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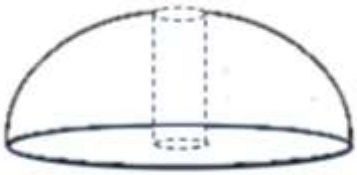
North Western Province

Diagnostic Test -2024 Grade -13

Physics - Part A Structured Essay

Name/Index No..... 01 Hour

Answer all the questions.You are given 10 minutes extra reading time



1. We want to find the volume of the material of the semi sphere which contain cylindrical hole with 5mm radius.

   For this you are provided spherometer

a) i)Pitch of the screw of spherometer is 0.5mm if circular scale is divided in to 50 parts calculate the least count of it.

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ii) What adjustment do you do , before using the spherometer .How do you verify experimentally that the adjustment has been done correctly

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b) For measure the radius of curvature R, following relation is used

$R=a^2/6h + h/2$

i) Identify the following symbols

1) a……
2) h……

ii) For measure the h where the screw is rotate from adjusted position up or down

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iii)When obtaining above reading screw is rotate 6 round and 30 parts of circular scale is coincided.Find the value of h.

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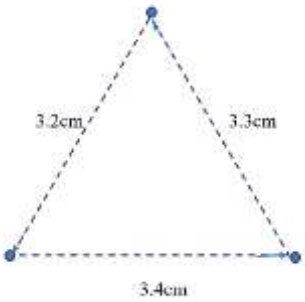
iv) By the student three base are emboss on the white paper.For finding the a ,

measuring distance is given in the figure.Calculate the value of a



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v) Calculate the radius of the curve surface to first decimal point.

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c) Considering the value of depth of the hole is equal to the value of diameter of sphere .Find the volume of hole by cm^3 to the two decimal points (get as $\pi=3$)

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d) Find the volume of material made of it to the second decimal point by cm^3.

(get as $5.7^3 \approx 185$)

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2) You are asked to determine the speed of sound(v) in air by using one and open resonance tube.For this you are provided resonance tube 480Hz tuning fork , a meter rule , a tall jar , a stand.

a) i) What is the more suitable tube you must be selected for this , in given three situation.

Tube	X	Y	Z
Diameter	5cm	5cm	2.5cm
length	25cm	50cm	50cm

ii) What type of wave produce in here

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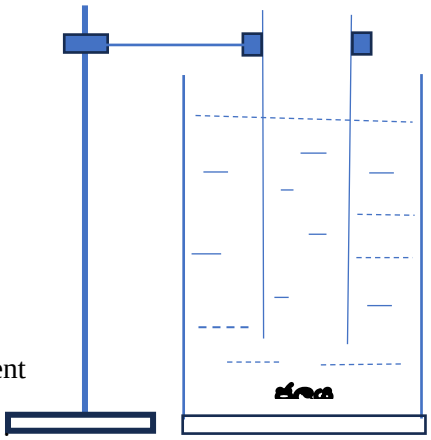
iii) Underline the correct answer , energy produce by this wave

(1) transmitted by it (2) do not transmitted by it

b)



i)Draw how to keeping the vibrating tuning fork in this diagram

ii)What is the purpose tube is immersed in water

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c) i)What are the obtaining measurements by you in this experiment

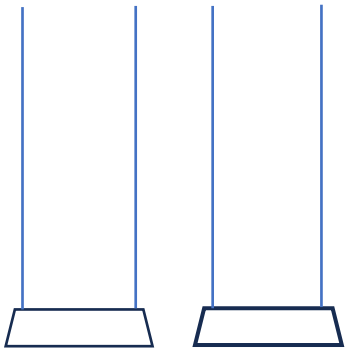
1)……

2)……

ii) Draw the relevant situations of tubes in the given diagram

iii)Draw the shape of the waves for relevant situations in that diagram.

iv) Mark the end corrections of the waves on that diagram



d) i)If first resonance length is l_1 and second resonance length is l_2,wave length is λ,end correction is e. Write down the two relation.

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ii)Get the expression for λ

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iii) If frequency of the tuning fork is f get the expression for V

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iv) If resonance length of first time is 12.5cm and second time is 47.5cm find the sound velocity in air

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3)

a) What is heat capacity of object

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b) Underline the correct answer in this experiment.

i) Heat capacity of water relative to heat capacity of calorimeter

1) must be reduce (2)must be equal (3) must be increase

c) i) In order to fulfil this , mark the level of the water/liquid in the given calorimeter

ii)How to fulfil the answer you have given in part (c) (i) according the water/liquid you have filled

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d) In this experiment liquid/water must be srir well.What is the reason for it.

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e) i)What are the reading are you get in here

independent variable ……...

dependent variable……...

ii)The two cooling curves obtained by the S_1 student are shown in the figure.What is the reason for obtained like that curves.

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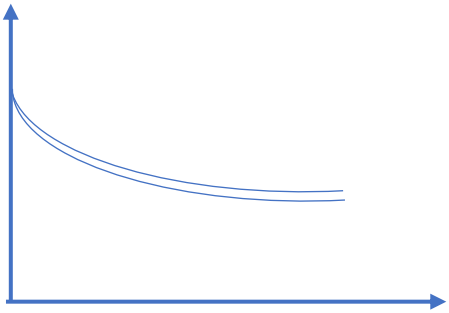
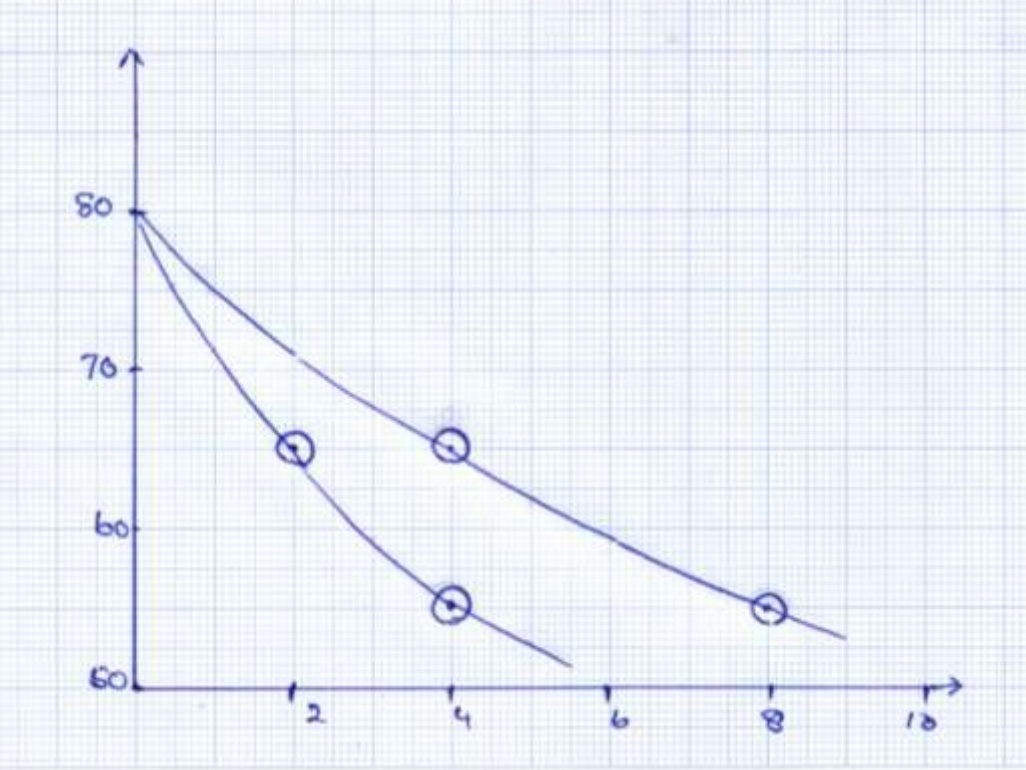


f) The two cooling curves obtained by the S_2 student are shown in following figure.



i) Label the axis with unit

ii) If specific heat capacity of liquid is lesser than specific heat capacity of water ,label the above curve

g) i)Following data of the experiment are also given below.

heat capacity of the calorimeter and the stirrer= $100Jk^{-1}$

mass of water=0.2kg

specific heat capacity of water=$4x10^3Jkg^{-1}k^{-1}$

mass of liquid=4/15 kg

What is the average heat loss of the calorimeter with water during the cooling from 65^0C to 55^0C

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ii) When cooling from 65^0C to 55^0C write down the expression for average heat loss of the calorimeter with liquid using specific heat capacity of liquid C_l

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iii) Calculate the specific heat capacity of liquid

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h) What is the reason more suitable using copper calorimeter in this experiment

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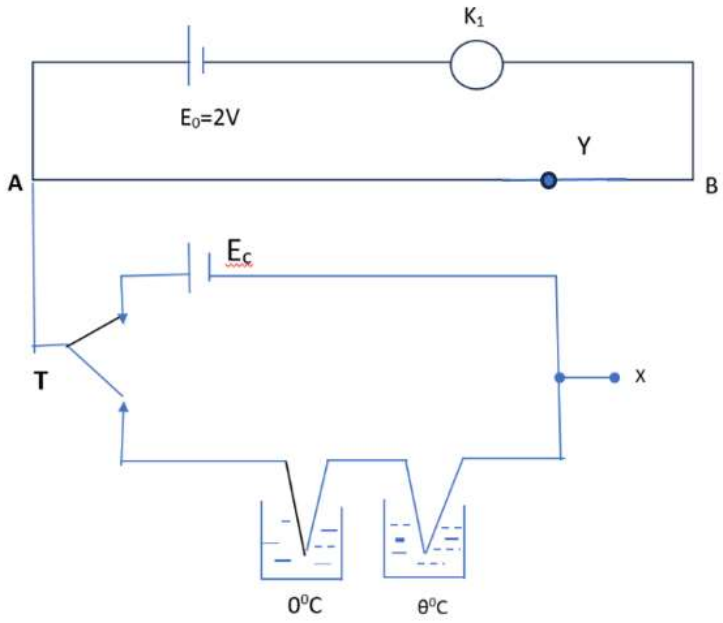
4) A student required to compare the e.m.f of cell and thermocouple. For this uncompleted circuit of potentiometer is given bellow used for it.



a) i) What are the items needed for complete XY part of the circuit

1)…… 2)…….

3)…… 4)……..

ii)Identify the T in circuit

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iii)Complete the part of the XY in circuit , using items you are written in part(a)

b) Total length of the potentiometer wire is 600cm and E_0=2V .Internal resistance of the accumulator can be negligible.When connect the E_c in the circuit ,balancing length is 450cm.Find the value of E_c.

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c) i)How to modify the potentiometer circuit to measure the e.m.f of the the thermocouple

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ii) Draw only modification part of the circuit

iii) If resistance of the potentiometer wire is 8Ω, to get the 40mV potential drop in total length , find the value of the item used in modification circuit.

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iv) When connection to thermocouple to the potentiometer balancing length is 240cm find the voltage of it in mV.

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d) Now connecting the E_2 cell instead of thermocouple a student is ready to find the E_c/E_2 ratio by using graphical method.If balancing length for E_c is l_c and for E_2 is l_2 get the expression for it

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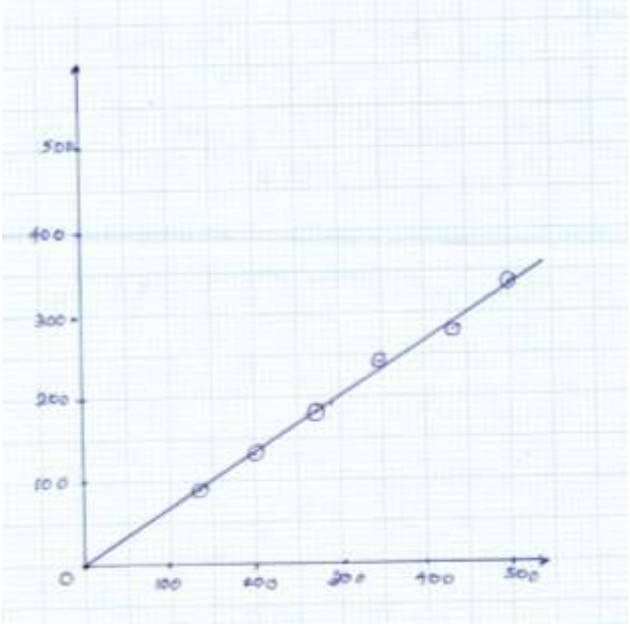
e) Obtain graph for it is given below.



i. Label the axis of the graph
ii. Mark the more suitable two point on the graph for finding the gradient.
iii. Calculate the ratio $\frac{E_c}{E_2}$