FWC

G.C.E. A/L Examination November - 2015

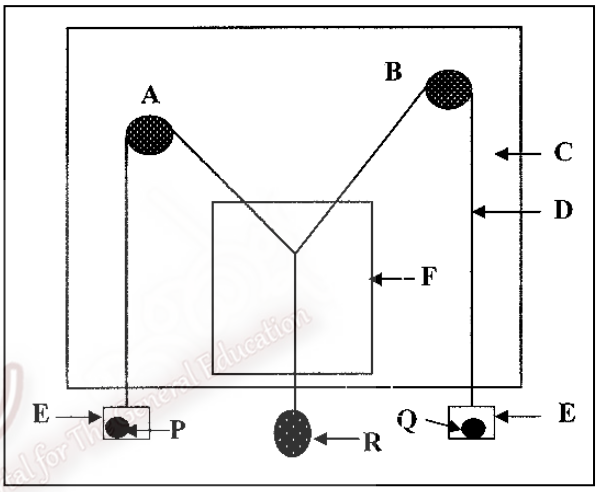
Conducted by Field Work Centre, Thondaimanaru
In Collaboration with
Zonal Department of Education Jaffna.

Grade :- 13 (2016)	Physics - II	Time :- Three hours

Part - II A - Structured Essay

01) The figure shows a setup used verify law of parallelogram in school laboratory

A, B – smooth pulleys
D – light inextensible string
C – vertical board
E – light balance pans
P, Q – weights
R – stone (density to be determined)



a) State the other instruments needed to complete this experiment

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b) The above setup done by the student is incorrect. How would you correct it?

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c) How would to test whether the friction in pulleys are negligible or not?

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d) Why light string are used in this experiment?

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e) The above setup is made for you. State the steps that you would do to verify parallelogram law. .....

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f) In this experiment student denotes the position of strings by using their shades. Do you agree with this procedure? Give reasons.

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g) If the weighing pans aren't light, what will you do to complete this experiment correctly?

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h) In this experiment if Q is larger than P and R, what will be the problem faced by you?

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i) From the above experiment student decided to determine the density of stone ρ and the density of liquid ρ_l. the length of diagonal of the force parallelogram is measured during the following instances stone in air, stone in water and stone fully immersed in liquid are l_1, $l_2$and l_3 respectively. Consider the density of water to be ρ_w

i) define the average density of a body

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ii) state an expression for the density of stone in relation to l_1, $l_2$andρ_w

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iii) l_1= 3.2cm l_2 =2.7cm, ρ_w = 1000kgm^{-3}. Find the density of stone

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iv) state an expression for the density of liquid in relation to l_1, $l_2$and l_3

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v) l_1= 3.2cm l_2 =2.7cm,l_3 =2.8cm, ρ_w = 1000kgm^{-3}. Find the density of liquid

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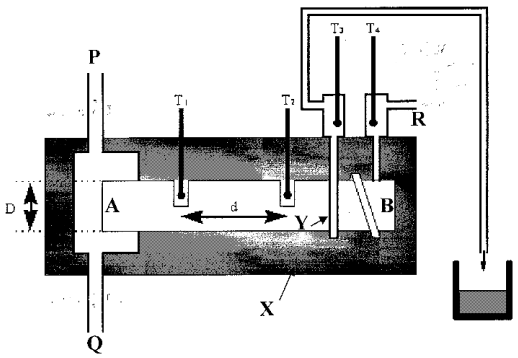
02) A part of the Searle's experiment to find the thermal conductivity of a metal is shown in the figure.



a) What are the other additional instruments needed to complete this experiment

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b) What is the name of the instrument to be connected to R? draw a sketch of that instrument in the correct place in the appropriate place and clearly show how it is connected to R.

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c) Through which P or Q water steam is sent to heat the metal through end A. state two reasons for your choice.

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d) How would you know whether the system has attained it's stable state?

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e) How would you get a better contact between thermometer T_1, T_2 and the metal rod?

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f) What is function of X? what is the physical feature considered when selecting a substance for X? state one example of substance used as X.

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g) In which direction should water have to flow at constant rate through the metal pipe? State the reason.

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h) In this experiment, at stable state the reading of thermometers T_1, T_2, T_3 and T_4 are θ_1, θ_2, θ_3 and θ_4.the mass of water collected in t second is m kg, the distance between thermometers T_1 and T_2 is d and the diameter of the metal rod is D.

i) What instruments will you use to measure d, D in your laboratory?

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ii) Give an expression for the thermal conductivity of metal rod in relation to S_w, the specific heat capacity of water

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iii) $\theta_1 = 80^0C$ $\theta_2 = 66^0C$ $\theta_3 = 37^0C$ $\theta_4 = 28^0C$, mass of water collected in 3 minutes is 0.4kg, cross section area of metal rod is $1.2 \times 10^{-3} m^3$, d = 0.08m, $S_w = 4200 Jkg^{-1}K^{-1}$ .find the thermal conductivity of the metal rod.

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i) Can you determine the thermal conductivity of insulators using this experiment? State reasons.

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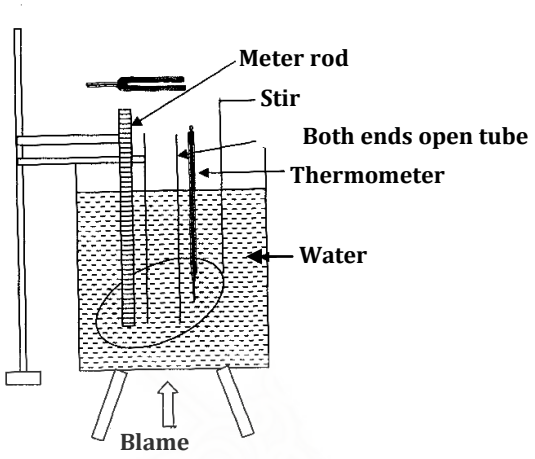
03) An experiment to find the molar mass (M) of gas in the tube and the end correction (e) of the tube is shown in the figure. Following instruments are used

- ✶ Tall water tank that can be heated
- ✶ Both end opened tube
- ✶ Standard tuning fork
- ✶ Bunsen burner
- ✶ Thermometer
- ✶ Meter rod



(a) Draw the pattern of wave that you will produce in order to carry out this experiment, in the tube shown in the figure. Clearly show the end correction

(b) Is there any reason for using this specific type of vibration? Explain your answer.

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(c) In the above condition write an expression for speed of sound in air v in relation to resonance length l, e and frequency of tuning fork f

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(d) In the above condition write an expression for speed of sound in air v in relation to absolute temperature of air, molar mass of air(M)

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(e) The variation of resonance length at deferent temperature of water is obtained. A straight line graph is drawn to obtain molar mass of air and end correction. State the expression of the graph.

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(f) Sketch the graph and label the axis

(g) Draw and label the graph as **x** that is obtained by using a tube with smaller diameter than the tube used here.

(h) State how would you find M and e from the above graph.

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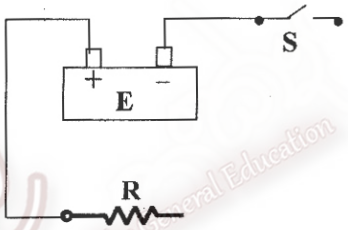
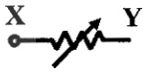
04) An incomplete circuit that is used to verify ohm's law in laboratory is shown in the figure.

- ✶ E – standard cell
- ✶ R – standard resistance(10Ω)
- ✶ S – switch
- ✶ V – voltmeter (resistance 2000Ω)
- ✶ A – Ammeter
  (scale of 10mA, maximum current 1A)
- ✶ Needed connecting wires





(a) Complete the above circuit to verify Ohm's law. Show the +, - end of voltmeter and ammeter in the circuit

(b) Write the relation between V, the voltage across the resistance R, I, the current through the resistance R.

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(c) How the value of the resistance of ammeter and voltmeter should be to make the experiment more accurate?

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(d) What physical quantity is chosen as dependent variable and what should be chosen as independent variable to verify Ohm's law using graphical method?

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(e) Draw the graph in axis given below and label the axis

(f) Would junction diode obey Ohm's law? Explain. Draw the graph for junction diode in the same graph and name it as X.

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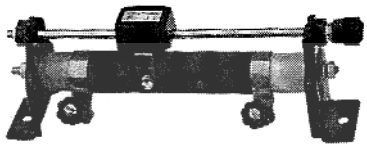
(g) The rheostat is given to use in this experiment. Mark the points X, Y in the circuit on the suitable place of the rheostat.



(h) Why you are not advised to use resistance box instead of a rheostat?

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(i) If the given standard resistance was 500Ω, how would you connect the voltmeter to carry out the experiment accurately? Give reasons

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(j) What is the minimum percentage of error that can be found when measuring current using the given ammeter?

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(k) A student says that it is better to do this experiment when small current passes through R. do you accept his statement? Give reasons.

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