3.56 ± 0.01
- b) 3.5639 ± 0.0057
- c) 3.56 ± 0.2
- d) 3.564 ± 0.006
- e) 3.6 ± 0.2

9) If $A = 12.4$, $B = 5.051$, then $C = A + B$ can be written as

- a) 17.4
- b) 18
- c) 17.5
- d) 17.45
- e) 17.451

10) A student wants to find the focal length of a convex lens. He measured the image distance $v = 25.8 \pm 0.8$ cm, and the object distance $u = 14.6 \pm 0.8$ cm. Then the focal length is:

- a) 13.8 ± 0.3 cm
- b) 9.3 ± 0.8 cm
- c) 9.3 ± 0.4 cm
- d) 9.32 ± 0.08 cm
- e) None of these

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$
$$\frac{1}{f} = \frac{1}{25.8} + \frac{1}{14.6}$$

11) The method of least square fit is used to calculate

- a) The root mean square of the signal.
- b) The centroid of the experimental points
- c) The standard deviation of the mean
- d) The systematic error.
- e) The best slope and the best y-intercept of a straight line that fits experimental points.

12) A measurement with low precision, but high accuracy is often an indication of the absence (مؤشر على غياب) of:

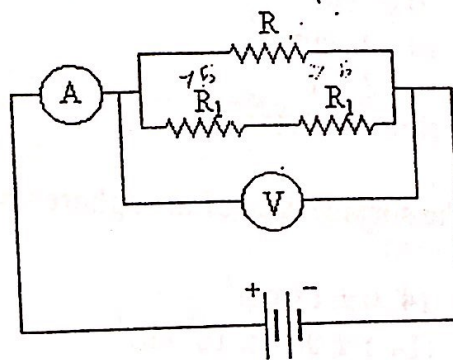
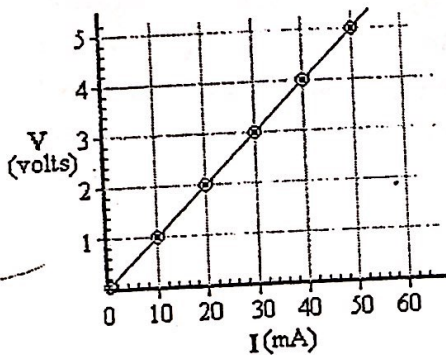
- a) Personal errors
- b) Random errors
- c) Statistical errors
- d) Systematic errors
- e) All kinds of errors

13) A student found the density of a metal block to be 7.802 ± 0.002 gm/cm³. The number of significant figures in the density is

- a) 2
- b) 1
- c) 3
- d) 5
- e) None of these

??
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14) Consider the circuit shown in the next figure with its V - I diagram. If the value of $R_1 = 75 \Omega$, then the value of R is:

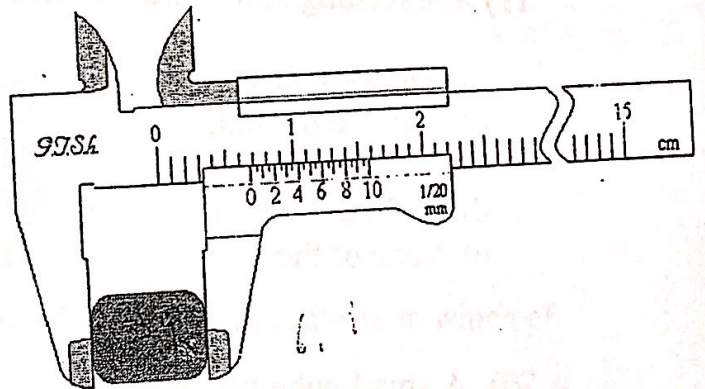


75, 75
150
150

- a) 125 Ω
- b) 200 Ω
- c) 150 Ω
- d) 300 Ω
- e) None of these

15) The reading of the caliper shown is:

- a) 0.38 ± 0.01 cm.
- b) 0.608 ± 0.005 cm.
- c) 7.80 ± 0.05 mm.
- d) 0.680 ± 0.005 cm.
- e) None of these



Five measurements of the radius of a sphere are given by: $R=10.65, 10.48, 10.53, 10.71$ and 10.62 cm. Answer the following three questions:

16) The standard deviation of the mean for the radius of the sphere is:

- a) 0.01 cm
- b) 0.09 cm
- c) 0.04 cm
- d) 0.12 cm
- e) None of these

$$\frac{0.5}{\sqrt{5}}$$

17) The "best estimate" of the true value of the radius of the sphere is:

- a) 11.85 cm
- b) 10.01 cm
- c) 10.60 cm
- d) 10.08 cm
- e) None of these

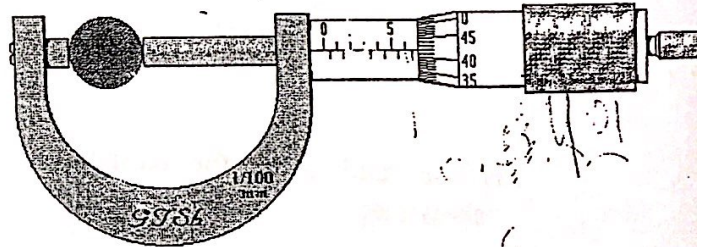
$$\frac{10.65 + 10.48 + 10.53 + 10.71 + 10.62}{5}$$

18) The surface area of the sphere is:

- a) $1420 \pm 11 \text{ cm}^2$
- b) $(14.1 \pm 0.1) \times 10^2 \text{ cm}^2$
- c) $(14.12 \pm 0.09) \times 10^2 \text{ cm}^2$
- d) $(14.8 \pm 0.9) \times 10^2 \text{ cm}^2$
- e) $(14 \pm 1) \times 10^2 \text{ cm}^2$

19) The reading of the micrometer shown is:

- a) 0.642 ± 0.001 cm.
- b) 6.98 ± 0.05 mm.
- c) 7.42 ± 0.001 mm.
- d) 0.692 ± 0.001 cm.
- e) None of these.



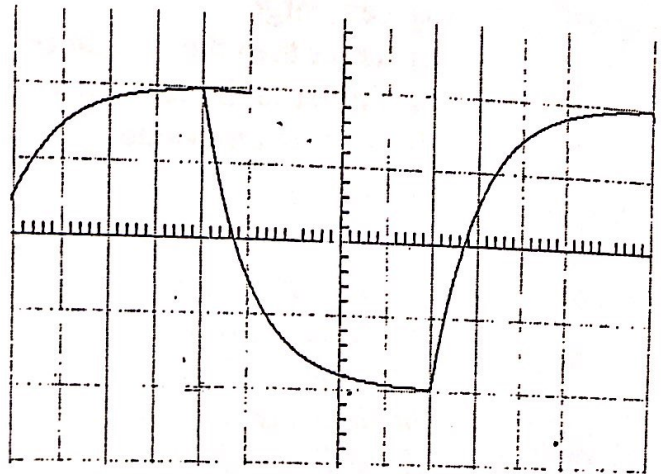
20) A small cube has an edge length equal to 2.465 ± 0.009 cm. The volume of the cube is

- a) $14.9 \pm 0.9 \text{ cm}^3$
- b) $14.98 \pm 0.09 \text{ cm}^3$
- c) $15 \pm 1 \text{ cm}^3$
- d) $15.0 \pm 0.2 \text{ cm}^3$
- e) None of these

21) The signal generator is an instrument used in the 111 lab to

- a) Measure the current in the circuit
- b) Display the voltage on the screen of the oscilloscope
- c) Turn on music in the lab
- d) Measure the time constant of the RC- circuit.
- e) Provide the circuit with an electric signal

The following graph represents the oscilloscope display of the voltage on the capacitor of an RC circuit. If $R = 20 \Omega$, and the voltage multiplier of the oscilloscope is set to 2 volts/div, while the time base is set to 100 $\mu\text{s}/\text{div}$, then answer the following two questions



22) When discharging the capacitor, then the time it will take the voltage across the capacitor to drop 4.0 volts from the maximum, is approximately:

- a) 10.0 μs .
- b) 40.0 μs .
- c) 20 μs .
- d) 100 ns
- e) 60 μs .

23) The value of the capacitor used in the circuit is closer to which of the following:

- a) 0.5 μF
- b) 1.0 μF
- c) 5.0 μF
- d) 2.0 μF
- e) 10 μF

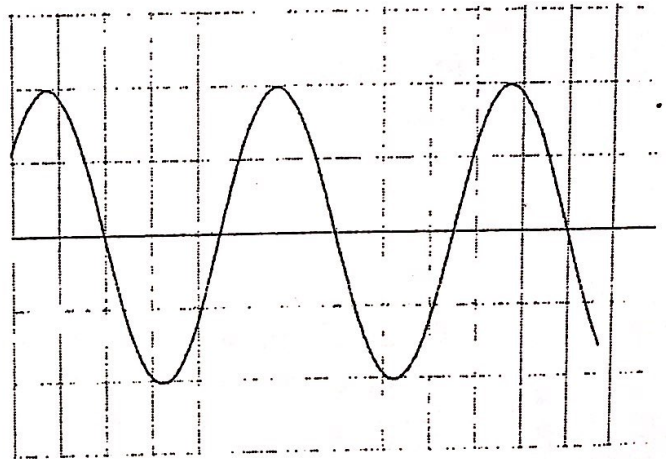
24) One of the following is true for the CRO (Oscilloscope):

- a) In the internal mode the horizontal-axis is a voltage axis.
- b) In the internal mode the vertical-axis is a time axis.
- c) In the external mode the horizontal -axis is a time axis.
- d) In the internal mode the horizontal -axis is a time axis.
- e) In the external mode the vertical-axis is a time axis.

25) The internal resistance of the Ammeter compared to (بالمقارنة مع) the resistance in the circuit must be

- a) very large
- b) larger than the resistance.
- c) similar to the resistance
- d) can take any value
- e) very small

Consider the electrical sinusoidal wave which is connected to the oscilloscope. The time base is set to $2.0 \mu\text{s}/\text{div}$, while the voltage multiplier is set to $1 \text{ volts}/\text{div}$. Answer the following three questions:



26) The frequency of the wave is:

- a) 40 KHz
- b) 200 KHz
- c) 100 KHz
- d) 20 KHz
- e) 10 KHz

27) The amplitude of the wave is:

- a) 10 volt
- b) 5 volt
- c) 4 volt
- d) 2 volt
- e) 1 volt

28) The period of the wave is:

- a) 5 μs
- b) 25 μs
- c) 10 μs
- d) 5 ms
- e) None of these

29) One of the following tools is not used to measure length

- a) Stop watch
- b) Meter stick
- c) Vernier Caliper
- d) Micrometer
- e) Ruler

30) The error in a single measurement should be

- a) Computed as the standard deviation of the mean
- b) Neglected
- c) Estimated
- d) Calculated from error propagation
- e) Found using the calculator.

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T=27+01 sec
BIRZEIT UNIVERSITY

Momen Talib
1110833

Physics 111

Final Exam
Time: 2.00 Hours

2nd sem. 2003/2004
June, 24, 2004

Student Name: <u>Dunia Talib</u>	Student No.: <u>1111811</u>
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Instructor

- () Arouri () Andoni () Suleiman () Ezzat
() Khater () Saja () Safi

(Note: The total number of questions is 30)

تعليمات:

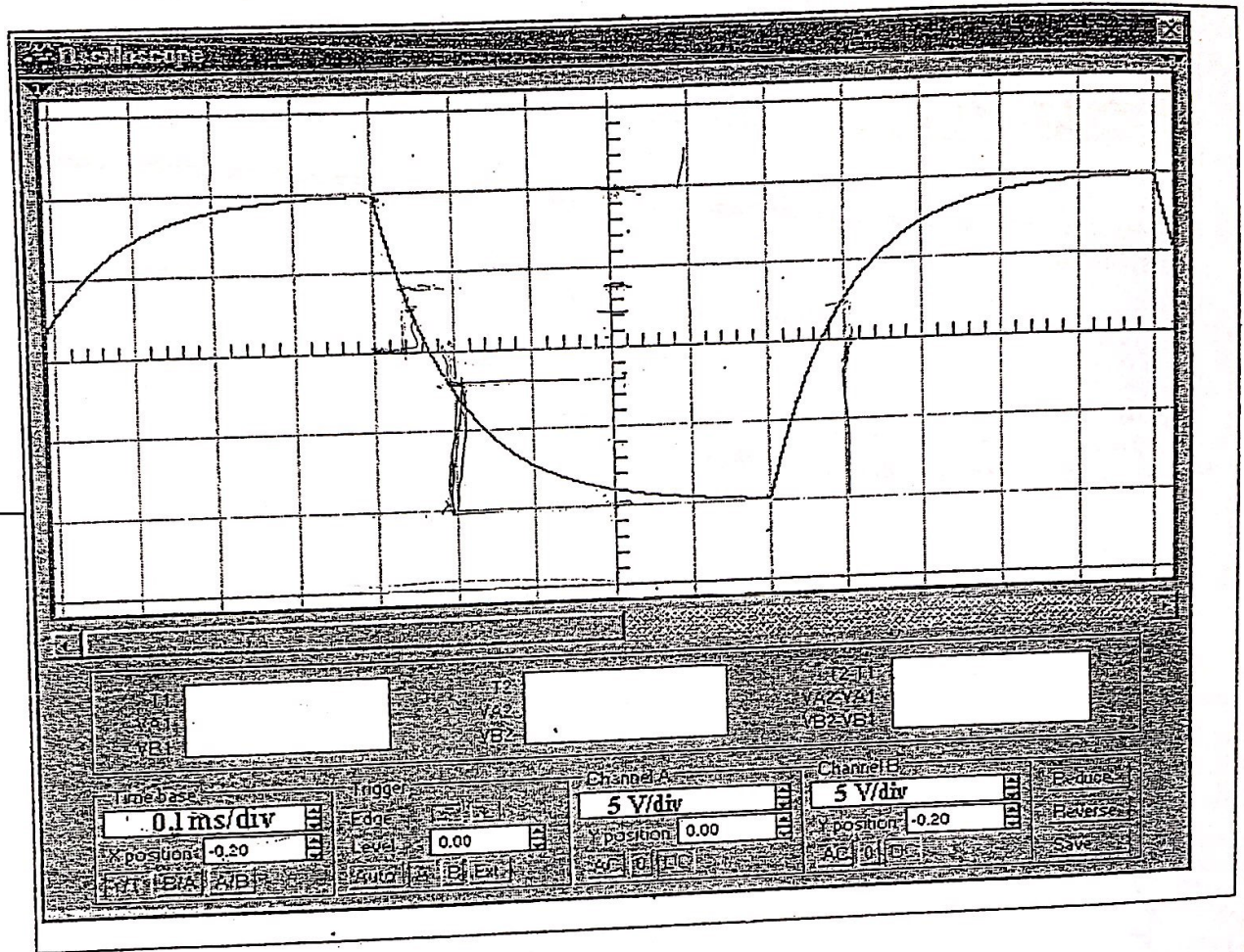
- لا تفتح ورقة الامتحان حتى يسمح لك بذلك.
- اكتب اسمك ورقمك في أعلى هذه الصفحة.
- في الخانة x اختر الجواب الأكثر قربا للجواب الصحيح وانقله على هذه الصفحة، وذلك بوضع إشارة () المناسبة.
- السؤال الذي له أكثر من إجابة يعطى علامة صفرا.
- يجب إعادة أوراق الامتحان كاملة.

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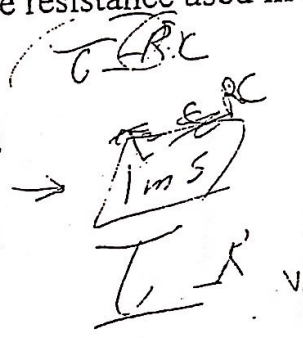
Consider an RC circuit with $C=0.1 \mu\text{F}$, the voltage on the capacitor is shown on the CRO screen (see the next figure).

Answer the following two questions:



1) The value of the resistance used in the circuit is closer to which of the following:

- a) 500Ω
- b) $1 \text{K}\Omega$
- c) $1 \text{M}\Omega$
- d) 75Ω



$V_c = V_0(1 - e^{-t/RC})$ charging

$V_c = V_0 e^{-t/RC}$ discharging

$V_c = \frac{1}{2} V_0$

$\frac{1}{2} V_0 = V_0 e^{-t/RC}$

$\tau = RC$

$t_{v_2} = \tau \ln(2)$

$\ln \frac{1}{2} = \frac{-t}{RC}$

1×10^{-4}

$\frac{0.1 \times 10^{-6}}{1 \times 10^{-7}} = 10$

$0.693 = \frac{t}{RC}$

2) If the capacitor is initially charged to a maximum value, then the time it will take the capacitor to drop to $\frac{1}{4}$ of its maximum value is closer to which of the following:

- a) 0.14×10^{-3} sec.
- b) $L=179.1 \pm 0.1 \text{ cm}$ sec.
- c) 47 sec.
- d) 22μ sec.

3) A pendulum of length $L = 179.1 \pm 0.1 \text{ cm}$, its period $T = 2.7 \pm 0.1 \text{ sec}$ then the value of $g \pm \Delta g =$

- a) $9.8 \pm 0.2 \text{ m/sec}^2$
- b) $9.7 \pm 0.7 \text{ m/sec}^2$
- c) $9.7 \pm 0.3 \text{ m/sec}^2$
- d) $9.6 \pm 0.1 \text{ m/sec}^2$

$$\omega^2 = \frac{g}{L} \quad T = \frac{2\pi}{\omega}$$

$$2.7 = \frac{2 \times 3.14}{\omega}$$

$$\omega = 2.32$$

$$g = 9.7$$

$$2 \frac{\Delta T}{T} = \frac{\Delta g}{g}$$

$$\frac{2 \times 0.1}{2.7} = \frac{\Delta g}{9.7}$$

$$\Delta g = 0.7$$

$$g = 9.7 \pm 0.7$$

$$\omega = \sqrt{\frac{g}{L}}$$

$$T = \frac{2\pi}{\omega}$$

$$T = \frac{2\pi}{\sqrt{\frac{g}{L}}} = \frac{2\pi^2 L}{g}$$

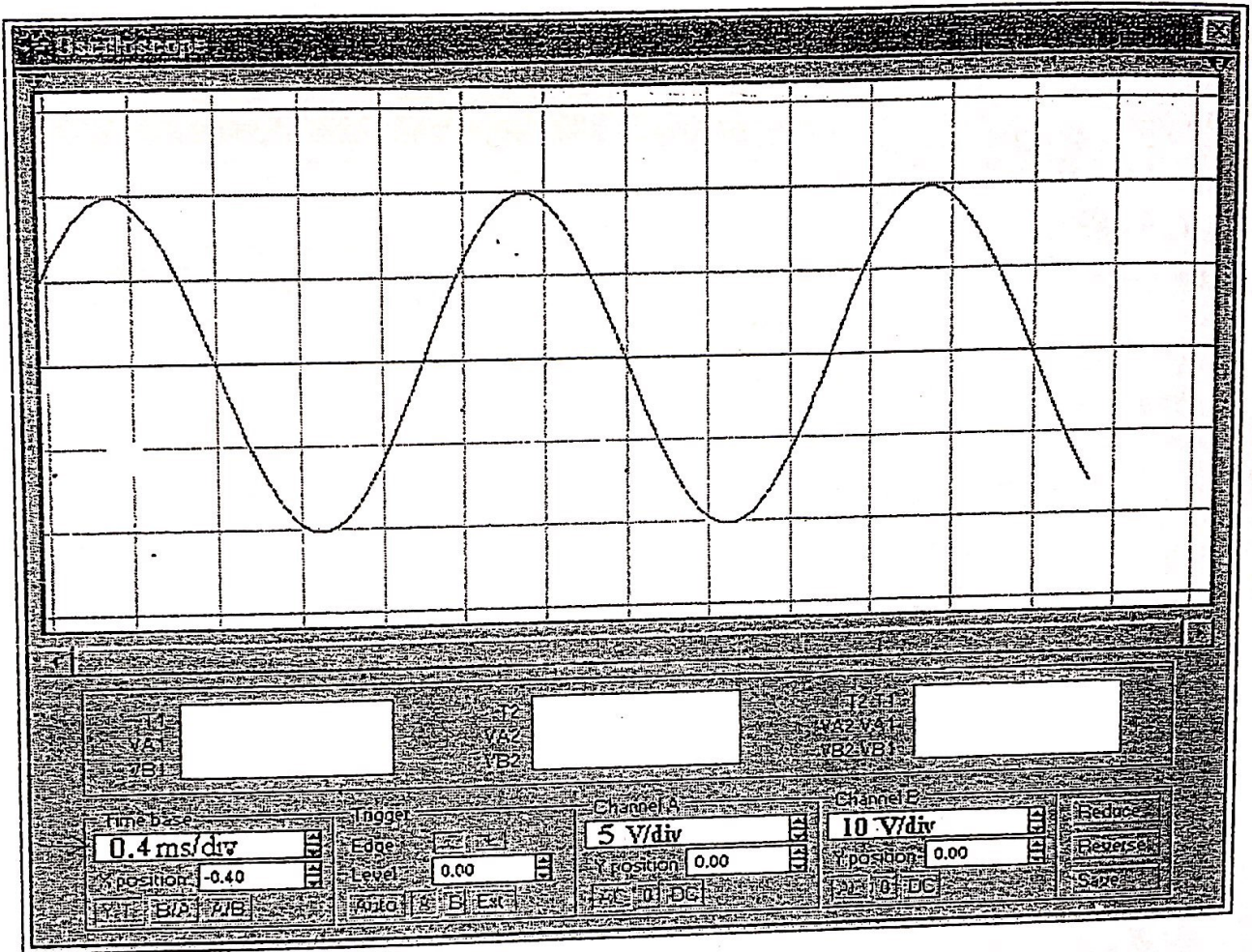
4) Consider the method of least square fit, let $\{(x_1, y_1), (x_2, y_2) \dots (x_n, y_n)\}$ be a set of N measured points, let $Y_i = mx_i + b$, where m is the best slope and b is the best y-intercept of the points, then one requires in the least square fit that:

- a) $\sum_{i=1}^N (y_i + Y_i)^2$ is minimum
- b) $\sum_{i=1}^N (y_i - Y_i)^2$ is maximum
- c) $\sum_{i=1}^N (y_i^2 - Y_i^2)$ is minimum
- d) $\sum_{i=1}^N (y_i - Y_i)^2$ is minimum

5) One of the following is true for the CRO (Oscilloscope):

- a) In the internal mode the x-axis is a voltage axis.
- b) In the internal mode the y-axis is a time axis.
- c) In the internal mode the x-axis is a time axis.
- d) In the external mode the x-axis is a time axis.

Consider the electrical sinusoidal wave which is connected to channel B shown below, notice the voltage multipliers and the time base readings for channel A and B, answer the following two questions:



6) The frequency of the wave is:

- a) 2 Hz
- b) 2 KHz
- c) 1KHz
- d) 500 Hz

$$f = \frac{1}{T}$$

7) The amplitude of the wave is:

- a) 10 volt
- b) 5 volt
- c) 20 volt
- d) 40 volt

$$V = 4$$

- 8) A student measured the object distance from a convex lens and the corresponding image distance as shown below:

$$u = 24.1 \pm 0.1 \text{ cm}, v = 31.3 \pm 0.4 \text{ cm}$$

The focal length and the uncertainty in it $f \pm \Delta f =$

- a) $13.62 \pm 0.01 \text{ cm}$
- ~~b) $13.6 \pm 0.1 \text{ cm}$~~
- c) $12.11 \pm 0.1 \text{ cm}$
- d) $12.1 \pm 0.1 \text{ m}$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$\frac{\Delta f}{f} = \frac{\Delta u}{u} + \frac{\Delta v}{v}$$

- 9) If $b = \frac{xy}{x+y}$ where x and y are variables, b is a constant, then you can obtain a linear relationship with a slope equals to -1 by drawing

- a) y vs. x
- b) y^2 vs. x
- ~~c) $\frac{1}{y}$ vs. $\frac{1}{x}$~~
- d) $\ln(y)$ vs. $\ln(x)$

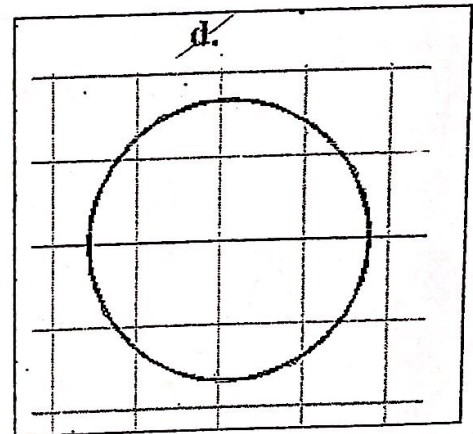
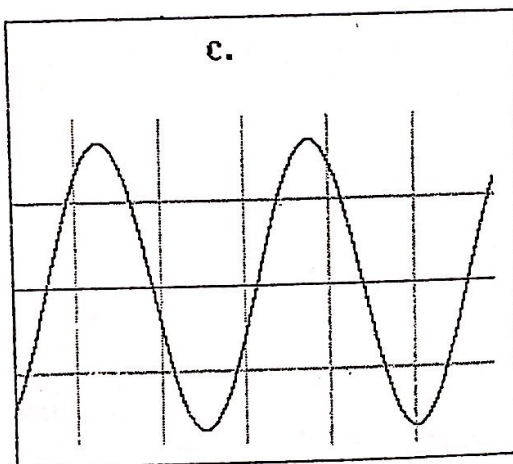
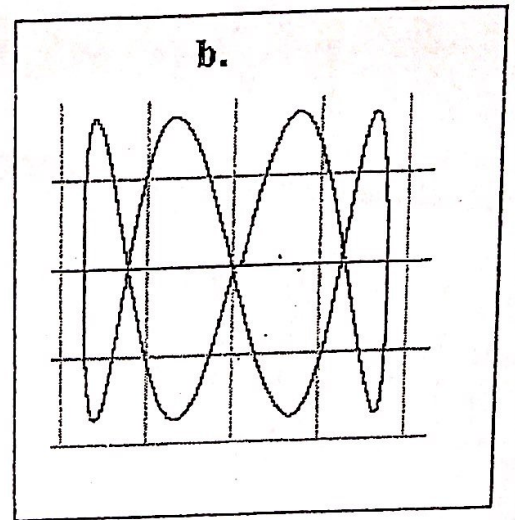
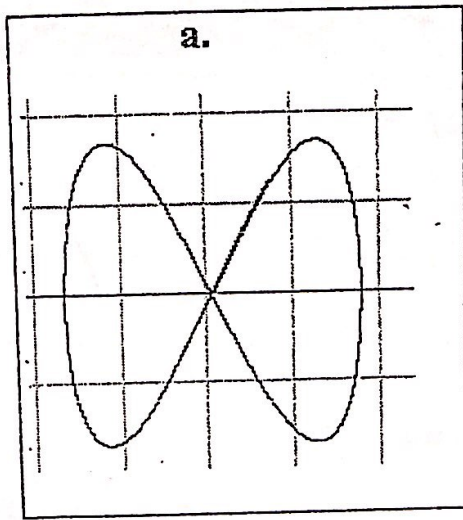
- 10) An object of mass 124 g and its total volume is 16.35 cm³, the density of the object in g/cm³ is:

- a) 7.58
- b) 7.6
- c) 7.584
- ~~d) 8~~

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

$$= \frac{124}{16.35}$$

11) Two sinusoidal signals with frequencies 500 Hz and 500 Hz, one of the signals is connected to x-input while the other is connected to the y-input; the oscilloscope is used in its external mode, what are the possible shape which you expect to see on the CRO screen:



12) If the sample standard deviation of ^N49 measurements of a measured quantity is 21, then the standard deviation of the mean is:

- a) 0.4
- b) 3
- c) 21
- d) 49

ok. $\frac{21}{\sqrt{49}} = 3$

Consider a set of measurements of a diameter of a sphere (كرة):

Diameter (القطر): 2.94, 3.04, 3.00, 3.02, 3.18 cm.

Answer the following three questions:

13) The standard deviation of the mean for the radius of the sphere (in cm) is:

- a) 0.01
- b) 0.2
- ~~c) 0.02~~
- d) 0.012

14) The "best estimate" of the true value of the radius of the sphere (in cm) is:

- a) 2.82
- b) 0.02
- c) 1.41
- ~~d) 1.52~~

$$\frac{d}{2} = r$$

15) The volume of the sphere (in cm^3) is:

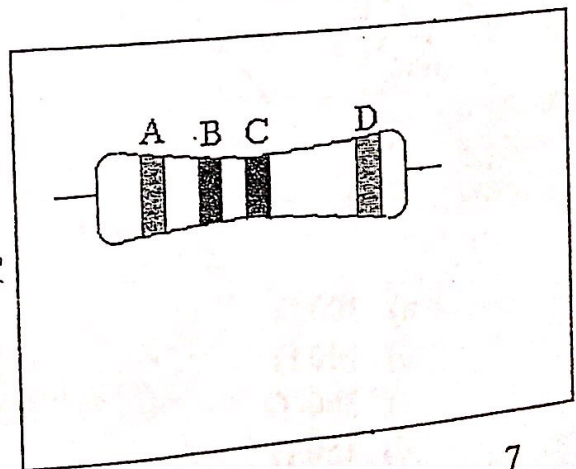
- ~~a) 14.7 ± 0.6~~
- b) 11.7 ± 0.2
- c) 14.72 ± 0.22
- d) 11.71 ± 0.07

~~$V = \frac{4}{3}\pi r^3$~~

16) For the carbon resistor shown in the figure, if A: Green(5), B: Green(5), C: Black(0), D: Gold (5%). Its value is:

- ~~a) (55 ± 5%) Ω~~
- b) (50 ± 10) $\text{K}\Omega$
- c) (55 ± 3) Ω
- d) (50 ± 2) Ω

$$55 \pm 5\%$$



17) Consider a collision in one dimension, where particle 1 with momentum $P_{1b} = (7.4 \pm 0.2) \text{ Kg m/s}$ collides with particle 2 which is initially at rest, after collision the momentum of particle 1 is $P_{1a} = (3.1 \pm 0.1) \text{ Kg m/s}$ and the momentum of particle 2 is $P_{2a} = (4.1 \pm 0.1) \text{ Kg m/s}$ then the ratio R of the momentum of the system after collision to the momentum before collision ($R = P_a / P_b$) and its uncertainty (ΔR) is closer to which of the following :

- a) 0.91 ± 0.03
- b) 0.97 ± 0.07
- c) 0.91 ± 0.09
- d) 0.97 ± 0.05

$$R = \frac{P_{1a} + P_{2a}}{P_{1b}} = \frac{3.1 \pm 0.1 + 4.1 \pm 0.1}{7.4 \pm 0.2}$$

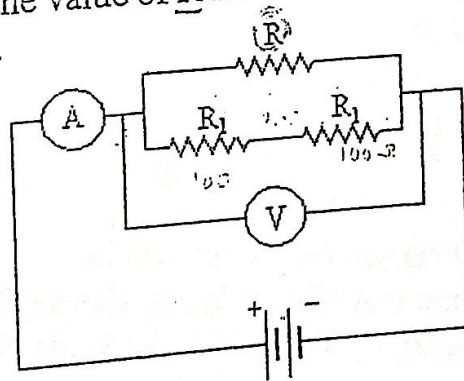
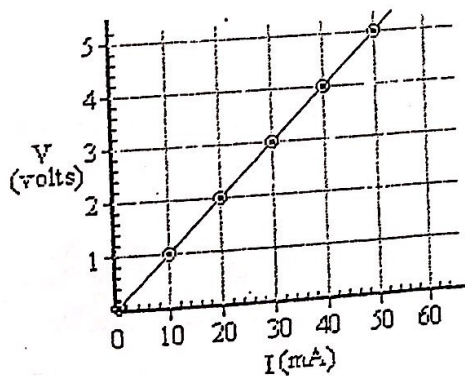
$$= \frac{7.2 \pm 0.2}{7.4 \pm 0.2} = \frac{\Delta A}{A} \quad \frac{\Delta B}{B}$$

18) If $R = 1/A + 1/B$, where $A = 1.5 \pm 0.1 \text{ cm}$, and $B = 0.81 \pm 0.04 \text{ cm}$, then R equals to:

- a) $1.9 \pm 0.1 \text{ cm}^{-1}$
- b) $1.90 \pm 0.11 \text{ cm}^{-1}$
- c) $1.9 \pm 0.1 \text{ cm}$
- d) $1.9 \pm 0.10 \text{ cm}^{-1}$

$$R = \frac{1}{A} + \frac{1}{B}$$

19) Consider the circuit shown in the next figure with its $V - I$ diagram. If the value of $R_1 = 100 \Omega$, then the value of R is:



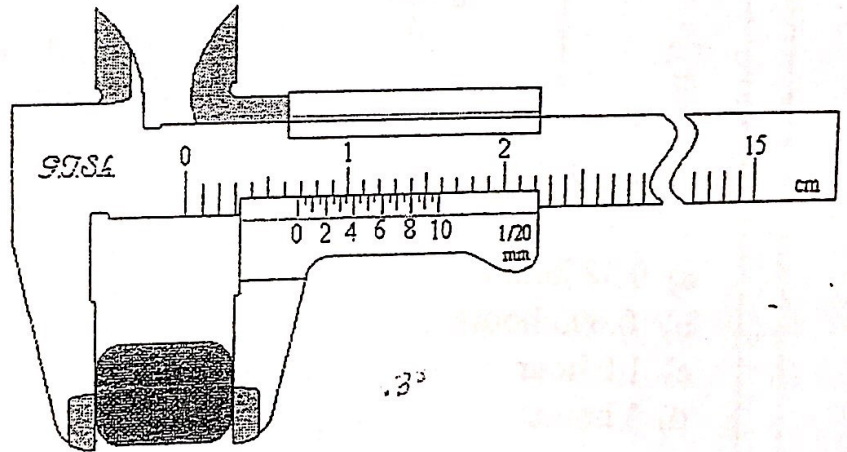
- a) 300Ω
- b) 100Ω
- c) 200Ω
- d) 150Ω

20) A measurement with low precision, but high accuracy is often an indication of the presence of:

- a) personal errors
- b) random errors
- c) statistical errors
- d) systematic errors

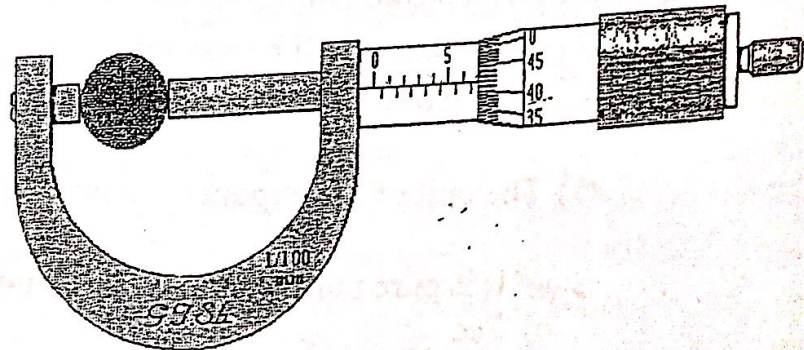
21) The reading of the caliper shown is:

- a) 0.38 ± 0.01 cm.
- b) 0.608 ± 0.005 cm.
- c) 0.680 ± 0.005 cm.
- d) 3.80 ± 0.01 mm.

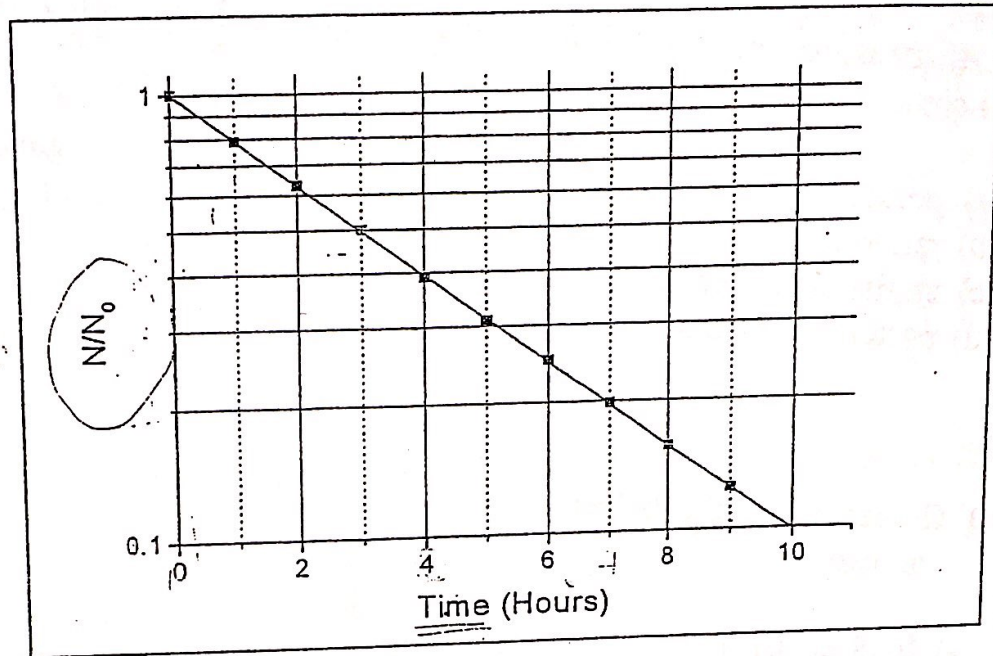


22) The reading of the micrometer shown is:

- a) 0.642 ± 0.001 cm.
- b) 0.692 ± 0.001 cm.
- c) 6.98 ± 0.050 mm.
- d) 8.42 ± 0.05 mm.



The following three questions are related to the simple exponential law of radioactive decay $N = N_0 e^{-\lambda t}$, where N is the number of nuclei (انوية) at time t . If N vs t is plotted on a semi-log graph paper, the following graph is obtained:



23) The half life time of the decay is:

- a) 0.38 hours
- b) 0.693 hours
- c) 1.0 hour
- d) 3 hours

24) If λ is decreased, then

- a) The decay will not change
- b) The decay will be faster.
- c) The decay will be slower.
- d) none of the above.

25) The unit of the exponent λt is:

- a) It is pure number, so it has no units
- b) Sec
- c) sec^{-1}
- d) none of the above

~~$$\frac{N}{N_0} = e^{-\lambda t}$$~~

$$N = -e$$

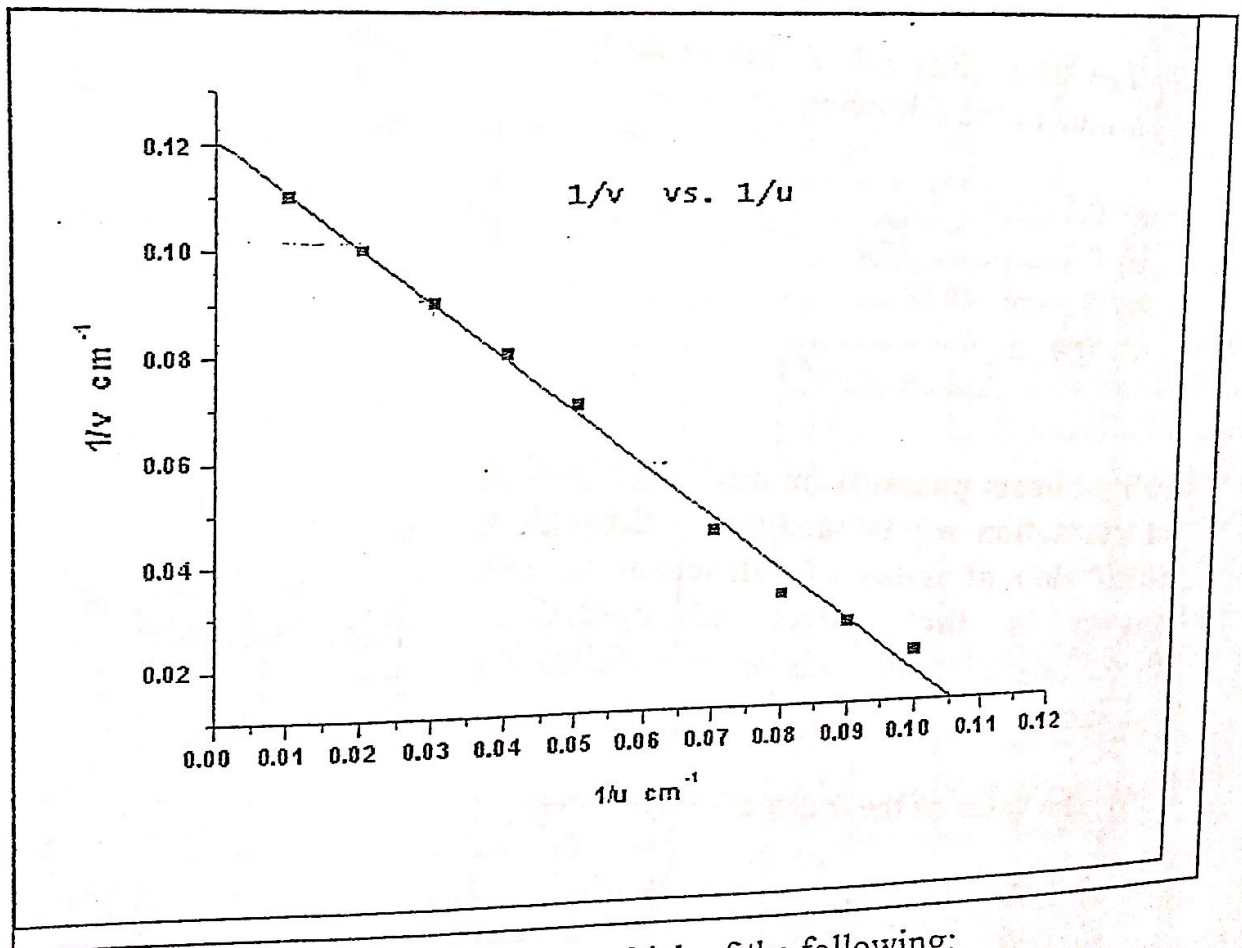
$$\left(\frac{N}{N_0}\right)^{\lambda} = e^{-t}$$

$$[\text{unit}] = \frac{-t}{\lambda}$$

26) For a voltmeter with 0.1 volt the smallest marked scale division, measurements should be estimated to the nearest:

- a) 1 volt
- b) 0.001 volt
- c) 0.01 volt
- d) 0.1 volt

27) An object is placed at a distance u from a convex lens of an unknown focal length f , an image is formed at a distance v from the lens, a graph is plotted $(1/v)$ vs. $(1/u)$ which is shown in the next figure:



The focal length of the lens is closer to which of the following:

- a) 11.3 cm
- b) 0.105 cm^{-1}
- c) 8.9 cm
- d) 16 cm

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

Two liquids are inside U-shaped tube with densities $\rho_L = 1.04 \text{ g/cm}^3$ and $\rho_h = 0.82 \text{ g/cm}^3$; this is shown in the next figure, If $L=5.7 \text{ cm}$, answer the following two questions:

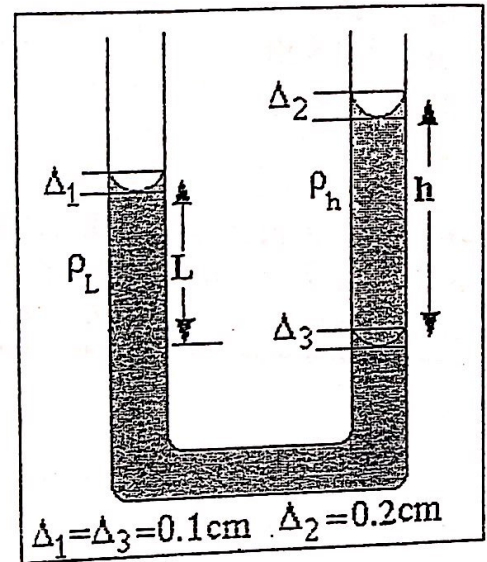
28) What is the value of h :

- a) 6.8 cm
- b) 7.2 cm
- c) 7.23 cm
- d) 6.85 cm

$$\rho_L L = \rho_h L_2$$

$$1.04 \cdot 5.7 = 0.82 \cdot L_2$$

$$L_2 = h = 7.23 \text{ cm}$$

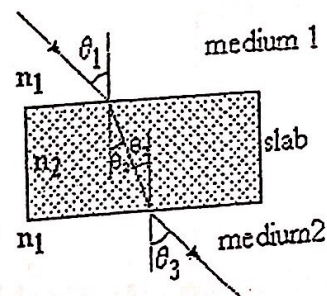


29) The uncertainty in h (Δh) is closer to which of the following:

- a) 0.1 cm
- b) 0.2 cm
- c) 0.3 cm
- d) 0.4 cm

$\Delta_3 + \Delta_2$

A light beam passes from medium 1 (Index of refraction n_1) to medium 2 through a thick slab of index of refraction n_2 , (As shown in the figure). If $n_1=1.13$, $\theta_1=25^\circ$, $\theta_2=17^\circ$, then answer the following question:



30) The value of the index of refraction n_2 is:

- a) 1.63
- b) 1.45
- c) 1.4
- d) 1.6

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$1.13 \sin 25^\circ = n_2 \sin 17^\circ$$

$$n_2 = \frac{1.13 \sin 25^\circ}{\sin 17^\circ} = 1.63$$

Good Luck