13 ශ්‍රේණිය - අවසාන වාර පරීක්ෂණය - ජූනි 2019
Grade 13 - Final Term Test -June 2019

භෞතික විද්‍යාව I **Physics I**	**01 E I**	පැය දෙකයි ***Two hours***

- ❖ Answer all 50 questions.
- ❖ Select the correct or the most suitable answer out of the 5 choices given and mark it with **(x)** in the relevant cage of the answer script provided

g= 10 Nkg^{-1}

(1) It is given the equation relating three physical quantities by $X = Y^2+Z$. Consider the following statements.

(A) $[X] = [Y] = [Z]$ should fulfill

(B) For the equation to be correct relative to dimension $[X] = [Y^2]$

(C) For the equation to be correct in terms of dimentsion $[Y^2] = [Z]$

Correct statement/s is /are,

(1) Only A (2) Only A and C (3) Only B and C

(4) Only B (5) All A, B and C

(2) In a vernier caliper 49 of mm divisions of the main scale devisions equals to 50 divisions of the vernier scale. Which of the following is not a reading obtained by this caliper?

(1) 1.04 mm (2) 2.006 cm (3) 2.605 cm (4) 30.40 mm (5) 6.642 cm

(3) The speed of longitudinal wave in a metal medium is, (The young's modulus and density of the metal medium are 2×10^{11} Nm^{-2} and 8×10^3 kgm^{-3} respectively)

(1) 5×10^3 kmh^{-1} (2) 5×10^3 ms^{-1} (3) 2.5×10^4 ms^{-1}

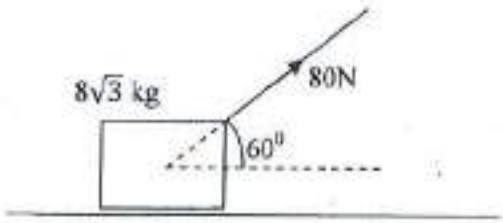
(4) 2.5×10^3 kmh^{-1} (5) 4×10^3 ms^{-1}

(4) The displacement (cm) of a paticle undergoing simple harmonic motion is given by $x = 10 \sin\left(4\pi t + \frac{\pi}{2}\right)$. The initial phase angle and frequency of this motion are respectively,

(1) $\frac{\pi}{2}$, 2Hz (2) 4π, $0.5Hz$ (3) $\frac{\pi}{2}$, 0.5 Hz

(4) 4π, 2Hz (5) $\frac{\pi}{2}$, 1Hz

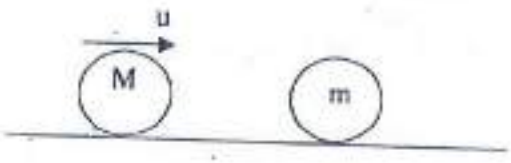
(5) As shown , a mass of $8\sqrt{3}\ kg$ is placed on a horizontal surface and pull along the surface at constant velocity by applying a 80 N force. The reaction on the mass by the horizontal surface is,



(1) 40 N (2) $40\sqrt{3}\ N$ (3) $80\sqrt{3}$ N

(4) 80 N (5) 160 N

(6) A mass M moving on a smooth horizontal plane at velocity u, collides with a mass m at rest. The collision is elastic , and the velocity of mass M after collision changes to V. The velocity of mass m,



(1) $\frac{2mu}{M+m}$ (2) $\frac{2Mu}{M+m}$ (3) $\frac{mu}{M+m}$

(4) $\frac{Mu}{M+m}$ (5) $\frac{(M+m)u}{M}$

(7) The breaking strain of an Aluminum rod is 0.3% young's modulus of Aluminum is 7×10^{7} Nm^{-2}. What should be the minimum cross sectional area of the rod to bear up a load of 10^{4}N?

(1) 7.1×10^{-4} m^2 (2) 1×10^{-4} m^2 (3) 1.4×10^{-3} m^2

(4) 5×10^{-2} m^2 (5) 1×10^{-3} m^2

(8) Consider the following statements regarding a photo-electric cell.

(A) While the intensity of fallen light remaines constant, if the colour of fallen light is changed, the potential difference at which current becomes zero also will change.

(B) For a given colour of incident light if intensity of light is varied , the potential at which current becomes zero will remain constant.

(C) The potential at which photo current become zero for a monochromatic light changes depending on the type of metal of the cathode.

The correct statement/s is/are,

(1) Only A (2) Only B (3) Only A and C

(4) All A, B and C (5) Only A and B

(9) Which of the following statements is correct regarding a p-n junction diode connected to a circuit?

(1) All points in the diode are at same potential.

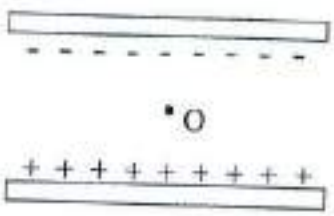
(2) The potential of p type side is at a greater potential than n side.

(3) There exists an electric fluid directed from n side to p side.

(4) There exists an electric field directed from p side to n side.

(5) There's no depletion layer inside the diode.

(10) A charge particle of mass m remains at equilibrium at point O, which is in between two of charged plates. Which is the incorrect statement out of the following?



(1) The electric force acting on the particle equal to mg.

(2) The direction of electric field between the plates is vertically upwards

(3) The given particle is negatively charge.

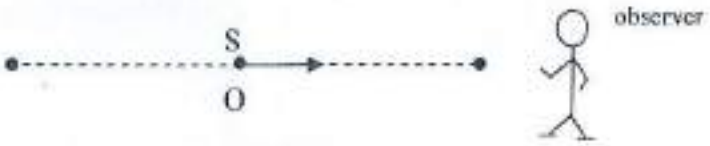
(4) If the amount of charge of the particle is increased, it will move upwards.

(5) If the charge on plates are increased, the particle will start moving upward.

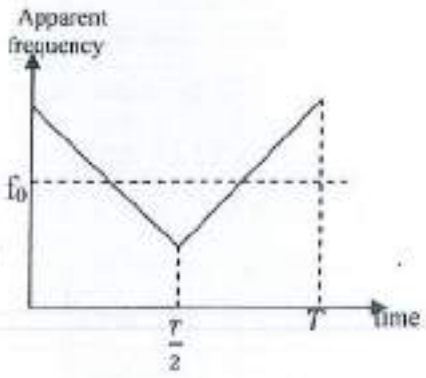
(11) The acceleration due to free fall of two planets X and Y are equal in magnitude. The diameter of planet Y is twice that of planet X. What is the ratio between the mean densities of planet X to planet Y?

(1) 2:1 (2) 1:2 (3) 1:1 (4) 4:1 (5) 1:4

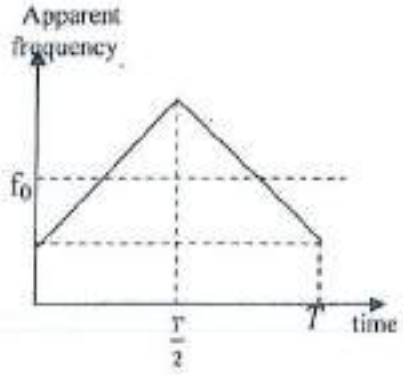
(12)



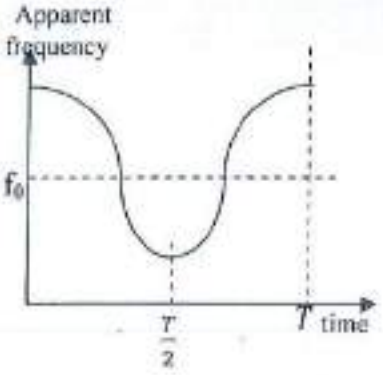
A sound source (s) emits a sound of frequency (f_0) and under goes a simple harmonic motion of centre O. Initially the source is at the centre O of oscillations and movement to right. During one time period which of the following graphs correctly depicts the apparent frequency of the observer with time.



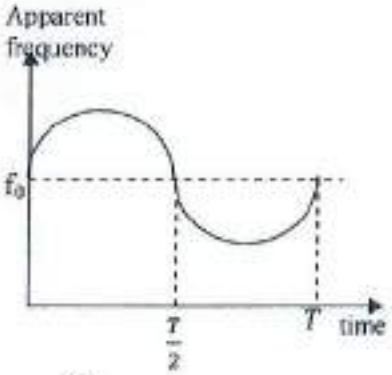
(1)



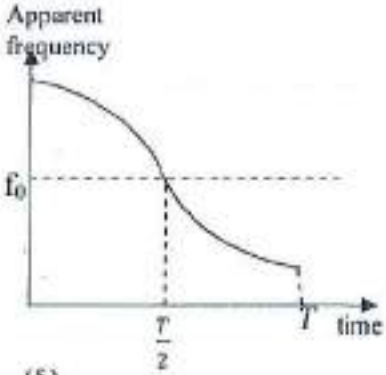
(2)



(3)

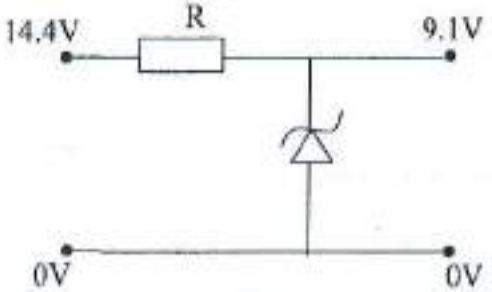


(4)



(5)

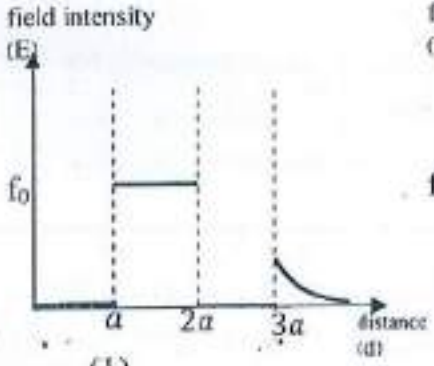
(13) As shown in the voltage supply circuit , input of 14.4V is regulated to 9.1V. If the maximum output current of supply voltage is 250 mA, and minimum current in diode is 10mA. What will the value of resistor R to maintain the given conditions?



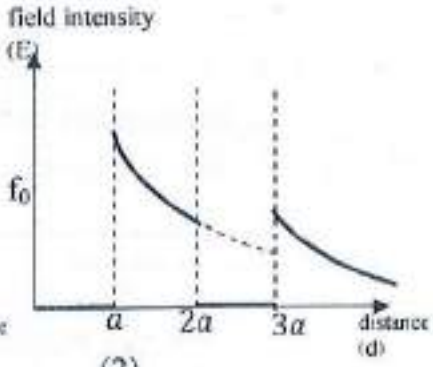
(1) 10.4 Ω (2) 14.4 Ω (3) 20.4 Ω

(4) 24.4 Ω (5) 30.4 Ω

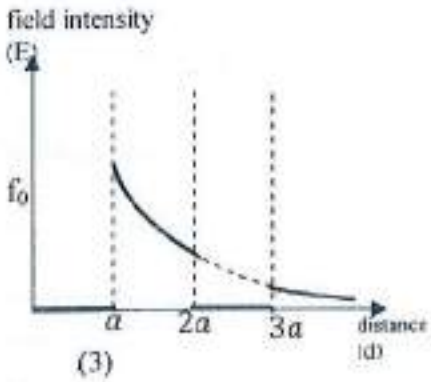
(14) A solid conducting sphere of radius a is inside a hollow conducting sphere as shown. The two spheres are concentric and external and internal radii of hollow sphere are $2a$ and 3a respectively. A charge of +q is given to the hollow sphere. Which of the following graph correctly depicts the variation of electric field measured (E) with the distance (d) insured from common centre of the spheres radially?



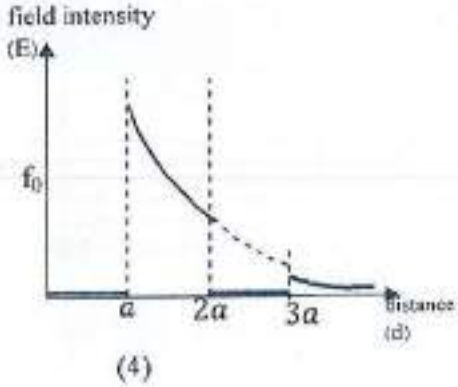
(1)



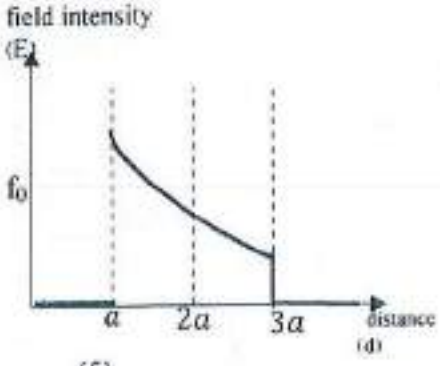
(2)



(3)

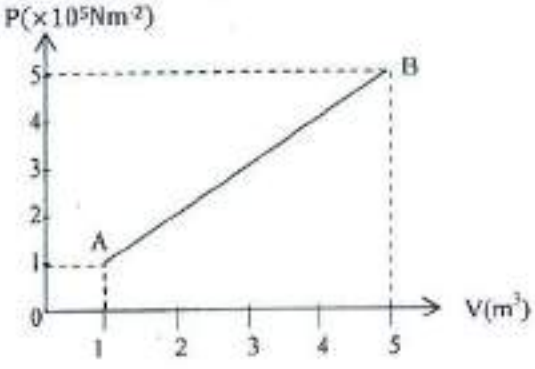


(4)



(5)

(15) A system is taken from state A to state B as shown in the figure. Find the work done by the system.



(1) 8×10^5 J (2) 12×10^5 J (3) 6×10^5 J
(4) 7.5×10^5 J (5) 7.5×10^4 J

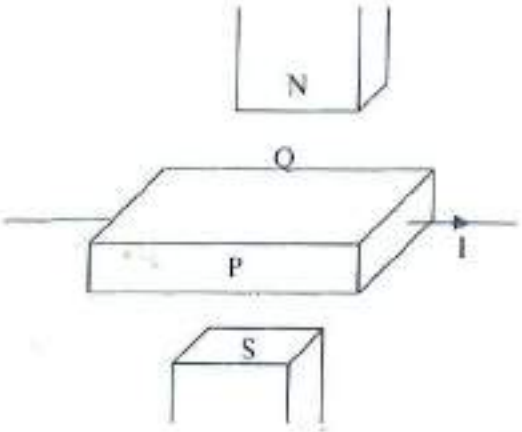
(16) In an experiment in determine specific heat capacity of Cu by a method of mixtures a block of Cu of mass 600g heated to 100^0C is mixed with mass of water 330g at 30^0C in a calorimeter of heat capacity 120 JK^{-1}. The observed maximum temperature of the mixture is 40^0C. Calculate specific heat capacity of Cu. Assume specific heat capacity of water as 4000 J kg^{-1} K^{-1}.

(1) 560 J kg^{-1} K^{-1} (2) 210 J kg^{-1} K^{-1} (3) 200 J kg^{-1} K^{-1}
(4) 400 J kg^{-1} K^{-1} (5) 450 J kg^{-1} K^{-1}

(17) When the supply voltage has dropped by 10%, what will be the percentage drop of speed of rotation of the power indicator wheel of a domestic electric motor?

(1) 19 % (2) 11 % (3) 10 % (4) 1.1 % (5) 0.01 %

(18) It is shown, a set up to demonstrate Hall effect. A constant current I flow in the slab.



(A) A potential difference will build up between P and Q.

(B) If the applied magnetic flux density is increased, the Hall voltage will increase

(C) If the thickness of shown metal slab is decreased, the Hall voltage will decreased.

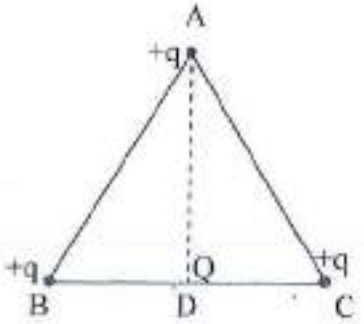
The correct statement/s is /are,

(1) Only A (2) Only A and B (3) Only B and C

(4) All A, B and C (5) all incorrect

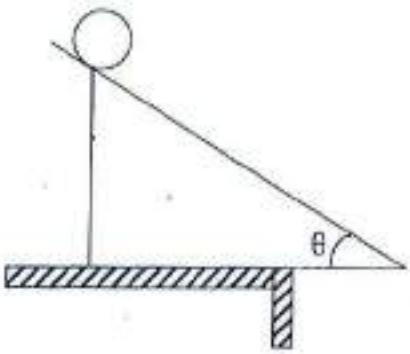
(19) Point charges of each +q are placed on vertices A, B and C of an equilateral triangle ABC. Another point charge Q is placed on the mid point of side BC.

If the resultant force acting on point charge q on A is zero due to point charges at B, C and D, What will be the magnitude charge Q?



(1) $\frac{+3\sqrt{3}q}{2}$ (2) $\frac{-3\sqrt{3}\,q}{2}$ (3) $\frac{+3\sqrt{3}q}{4}$ (4) $\frac{-3\sqrt{3}q}{4}$ (5) $\frac{-\sqrt{3}q}{4}$

(20) There solid cylinders of same length but ratio of radii 1:3:5 are released from rest one at a time form the same point of an inclined plane. The times taken by cylinders to roll down without slipping to the bottom of the plane,



(A) the smallest cylinder will take the minimum time

(B) the time taken by the largest cylinder is the highest

(C) all three cylinders will take equal times.

The correct statement/s is/are

(1) Only A (2) Only B (3) Only C

(4) Only A and B (5) All A, Band C

(21) The distance between an object and a screen is 60 cm. When a convex line is moved between the object and the screen two images of heights 2 cm and 8 cm were formed. The focal length of the lens,

(1) 10 cm (2) $\frac{20}{3}$ cm (3) $\frac{40}{3}$ cm

(4) 40 cm (5) 50 cm

(22) The reading of the electronic balance with a container of water on it in figure (a) is 2.60 kg. As shown is figure (b) a solid object of mass 1 kg and density 5000 kgm^3 is submerged fully in water. The new reading of the balance, (density of water 1000 kgm^3)

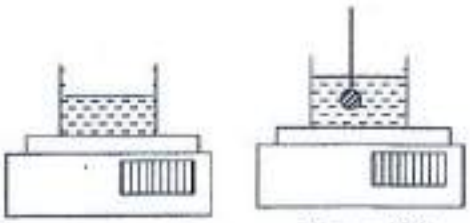


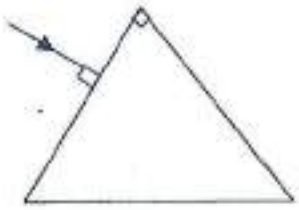
figure (a) figure (b)

(1) 2.40 kg (2) 2.60 kg (3) 2.80 kg (4) 4.60 kg (5) 0.60 kg

(23) Consider a vehicle moving towards a cliff while sounding a horn of 600Hz, The beat frequency heard by the driver of the vehicle is 8Hz. If the speed of sound in air is 330 ms^{-1} , the velocity of the vehicle may be,

(1) 22ms^{-1} (2) 6.1ms^{-1} (3) 2.2 ms^{-1} (4) 22 kmh^{-1} (5) 2.2 kmh^{-1}

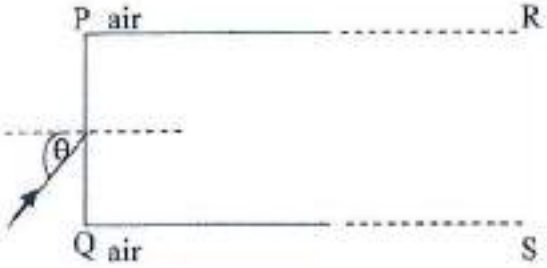
(24) The shown prism with an equilateral cross-section is made of glass of refractive index 1.5. What is the total deviation of the shown ray on first face , after emerging through the prism?



(1) $\sin^{-1}\left(\frac{3\sqrt{3}}{4}\right)-60^0$ (2) $\sin^{-1}\left(\frac{3}{4}\right)-60^0$ (3) 30^0

(4) 60^0 (5) 120^0

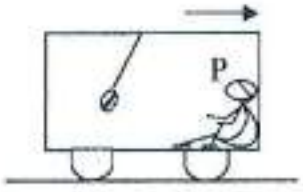
(25) Consider a glass block of parallel surfaces. It's critical angle with air is 42^0. Consider following statements regarding the ray incidents on face PQ.



(A) It may undergo partial refraction on side PR.
(B) It will not emerge from surface PR.
(C) It will not incident on surface PR.

(1) Only A (2) Only B (3) Only A and B
(4) Only C (5) All A, B, C

(26) Consider a simple pendulum suspended from the roof of a train compartment, travelling at constant acceleration. (P is a person at rest in the compartment Q is a person at rest on the ground)

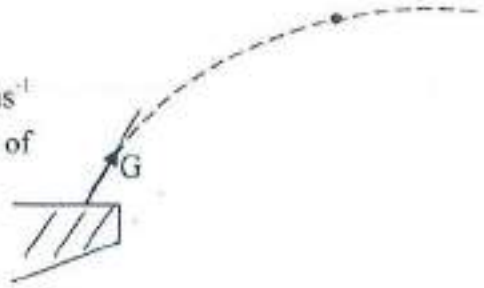


(A) There is no horizontal force acting on pendulum bob relative to P.
(B) There is a horizontal resultant force acts on the pendulum bob relative to Q.
(C) There is no vertical resultant force acting on the pendulum bob relative to P.

The correct statement/s is are,

(1) Only A (2) Only B
(3) Only A and B (4) Only B and C
(5) All A, B and C

(27) A Swimmer in a swimming event achieves a velocity of 5 ms^{-1} at the maximum height of his projectile motion. The radius of his trajectory at this moment will be,

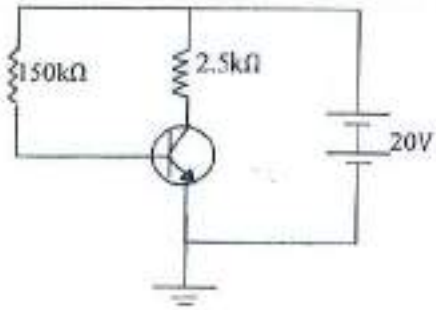


(1) 0.5m (2) 1m (3) 2.5m (4) 5m (5) 10m

(28) Radius of a soap bubble is r. The coefficient of surface tension of soap is T. What will be the required energy to double the radius of the soap bubble under constant temperature?

(1) $2\pi r^2 T$ (2) $4\pi r^2 T$ (3) $8\pi r^2 T$ (4) $12\pi r^2 T$ (5) $24\pi r^2 T$

(29) To bias the shown transistor to the middle of the active region. What current should flow through the resistor 2.5kΩ.



(1) 2 mA (2) 4mA (3) 6mA
(4) 8mA (5) 10mA

(30) Consider small sphere made of a material of density σ. It reaches terminal velocity of V_1 in viscous.medium density ρ. Another small sphere of same radius but made of a material of density 2σ moves in the above medium at terminal velocity V_2. Which of the following expression is correct?

(1) $V_2 = V_1\left(\frac{2\sigma-\rho}{\sigma-\rho}\right)$ (2) $V_2 = V_1\left(\frac{\sigma-\rho}{2\sigma-\rho}\right)$ (3) $V_2 = V_1\left(\frac{\sigma-2\rho}{\sigma-\rho}\right)$

(4) $V_2 = V_1\left(\frac{2\sigma-\rho}{\sigma-2\rho}\right)$ (5) $V_2 = V_1\left(\frac{\sigma-2\rho}{2\sigma-2\rho}\right)$

(31) The electro static field intensity and electric potential at a point at a certain distance from a pensively charge point object are 30 NC^{-1} and 18 JC^{-1} respectively. Find the distance from this point charge to the above considered point and also the magnitude of charge of the particle assuming $\frac{1}{4\pi\varepsilon_0} = 9\times10^9\ Nm^2C^{-1}$.

(1) $\frac{3}{4}$m, 1.5×10^{-9}C (2) $\frac{5}{4}$m, 2.5×10^{-9}C (3) $\frac{5}{3}$m, 2.5×10^{-9}C

(4) $\frac{3}{5}$m, 1.2×10^{-9}C (5) $\frac{4}{5}$m, 1.6×10^{-9}C

(32) Two objects of masses m and 4m are at rest at two points which are infinity apart from each other. While two masses are moving towards each other under the mutual gravitiational forces and when their distance apart is r.

(A) The kinetic energy of each of object is $\frac{4Gm^2}{r}$

(B) The total energy of two objects is zero

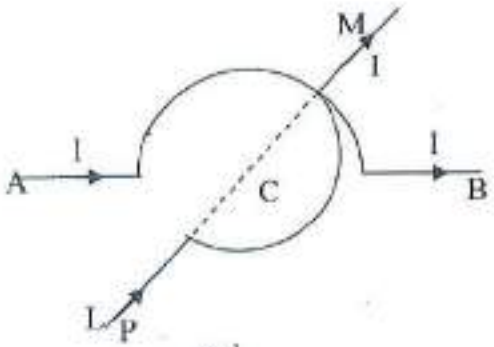
(C) The velocity of one object relative to other is zero.

(D) The addition of magnitudes of velocities of two objects is $\sqrt{\frac{10\,Gm}{r}}$

The correct statement/s is/are

(1) A and B (2) A and C (3) D and B (4) A,B and C (5) C and D

(33) It is shown a pair of infinitely long wires and point C is the common centre of semi circular parts of two wires. The radii of both semi circles is R. Both wires are thin insulated wires. One wire is placed in horizontal plane and the other is placed in a vertical plane. Both wires carry the same current I and , what is the magnetic flux density at their centre C?



(1) $\frac{\mu_0 I}{4R}$ (2) $\sqrt{2}\frac{\mu_0 I}{4R}$ (3) $\frac{\mu_0 I}{2R}$

(4) $\frac{\mu_0 I}{8R}$ (5) $\frac{\mu_0 I}{R}$

(34) If the value of R is increased from zero to infinity, the reading of ammeter (A) ,

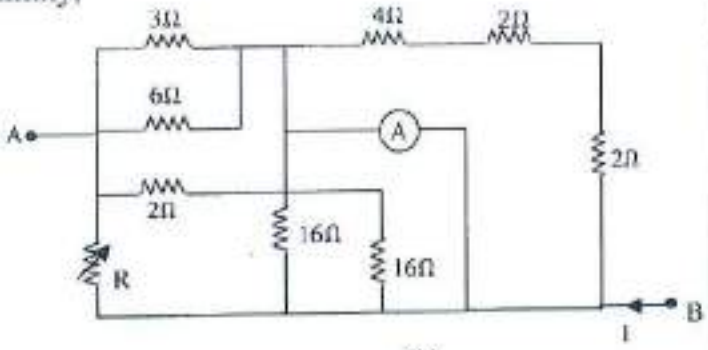
(1) will continuously decrease

(2) will continuously increase

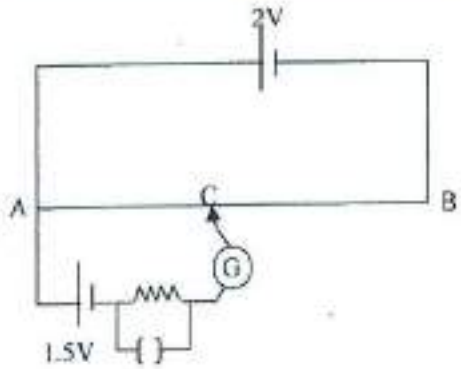
(3) will first increase and then decrease

(4) will be zero for value of R at infinity

(5) will be zero for value of R at zero.



(35) The balance length of the cell of E.M.F of the 1.5V 63cm in the shown potentiometer. After connecting a resistor of 8 Ω across the terminals of cell of E.M.F 1.5 balance length has decreased to 56cm.



Therefore the internal resistance of cell of 1.5 V is,

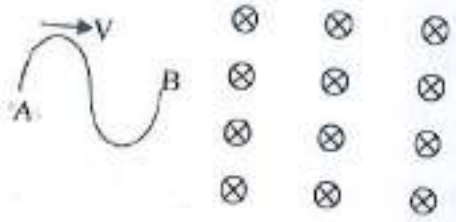
(1) Zero (2) 1.0Ω (3) 1.2Ω

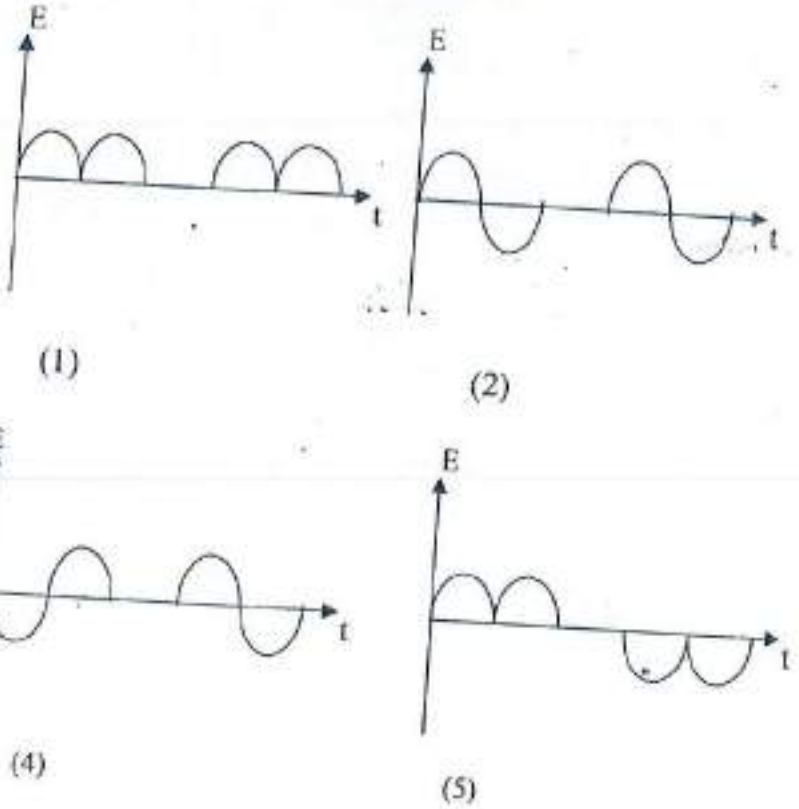
(4) 2.0 Ω (5) 3.0Ω

(36) The kinetic energy of a moving particle is E. The De Brogh wave length of the above particle is proportional to.

(1) $E^{1/2}$ (2) E (3) $E^{-1/2}$ (4) E^{-1} (5) E^{-2}

(37) Consider the wire bent in to two equal semi circular parts AB shown in the figure. It is moved along the uniform magnetic field at uniform speed. Which of the following graphs best represents the variation of induced E.M.F, E across AB with time t?

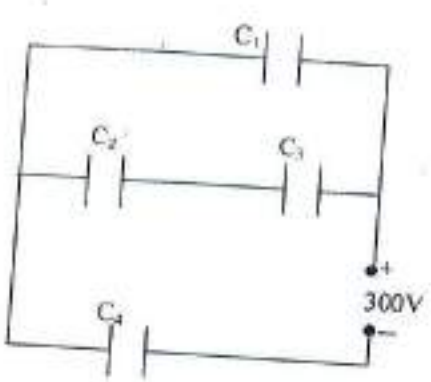




(1) (2) (3) (4) (5)

(38) The potential difference across the shown capacitors C_1, C_2, C_3 and C_4 are V_1, V_2, V_3 and V_4 respectively. Select the correct values of V_1, V_2, V_3 and V_4 in volts out of the following.

(Assume $C_1 = C_4 = 100pF$ and $C_2 = C_3 = 200pF$)



	V_1	V_2	V_3	V_4
(1)	100	50	50	200
(2)	200	100	100	200
(3)	150	50	50	150
(4)	300	150	150	300
(5)	200	50	50	200

(39) An object of mass 25 kg is pulled along a rough horizontal plane at constant speed 20 kmh^{-1}. What will be the increase in temperature of the body after pulling one hour?
Assume the coefficient of friction between the object and the surface as 0.5 and the dissipated heat energy is equally absorbed by the object and the surface. The specific heat capacity of the object is 500 $J\,kg^{-1}\,K^{-1}$

(1) 50^0C (2) 100^0C (3) 125^0C (4) 150^0C (5) 25^0C

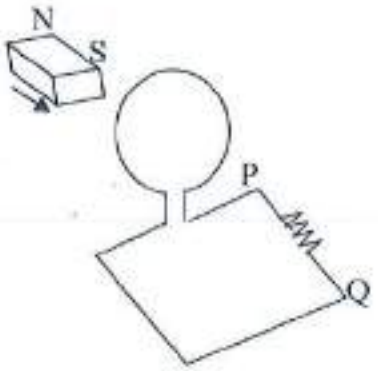
(40) A certain amount of Hg is inside a glass flask of volume 1l. At all temperatures the volume of air inside the flask remains constant. Calculate the volume of Hg in the flask. (The linear expansivity of glass is $9\times10^{-6}K^{-1}$ and volume expansively of Hg is $1.8 \times 10^{-4}\,K^{-1}$)

(1) 90 cm^3 (2) 100 cm^3 (3) 200 cm^3 (4) 150 cm^3 (5) 250 cm^3

(41) In an environment at temperature 30^0C, a hot object is suspended and it's temperature falls from 62^0C to 58^0C in 4 minutes. The time taken to decrease it's temperature from 46^0C to 44^0C is,

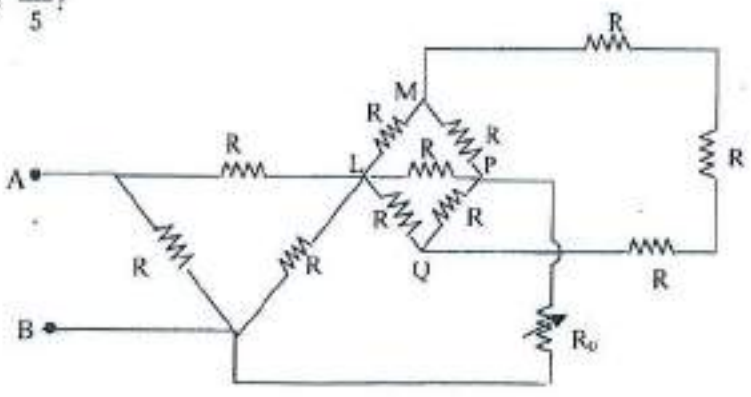
(1) 1 minutes (2) 2 minutes (3) 3 minutes (4) 4 minutes (5) 5 minutes

(42) As shown in the diagram a bar magnet is moved completely across a wire loop. The most suitable statement regarding the direction of currents through P and Q is,



(1) There is no current flow through PQ while the magnet passes through the wire coil.
(2) A current flows from direction P to Q while the magnet passes through the wire coil
(3) A current flows from direction Q to P while the magnet passes through the wire coil.
(4) A current flows from direction P to Q while the magnet enters to the wire coil and the current flows from Q to P while the magnet leaves it.
(5) A current flows from direction Q to P while the magnet enters to the wire coil and the current flows from P to Q while the magnet leaves the coil.

(43) What should be the value of resistor R_0 for the equivalent resistance of the shown circuit across A and B to be $\frac{3R}{5}$?



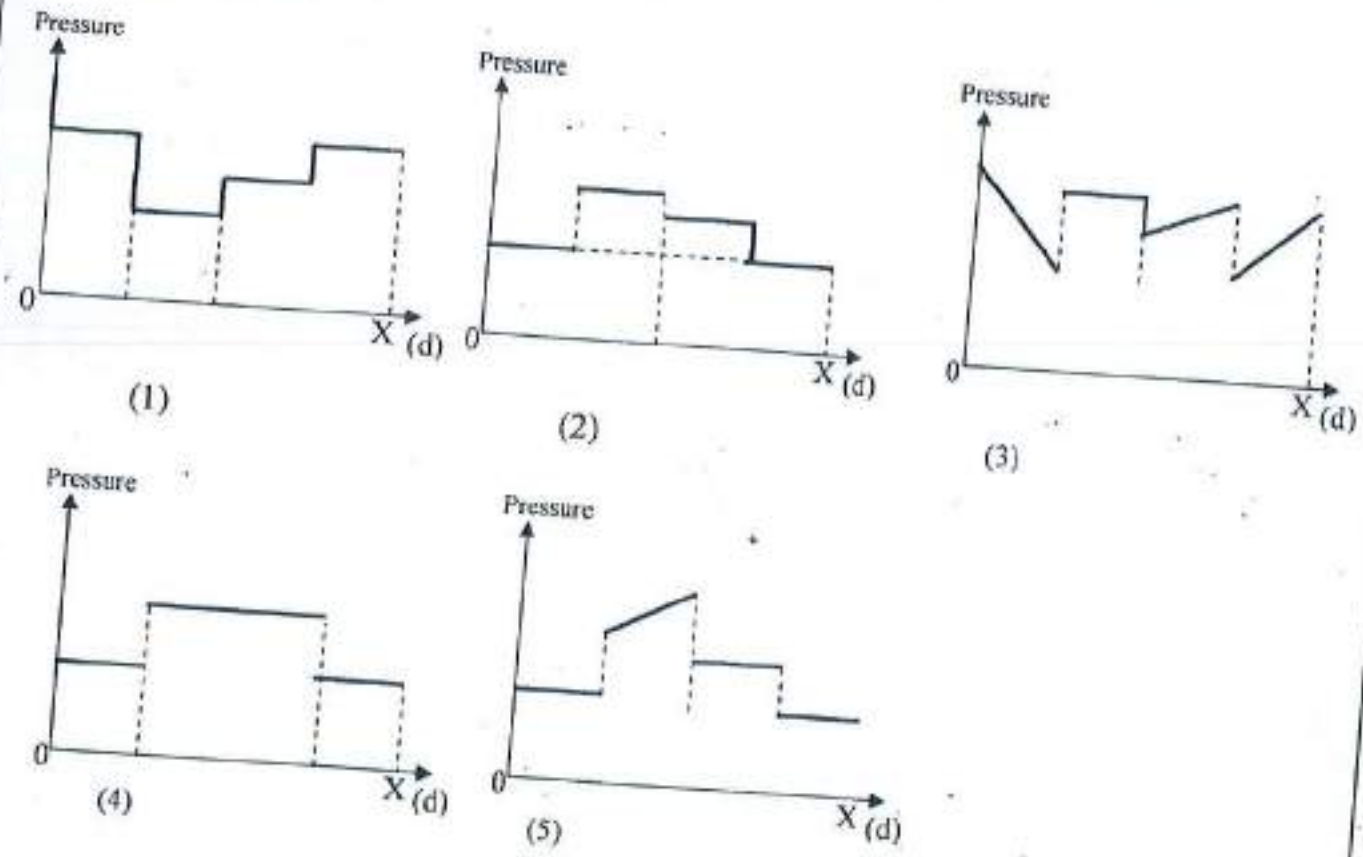
(1) $\frac{R}{5}$ (2) $\frac{R}{3}$ (3) $\frac{R}{2}$ (4) $\frac{2R}{3}$ (5) 2R

(44) A circular wire coil of radius r is placed in a plane perpendicular to a uniform magnetic field of flux density B. The wire coil is rotated at angular velocity ω about a perpendicular axis to the plane of the coil and passing through it's centre. If the resistance of wire coil is R, at what rate will the coil dissipate heat?

(1) $\frac{B\pi r^2\omega}{2R}$ (2) $\frac{(B\pi r\omega)^2}{8R}$ (3) $\frac{(Br^2\omega)^2}{4R}$

(4) $\frac{(B\pi r^2\omega)^2}{8R}$ (5) $\frac{B\pi r^2\omega}{8R}$

(45) It is shown in the figure two soap bubbles which just contact each other. Which of the following graphs best represents the variation of pressure from O to X?



(1) (2) (3) (4) (5)

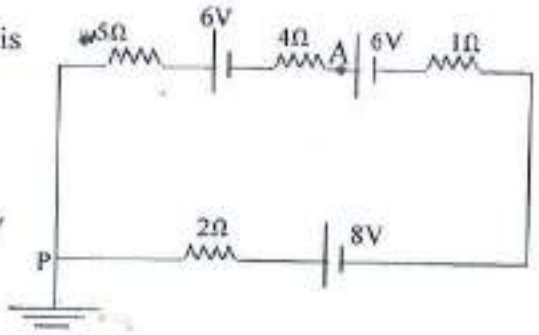
(46) The initial number of nuclii of two radioactive samples A and B are equal. The half life periods of A and B are 2 days and 4 days respectively. The ratio between the activities of A and B after 8 days is,

(1) 1:2 (2) 1:4 (3) 2:1 (4) 4:1 (5) 1:8

(47) Consider a volume $1m^3$ of air of relative humidity 50% at temperature 27^0C. The volume of air is reduced to $0.25m^3$, while temperature remains constant. If saturated vapour pressure of water at 27^0C is 2400 Pa, the mass of condensed water will be ($R = 8\ J\ mol^{-1}\ K^{-1}$ and molar mass of water is 18)

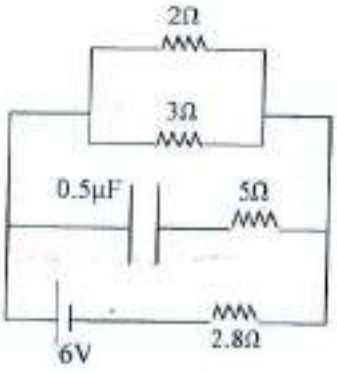
(1) 2.5 g (2) 3.5 g (3) 4.5 g (4) 6 g (5) 9 g

(48) The internal resistances of the cells in the shown circuit is negligible. What will be the potential at point A?



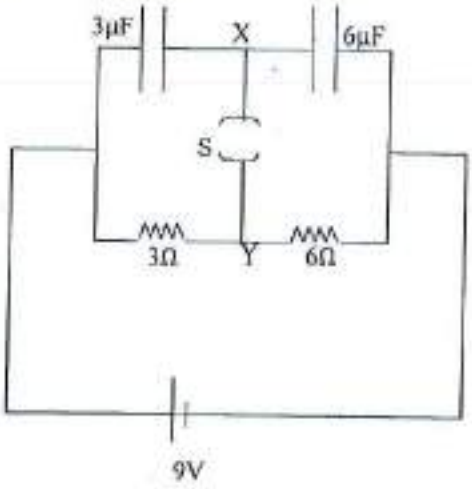
(1) −3V (2) −6V (3) −21.75 V
(4) + 3V (5) + 6V

(49) If the internal resistance of the cell is negligible what will be the current flowing through resistor 2Ω?



(1) 0.2A (2) 0.3A (3) 0.6A
(4) 0.9A (5) 1.2A

(50) In the shown circuit initially the switch s is opened. If the switch s is closed, what will be the total charge flowing from Y to X?,



(1) 95 μc
(2) 81μc
(3) 54μc
(4) 27μc
(5) 0

අවසාන වාර පරීක්ෂණය - ජූනි 2019
Final Term Test –2019 June

භෞතික විද්‍යාව - II Physics -II	13 ශ්‍රේණිය A/L 2019 Grade 13 A/L 2019	01	E	II	කාලය පැය තුනයි . Time :Three hours

Name : ..... Class : .....

Instructions: *This question paper consists of 10 questions in 13 pages

* This question paper comprises part A and part B. The time allocated for **both parts** is **Three hours**

PART A - Structured Essay (pages 2-7)

**Answer all four questions on this paper itself*

** Write your answer in the space provided for each question. Note that the space provided is Sufficient for your answer and extensive answers are not expected.*

PART B– Essay (Page 8-14)

* ***Answer 04 questions only.*** *Use separate sheets for this purpose. At the end of the time allocated for this paper ,tie the two together so that* ***part A is on the top of part B*** *before handing over to the supervisor.*

* *You are permitted to remove only part B of the question paper from the examination hall.*

For Examiners' use only

Part	Q. NO	Marks
A	01	
	02	
	03	
	04	
B	05	
	06	
	07	
	08	
	09 - A	
	09 - B	
	10 - A	
	10- B	
Total		
Percentage		

Final marks

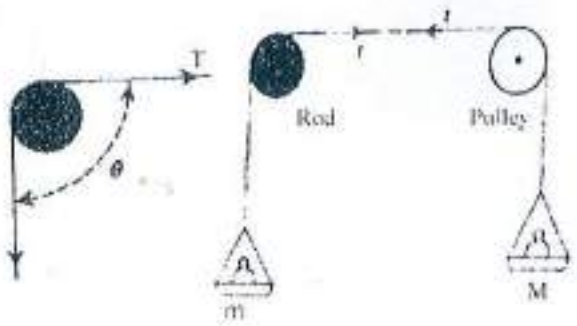
In numbers	
In words	

Part A - Structured Essay

$g = 10\ Nkg^{-1}$

* Answer all questions.

1. An experimental set up that can be used to find the coefficient of friction between a rope and rod is shown in the diagram.
Two ends of the rope passing over a smooth pulley and the rod are connected to a scale pan of negligible man holding constant mass M. Mass m just sufficient to lift the load M is put on the scale pan.



a) What is the correct relationship of the following and give the reason.

M = 2 Kg

- m > M
- m = M
- m < M

Reason.

.....

.....

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b) Coefficient of friction between the rope and the rod is given by

$2.3 \log_{10}\left(\frac{m}{M}\right) = \mu\theta$

θ -The angle subtends at the center by the length in contact with the rod.

(i) What is the value of θ in following two cases?

1) When the rope just past over the rod.

.....

2) When the rope is rapped once around the rod;

.....

(ii) What should be done to just lift M if number of turns rapped round the rod is increased?

.....

(iii) 1) If the above experimental set up is given for you, write the procedure of the experiment to find μ from a graphical method.

.....

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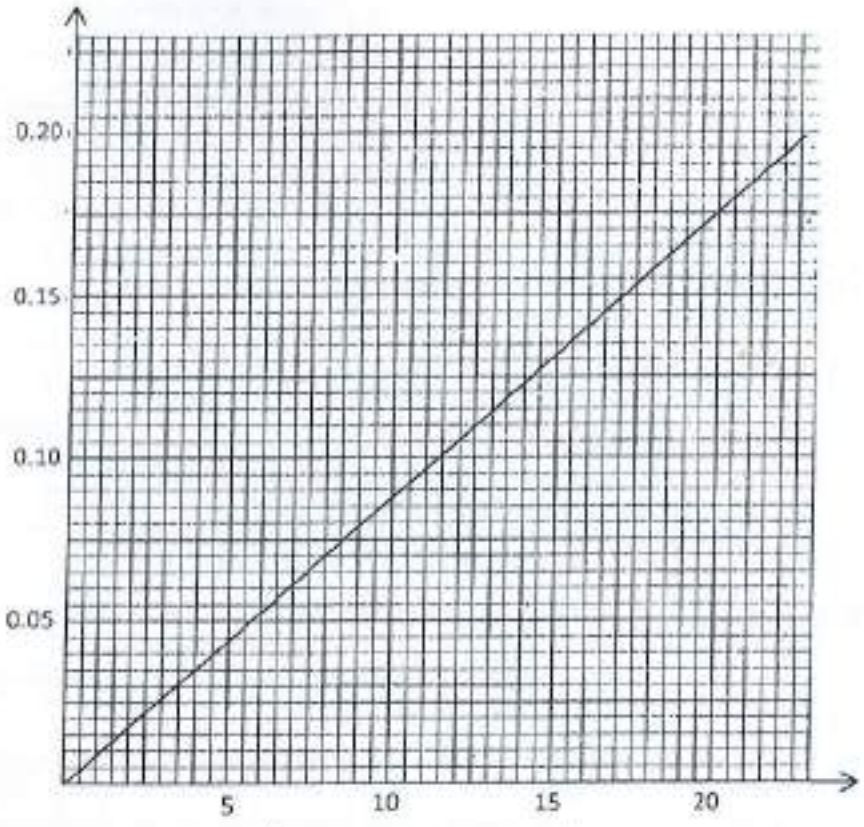
2) What are independent variable dependent variable and the gradient?

Independent : .....

Dependent : .....

Gradient : .....

(iv) The graph plotted using the experimental data is given below.



(1) Value of m for certain θ value is 1.2 kg. Find the value of $log_{10}\left(\frac{m}{M}\right)$ and θ.

.....

.....

.....

(2) Find the gradient of the graph.

.....

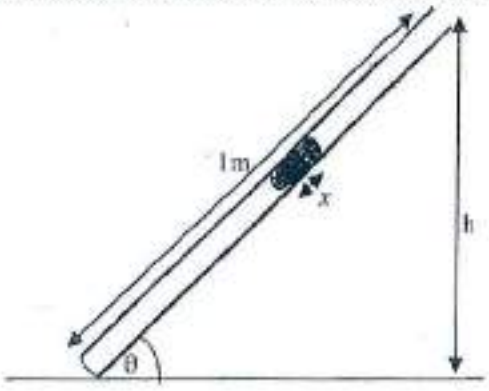
.....

(3) Hence find the value of μ.

.....

.....

2. Shown here is a thin tube of uniform cross section A and of length 1m. "V" constant volume of a gas is trapped using a mercury column of length "x". The tube's inclination to the horizontal "θ" can be varied by changing the height "h" between the top of the tube and the horizontal table. Atmospheric pressure H(cm Hg). You are to verify Boyle's Law using this et up.



(i) State Boyle's Law

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(ii) Deduce a relationship between the length of air column (l) and h.

.....

.....

.....

(iii) State the independent (x) and dependent (y) variables for this experiment.

x ..... y .....

(iv) Sketch the graph and lable the axes with SI units.

(v) Write down an expression for H (atmospheric pressure) in terms of gradient (m) and intercept (c) of the graph.

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(vi) Why should you get a thin tube (of internal diameter about 2-3 mm) for this experiment?

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(vii) The experimental procedure could be extended to find the saturated vapour pressure of water (P_0) at room temperature by trapping a thin film of water right below the Mercury column. Write down expressions for the partial pressure of air (P) using the terms given here when the tube is vertically held;

1) Upright

.....

.....

2) Inverted

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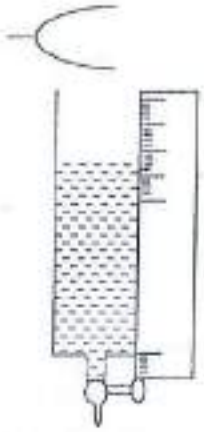
.....

(viii) In order to determine P_0, the inclination θ of the tube is varied. What could be the variables for plotting the graph using experimental data thus obtained?

X ..... Y .....

3. To determine velocity of sound in air and the end correction of the tube, the experimental set up is shown. It consists of a single glass tube of internal diameter about 5cm with a single turning fork and a metre ruler. Initially if's full of water to the open end and the vibrated tuning fork is held just above the open end of the tube. Then the tap at the bottom of the tube is opened and the water level in the tube is gradually decreased.



(i) How can you select the most suitable tuning fork in this experiment? Give the reason.

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(ii) Explain , how you obtain the resonance length of the fundamental mode with the given tuning fork.

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(iii) If the length of the air column for the fundamental mode is l_0 and the end correction of the tube is e, write down the expression for wave length λ_0 at fundamental in terms of l_0 and e.

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(iv) If the resonance length for the next resonance condition is obtained by extending the expression. If this resonance length is l_1 obtain an expression for this wavelength λ_2 interms of l_1 and e.

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(v) Using the expressions derived in parts (ii) and (iii) above write two expressions for velocity of sound in air V.

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(vi) If $l_0 = 15cm, l_1 = 48cm$ and the frequency of the tuning fork is 512 Hz, calculate the velocity of sound in air and end correction of the tube.

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(vii) Explain how you verify the calculated value of end correction? Name the extra measurement you obtain for this

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(viii) If you are supplied with set of tuning forks with frequencies 512Hz, 480 Hz, 320 Hz, 288 Hz, and 256 Hz and asked repeat the above experiment with all tuning forks and you should use all the given forks, what should be the minimum length of the required tube?

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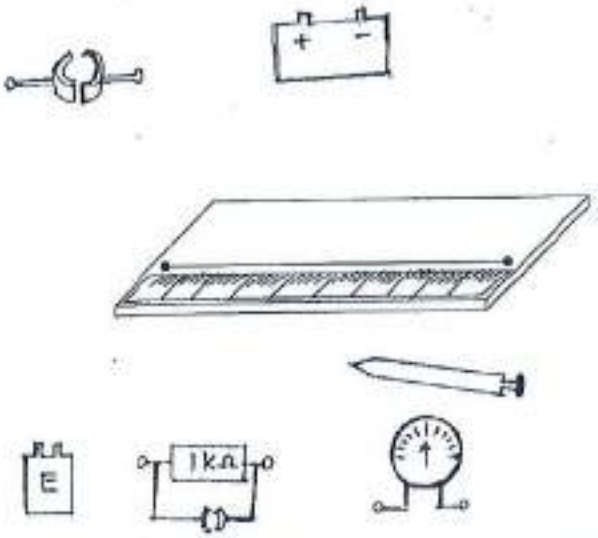
(ix) In both above experiments you should state two of environmental factors with the determined velocity of sound in air what are those?

.....

4. As a substitution for voltmeter, the potentiometer is used in laboratory experiments. As the potentiometer cell usually a lead accumulator of E.M.F. 2V and internal resistance 2Ω is used. The length of the potentiometer wire is 1m and its resistance 18 Ω.
The incomplete experimental set up of a potentiometer used to determine electro motive force of a cell having very small EMF is given for you.



(i) Complete the circuit by connecting components correctly using wires.

(ii) Mark the polarity of the test cell and the potentiometer wire by (+) and (-) sign.

.....

.....

(iii) Write one advantage and one disadvantage of a potentiometer when compared with a real voltmeter.

1) advantage

.....

2) disadvantage

.....

(iv) Write two important properties which the potentiometer wire should have?

.....

.....

(v) Calculate the potential drop per unit length (potential gradient) of the above potentiometer in Vcm^{-1}.

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(vi) A cell of E.M.F 3.6 mV is balance with this potentiometer. Calculate the balance length in mm. Also calculate the percentage error of this balance length.

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(vii) To minimize the percentage error in measuring small potential differences the potentiometer is modified. For this how you connect the resistor.

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(viii) Calculate the required resistor to maintain a potential difference of 20mV across the potentiometer wire.

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(ix) Find the new balance length in mm, for the above cell after the potentiometer is modified.

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13 ශ්‍රේණිය - අවසාන වාර පරීක්ෂණය - 2019 ජූනි

Grade 13 - Last Term Test - June 2019

භෞතික විද්‍යාව II
Physics II

01 E II

Part B - Essay

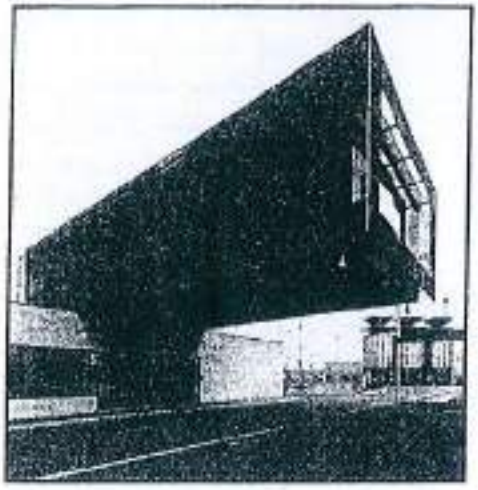
$g = 10\ Nkg^{-1}$

• Answer any (4) questions.

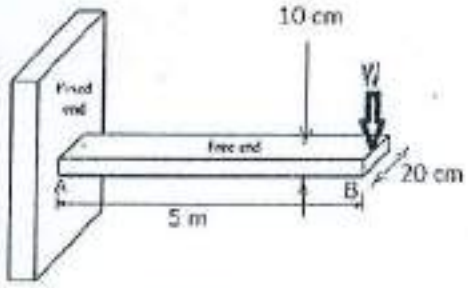
5. Cantilever beam is a horizontal beam that is firm at only one end while the other end is left free to carry some vertical loads. Diving board at swimming pool is a perfect example for cantilever beam. Aircraft wing that carries wind force is another good example for cantilever beam.

Cantilevers are employed extensively in building construction, any beam built into a wall and with the free end is a cantilever. Longer cantilevers are incorporated in a building when clear space is required below.

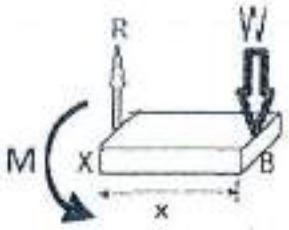
The stress that develops within the beam must be calculated in order to access the load capacity of the beam. The below figure depicts a light cantilever beam fixed to a vertical plane with a load m at the end. Its length is 5 m and the cross section is 20 cm×10 cm. *



(figure 1)



(figure 2)



(figure 3)

(a) Write one advantage of cantilevers in building construction.

(b) Every point along the beam produces a reaction force tangentially upward to its cross section to counter balance the external load W. This reaction force(R) is called the sheer force. A segment of the rod XB of length x from the free end is shown in the diagram

(i) What is the value of R at X?

(ii) Sketch the variation of sheer force along the rod

(c) Every point along the beam produces a moment to counter balance the moment from the external load as shown in the diagram . This is called the bending moment (M)

(i) Write an expression for the bending moment at X(Take the clockwise direction as positive).

(ii) Sketch the variation of bending moment along the rod

(d) The load at the end is 20 kN. The length of the rod is 5m.

(i) Find the sheer force and the bending moment at A with correct directions.

(ii) Find the sheer stress experienced by the rod

(iii) Maximum sheer stress the beam can withstand is 4×10^6 Nm^{-2}. Can the beam withstand this stress? Explain

(iv) The tensile stress at X on the surface of the beam due to the bending is given by $\sigma = \frac{Mxy}{I}$

where:

M = bending moment at X

I = moment of inertia about centroidal axis(0.25 kg m^2)

y = the distance from the centroidal axis to the surface

(1) Where does the beam experience maximum tensile stress?

(2) Find the maximum tensile stress.

(e) Now uniformly distributed load W is applied on the beam as shown in the diagram

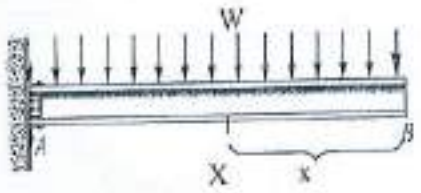


figure 4

(i) Find the sheer force at A , B and the middle

(ii) Draw the variation of sheer force along the rod

(iii) Write an expression for the bending moment at X.

(iv) Sketch the variation of bending moment along the rod

6. (a) (i) State the sing convention used in the lens formula.

(ii) A bright object is placed in front of a lens of focal length 10 cm, produces a real image magnified ×5. Find the corresponding object distance.

(iii) Now (only) the lens is moved 6 cm away from the object, while the object and the screen remained at their previous positions. To obtain a real image once again, how far towards which direction, the screen has to be shifted?

(b) (i) A convex lens and a concave lens each of focal length 4 cm is positioned at 8cm separation. A vertical linear object is placed on the principal axis at 3cm distance from the convex lens. The final image is formed at "x" distance from the concave lens. Work out x.

(ii) Is the final image a) real or virtual? b) Upright or inverted?

(iii) Obtain the final image after being refracted from both lenses by constructing a ray diagram considering 2 rays coming from the object.

(c) (i) What is the defect of vision suffered by a person wearing spectacles with concave lenses of power 0.5D?

(ii) What is her natural range of vision with out spectacles?

(iii) Another person wears spectacles having an equal power to a combination of two lenses of powers +2D and -0.5D. What is his defect of vision?

(iv) Find his range of vision while wearing spectacles
(Least distance of distinct vision = 25cm)

7. (i) All soap bubbles formed by a soap solution is always spherical in shape. Explain this.

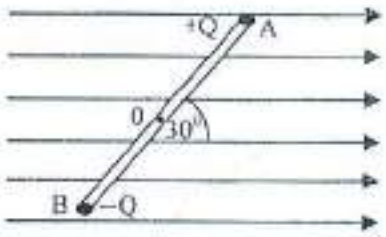
(ii) Derive an expression for the excess pressure inside a spherical liquid drop in terms of it's radius r and surface tension T of the liquid.

(iii) The density and surface tension of a soap solution are 1000 kgm^{-3} and 2.5×10^{-2} Nm^{-1} respectively. Consider a soap bubble of diameter 1cm and thickness 20μm, formed by the above soap solution. Calculate the speed of fragments of this bubble move away when it bursts. Assume that the total surface energy of the bubble coverts into kinetic energy of fragments of soap film.

(iv) A liquid of surface tension $30\times10^{-3}Nm^{-1}$ and density 700 kgm^{-3} is poured in the vertically set arms of a glass U tube. The internal radii of two arms are not equal and these radii are 0.6mm and 0.6cm; respectively. Find difference in heights of liquid columns in 2 arms if angle of contact between the liquid with glass is 30^0.

(v) A horizontal circular wire loop is placed on a the free surface of a soap solution. By calculating the minimum force required to lift the loop vertically, the surface tension of soap solution can be found. In this experiment the force required to lift in wire loop of weight 4.0N and radius 2cm was found as 12.8N. Calculate the surface tension of this soap solution.

8. Two oppositely charge particles +Q and -Q are shown in the figure. Mass of each particle M= 2mg and charge of each particle 4 μC. The two particles are connected to the ends of rod AB of length l = 0.2m. The rod AB is non-conducting and has negligible mass. The system with rod AB is placed in a uniform electric field of intensity E = 6 Vm^{-1} at an angle 30^0 to the electric field and released. (Neglect the affect of gravitational field).



(a) Copy only AB in your answer script and mark the forces act on each charge by the electric field.

(b) If AB starts to rotate about its' centre O. Find the torque acting on AB at that instance. Also calculate the angular acceleration

(c) If the rod AB is made to rotate about O by a small angle θ, show that it will continue a simple harmonic motion of angular velocity ω, by deriving a relationship by the given symbols, show that $\omega = \sqrt{\frac{2QE}{Ml}}$

Also calculate the time period of this simple harmonic motion.

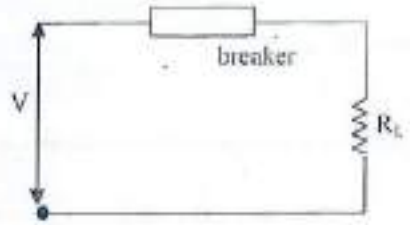
(d) Point charges of Q_1 = 6 and μC Q_2= −2μC are placed isolated at a distance to each other. Draw the pattern of electric lines of force acting between these. Also draw 2 of equipotential surfaces by broken lines.

State the principle you used to draw those equipotential surfaces.

9. Answer part (A) or part (B) only

(A) (a) Circuit Breaker is a device used in electrical circuits to protect electrical appliances from high current. It is connected in series in a circuit and acts as a switch. If the current in the circuit exceeds the rating current, the device become open and disconnects the circuit from the power supply. There are circuit breakers with different current ratings and are used in circuits appropriately. Two different breakers with rating, 5A and 15A are used in house wirings.

The circuit below shows how a breaker is connected with a load. The resistance of the breaker is negligible.



(i) The power of the load is P when the voltage V is applied across it. Write down an expression for the current I flowing in the load.

(ii) Consider a filaments bulb of ratings 100W, 250V. If voltage of 250V is supplied to it, find the current flow through the bulb.

(iii) Consider the circuit breaker of 5A. What is the maximum number of bulbs that can be connected to the circuit without opening the breaker. Show how they are connected.

(iv) Now an electric oven of power 1500W , 250 V is added to this circuit. Find the maximum no of bulbs that can be connected without opening the breaker.

(v) What is the type of circuit breaker that can be used in a circuit to run a hair dryer of power 1500W, 250V.

b) Before introducing circuit breakers in circuits, fuse wires were used. If current is greater than the recommended current it melts and the circuit is disconnected.

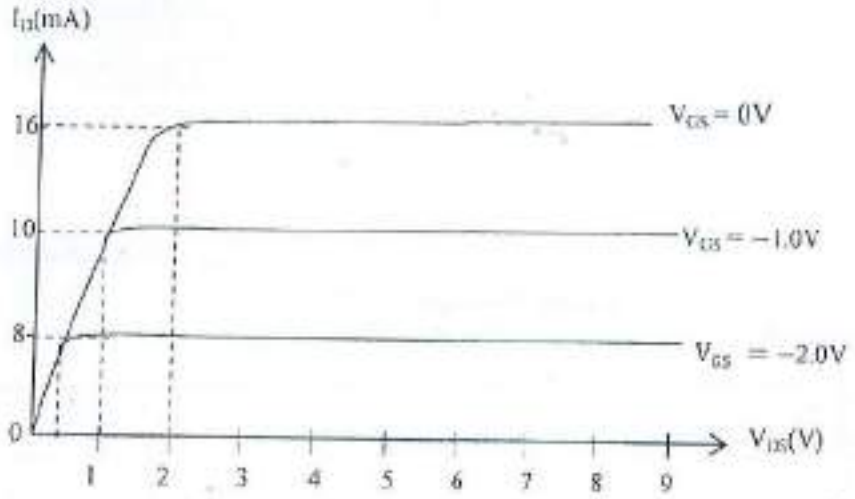
(i) Consider a fuse wire of rating 5A. It's length and cross -sectional area are 3cm and 3×10^{-8} m^2 respectively. The resistivity of the material of the fuse wire at temperature 30^0C is 1.7×10^{-8} Ωm. Calculate the resistance of fuse wire at 30^0C.

(ii) At steady state of the above fuse wire the total heat generated within it is made to transfer to the surroundings without burning it. Steady state rate of loss of heat to surrounding is 2.125W, find the resistance of the fuse wire. What factor it increased when compared with 30^0C.

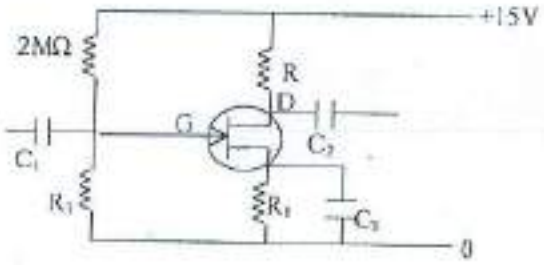
(iii) If the temperature coefficient of resistance of the fuse wire is $4.44\times10^{-3}\,{}^0C^{-1}$, calculate the temperature of it in above situation. (take $4.44\times10^{-3}=\frac{4}{9}\times10^{-2}$)

(B)(a) There are two types of transistors used in electronics circuits. They are junction bipolar transistors (BJT) and junction unipolar field effect transistor (JFET)

Now a days mostly used transistor in circuits is JFET type. Three terminals of the JFET type are called source (S) , drain (D) and gate (G). The variation of V_{DS} with I_D for different V_{GS} values is shown in the graph below.



Potential divider is introduced to the gate as shown in the diagram to biased the transistor properly.



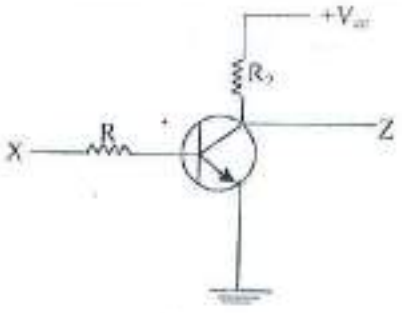
(i) If V_{GS} =0 V, find the drain current I_D

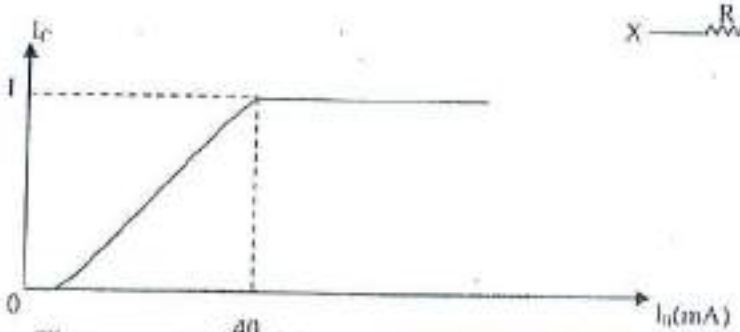
(ii) V_{GS} required to keep the transistor in the pinched off state.

(iii) Find R_1, R_2, R_3 If V_G = 5V and V_D =8V

(iv) Sinusoidal signal is applied to the input terminal. Write 3 properties of the out signal.

(b) Bipolar junction transistor (BJT) used as a switch and its transfer characteristics curve is shown in diagrams below.





(i) The current gain of the transistor is 200. find the saturated current.

(ii) Voltage applied to X is 5V. Find the maximum R value to keep the transistor in the saturated state. V_{BE} = 0.6V.

(iii) 1) Complete the table below according to the voltages applied to X.

Voltage of X	Voltage of Z
0V	
5V	

2) What is the state of the transistor when X=0V

3) What is the logic gate corresponding to the above table.

10. Answer part (A) or part (B) only

(A) A metal container of uniform cross sectional area 10 cm^2 is of height 40cm. It contains 100ml of a liquid of density 1200 kgm^{-3} at 30°C room temperature. For the liquid; Specific heat capacity 4000$Jkg^{-1}{}^0C^{-1}$, and volume expansivity $= 2\times10^{-4}{}^0C^{-1}$

Heat capacity of the container = $400J^0C^{-1}$. Linear expansivity of the metal from which the conainer is made of = $2\times10^{-4}{}^0C^{-1}$

A Heating coil 240V, 1kW is used to heat up the system from 30°C to 60°C

(a) (i) How long would it take to raise the temperature of the system from 30°C to 60°C? State your assumptions (if any)

(ii) What extra time would be required to reach the temperature 60°C if the supply voltage had dropped to 200V?

(b) (i) Define boiling point of liquid interms of vapour pressure.

(ii) Suppose the boiling point of the liquid was reached at 60°C. It took 4 minutes to vapourize the full liquid volume. What is the specific latent heat of vapourization of the liquid in $kJkg^{-1}$?

(iii) The liquid is thus vapourized at 60°C in a very high altitude. Would the boiling point be equal / above or below 60°C at sea level? Explain.

(iv) Sketch the rate of heat absorption of the container with time.

(c) Define the coefficient of apparent expansivity for a liquid.

(i) What is the height of the liquid in the container at 60°C?

(ii) Assume a glass cuboid having volume "V" at 30°C is introduced to the system such that at any temperature between 30°C to 60°C, the free volume of the container remains the same. Linear expansivity of glass = $1.5\text{x}10^{-5}$ $^0C^{-1}$ Calculate "V".

(B) (a) Nuclear technology is used for different activities in more than 30 countries worldwide. During the world war two, the scientist did research secretly and produced nuclear weapons. The two of the rare element Polonium (P_o) and Beryllium (Be) were used as the indicator of nuclear bombs and introduced the nuclear weapon to the world.

The radioactive nucleus of $^{210}_{84}P_o$ of half life 138 days emits an α particle of mean energy 6 MeV.

(i) Write down nuclear reaction for the above decay.

(ii) What may be the resulting stable nucleus of the above?

(iii) What is meant by the "half life" of an unstable element like $^{210}_{84}P_0$

(iv) calculate the decay constant of above $\left(T = \frac{0.693}{\lambda}\right)$.

(b) The mass of the pure sample of used Polonium (Po) is 42g.

($N_A = 6 \times 10^{23} mol^{-1}$ and charge of an electron $-1.6 \times 10^{-19} C$)

(i) Show the mean energy of $6MeV$ in joules.

(ii) How many atoms of polonium are there in the sample?

(iii) Calculate the energy of α particles released by Polonium sample in Joules.

(iv) Find the activity of 42g of Polonium.

(v) In a time period of 414 days it is examined the decay of polonium sample of 42g. What mass of polonium has decayed in this period of time?

(vi) Plot the variation of mass of the polonium in the sample with time.

(vii) Also draw the rough shape of variation of mass of produced stable element with time on the above graph (vi) and label.

(c) A Russian secret agent Alexander Litvinco was murded in 2006 in London by poisoning with suitable amount of radioactive $^{210}_{48}Po$. If any radiation transmitts through any live matter it's energy may absorbed by the live matter and damages may occur. The danger of absorbed radiation depends on the type of radiation absorbed and the organ of the body which it is absorbed.

(i) Define the SI unit used to measure radiation absorbed dose.

(ii) Write down the relationship between the unit Sieverts to unit used to measure absorbed does of radiation (Sievert is used to measure the hygienic danger of radiation)

(iii) In a particular country in area of 5km radius the maximum environmental radioactive level in one year is given by 10mSv. As a result of sudden leakage of radiation the instrument measuring the level of environmental radiation indicated as $100\mu Sv$ per day. If this condition remains continuous, how many days will it take to exceed the maximum safe volume above?

Marking Scheme

PR

1

අවසාන වාර පරීක්ෂණය - ජූනි 2019

Final Term Test –2019 June

භෞතික විද්‍යාව - II Physics -II	13 ශ්‍රේණිය A/L 2019 Grade 13 A/L 2019	01	E	II	කාලය පැය තුනයි. Time :Three hours

Name : ..... Class : .....

Instructions: *This question paper consists of 10 questions in 13 pages

* This question paper comprises part A and part B. The time allocated for **both parts** is **Three hours**

PART A - Structured Essay (pages 2-7)

**Answer all four questions on this paper itself*

** Write your answer in the space provided for each question. Note that the space provided is Sufficient for your answer and extensive answers are not expected.*

PART B– Essay (Page 8-14)

* ***Answer 04 questions only****. Use separate sheets for this purpose. At the end of the time allocated for this paper ,tie the two together so that* ***part A is on the top of part B*** *before handing over to the supervisor.*
* *You are permitted to remove only part B of the question paper from the examination hall.*

For Examiners' use only

Part	Q. NO	Marks
A	01	
	02	
	03	
	04	
B	05	
	06	
	07	
	08	
	09 - A	
	09 - B	
	10 - A	
	10- B	
Total		
Percentage		

Final marks

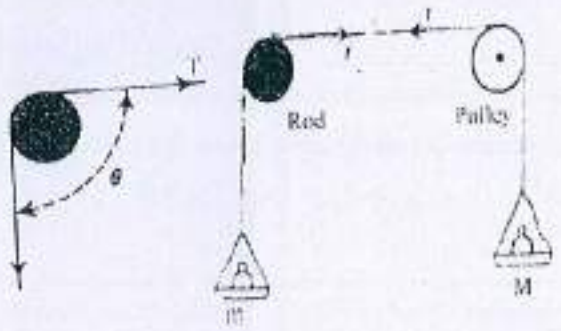
In numbers	
In words	

Part A - Structured Essay

$g = 10\ Nkg^{-1}$

* Answer all questions.

1. An experimental set up that can be used to find the coefficient of friction between a rope and rod is shown in the diagram.
Two ends of the rope passing over a smooth pulley and the rod are connected to a scale pan of negligible man holding constant mass M. Mass m just sufficient to lift the load M is put on the scale pan.



a) What is the correct relationship of the following and give the reason.

- m > M
- m = M
- m < M

Reason.

Friction acts on the rope upward on left side of the rod. (01)

b) Coefficient of friction between the rope and the rod is given by

$2.3 \log_{10}\left(\frac{m}{M}\right) = \mu\theta$

θ -The angle subtends at the center by the length in contact with the rod.

(i) What is the value of θ in following two cases?

1) When the rope just past over the rod.

$\pi/2$ (01)

2) When the rope is rapped once around the rod;

$2\pi + \pi/2 = \frac{5\pi}{2}$ (01)

(ii) What should be done to just lift M if number of turns rapped round the rod is increased?

Increase the value of m (01)

(iii) 1) If the above experimental set up is given for you, write the procedure of the experiment to find μ from a graphical method.

Increase the no of turns rapped round the rod and find the corresponding m just sufficient to lift the M in each time (01)

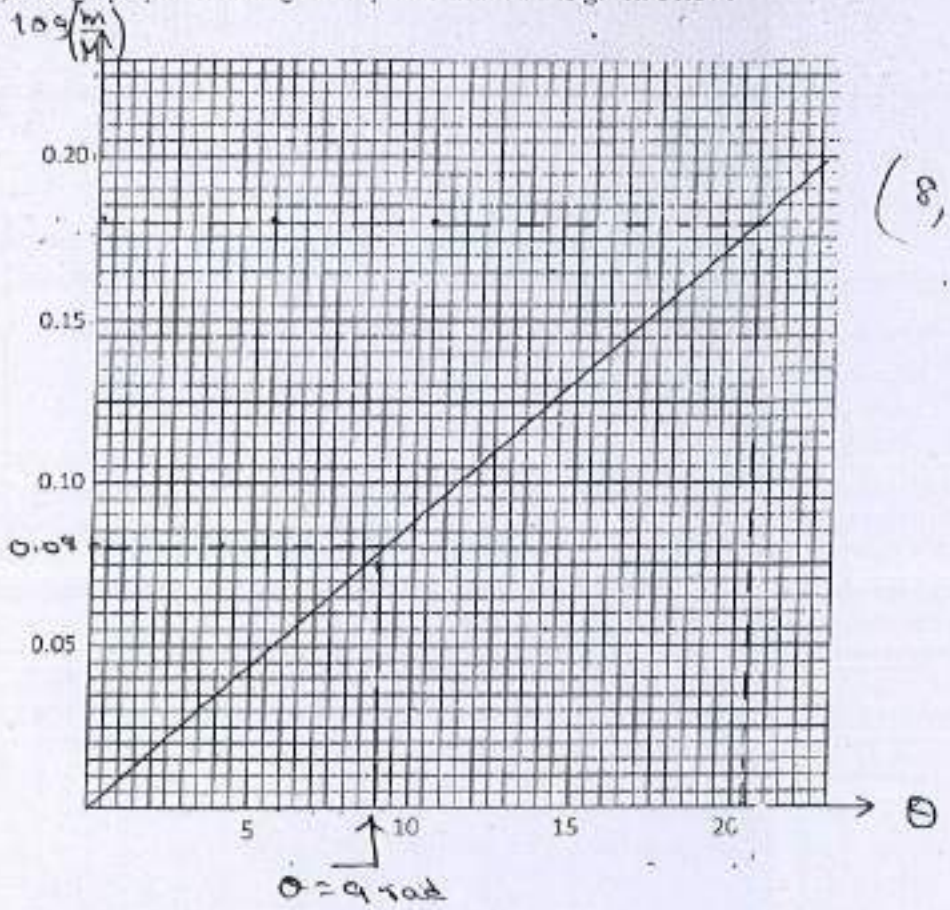
2) What are independent variable dependent variable and the gradient?

Independent : θ

Dependent : $\log_{10}\left(\frac{m}{M}\right)$ (01)

Gradient : $\frac{1}{2.3}$

(iv) The graph plotted using the experimental data is given below.



(8, 0.07),
(20, 0.175)

(1) Value of m for certain θ value is 1.2 kg. Find the value of $log_{10}\left(\frac{m}{M}\right)$ and θ. (M = 2kg)

free marks

$\log_{10}\left(\frac{m}{M}\right) = \log\left(\frac{1.2}{2}\right) = \log_{10}(0.6) = 0.07782 = 0.08$ } (01)

θ = 9 rad

(2) Find the gradient of the graph.

$m = \frac{0.175}{20} = 8.75 \times 10^{-3}$ (01)

$m = \frac{0.175 - 0.07}{20 - 8} = 8.75 \times 10^{-3}$

(3) Hence find the value of μ.

$m = \frac{\mu}{2.3}$ | $\mu = 8.75 \times 10^{-3} \times 2.3$

$= 0.02$ (01)

2×10^{-2}

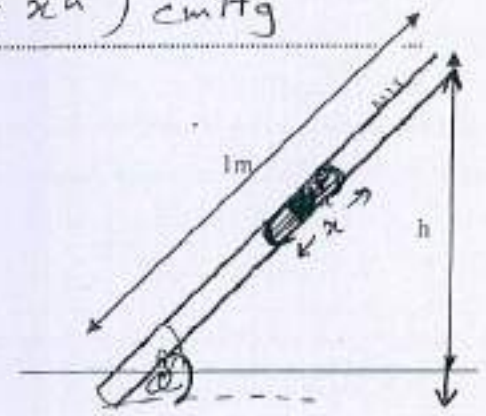
10

PR

$\sin\alpha = \frac{h}{100}$ රූපයේ සඳහන් පරිදි $x \sin\alpha = x h$.

වායු තීරුවේ මුල් පීඩනය $(H + xh)$ cmHg

2. රූපයේ දක්වා ඇත්තේ 1m දිගැති බිඟින් ඒකාකාර A හරස්කඩ ඇති විදුරු නලයක් තුළ x දිගැති රසදිය කඳක් මගින් V නියත වායු පරිමාවක් සිර කර ඇති අයුරුයි. මෙම නලයේ ඉහළ කෙළවර තිරස් මේසය සමඟ ඇති උස h වෙනස් කරමින් තිරසට ආනතිය θ වෙනස් කළ හැක. මෙම ඇටවුම මගින් බොයිල් නියමය සත්‍යාපනය කිරීම සඳහා පරීක්ෂණයක් සිදුකිරීමට ඔබට පැවරී ඇත. වායුගෝලීය පීඩනය H(cmHg)



(i) බොයිල් නියමය සඳහන් කරන්න.

නියත උෂ්ණත්වයේ දී අචල වායු ස්කන්ධයක පීඩනය, එහි පරිමාවට ප්‍රතිලෝමව සමානුපාතික වේ. (01)

(ii) වාත කඳේ දිග (l) හා නලයේ තිරස් උස h අතර සම්බන්ධය ගොඩනගන්න.

$PV = K$

(01) $(H + xh) A l = K$

$\frac{K}{Al} = H + xh$

$\frac{1}{l} = \frac{xA}{K} \cdot h + \frac{HA}{K}$

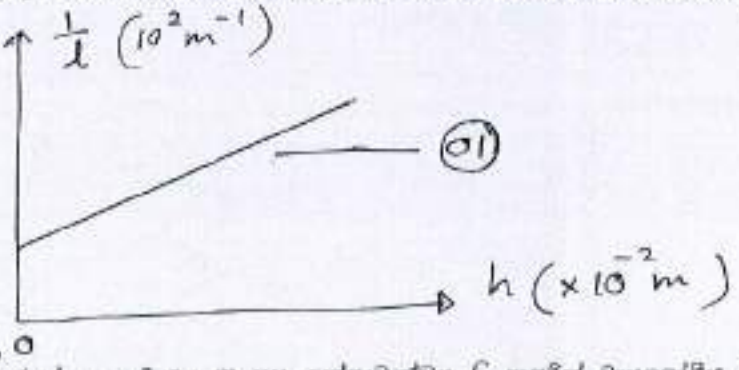
$y = m x + C$

(iii) මෙම පරීක්ෂණයේ ස්වායත්ත විචලය (x) සහ පරායත්ත විචලය (y) හඳුනාගන්න.

x ..... h - නලයේ තිරස් උස — (01)

y ..... $\frac{1}{l}$ — (01)

(iv) අදාළ ප්‍රස්තාරයේ දළ සටහනක් ඇඳ අක්ෂ නම් කර SI ඒකක යොදා ලේඛල් කරන්න.



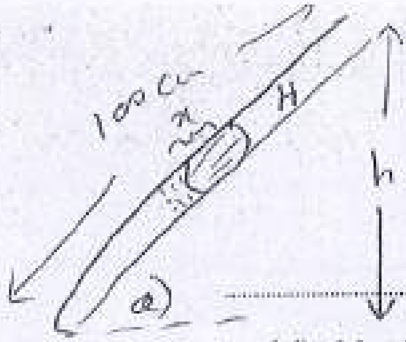
(01)

(v) ප්‍රස්තාරයේ අනුක්‍රමණය m සහ අන්තඃඛණ්ඩය C ඇසුරින් වායුගෝලීය පීඩනය H සඳහා ප්‍රකාශනයක් ව්‍යුත්පන්න කරන්න.

$\frac{C}{m} = \frac{HA/K}{xA/100K} = \frac{H \times 100}{x}$ $H = \frac{Cx}{m \times 100}$ — (01)

x - රූපයේ සඳහන් දිග

* $\frac{1}{l}$ සහ h ප්‍රස්තාරයේ නිවැරදිව ලකුණු කර තිබෙනම් iii) හි පිළිතුර වැරදි වුව ද ප්‍රස්තාරයේ අක්ෂ නම් කිරීමට එම ලකුණු 2 ලකා දෙන්න.



$P_{air} = P_{tot} - P_0$

$P_{tot} = \left(\frac{H + x'}{100}\right) \rho_{Hg}\, g = \left(\frac{H + xh}{100}\right) \rho_{Hg}\, g$

l මැනීමේදී සිදුවන භාගික දෝෂය අඩු වේ

(vi) මෙම පරීක්ෂණය සඳහා අභ්‍යන්තර විෂ්කම්භය 3mm පමණ වන සිහින් නලයක් තෝරා ගන්නේ ඇයි?

වැඩි සංවේදීතාවයකින් යුතුව l සඳහා පාඨාංක ලබා ගැනීම

$V = Al \quad A\downarrow \; l\uparrow \quad V \propto l$

A කුඩා නිසා V සුළු වෙනස් වීමකදී මැනිය හැකි l වෙනසක් ඇතිවේ. (01)

(vii) රසදිය කඳට පහළින් කුඩා ජල පටලයක් සිරකර ගැනීමෙන් කාමර උෂ්ණත්වයේදී ජලයේ සංතෘප්ත වාෂ්ප පීඩනය (P_0) සෙවීම සඳහා මෙම පරීක්ෂණාත්මක ක්‍රමවේදයම තවදුරටත් දීර්ඝ කර ගත හැක.

පහත අවස්ථාවලදී නලය තුළ සිරවී ඇති වාතයේ ආංශික පීඩනය (P) සඳහා දී ඇති පද ඇසුරින් ප්‍රකාශන ගොඩනගන්න. ρ - රසදියේ ඝනත්වය

1) නලය සිරස්ව ඉහළට පවතින විට

$(H + xh)\rho g - P_0$ / $(H + xh) - P_0$ (01)

2) නලය සිරස්ව පහළට පවතින විට

$(H - xh)\rho g - P_0$ / $(H - xh) - P_0$ (01)

$H - (P_0 + x)$

(viii) P_0 නිර්ණය කිරීමට නලයේ ආනතිය θ වෙනස් කරමින් පරීක්ෂණය සිදු කරයි. මෙහිදී ප්‍රස්තාරයක් ඇඳීමට ඔබ තෝරාගන්නා විචල්‍යය කවරේද?

X ...... h ...... Y ...... $1/l$ ...... (01)

(දෙකම නිවැරදි නම්)

$(H + xh - P_0)\, Al = K$

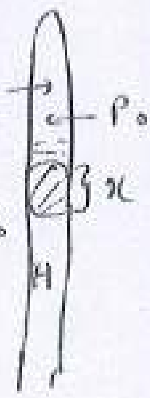
$\frac{1}{l} = \frac{Ax}{K} \cdot h + \frac{A}{K}(H - P_0)$

$y = m x + c$

$P_0 + P = P_{tot}$

$P = P_{tot} - P_0$

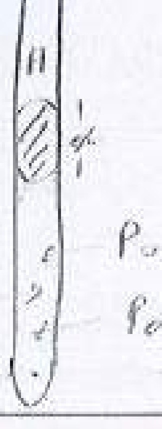
$= \left(\frac{H - x}{100}\right)\rho_{Hg}\, g - P_0$



vii) සඳහා P_0, P_a හෝ cmHg ලෙස ලිවිය හැක. එම ආකාර සලකා ප්‍රකාශන ලබා දෙන්න. දෙකටම ලකුණු ලබා දෙන්න.

$P_{tot} = P_{dry\,air} + P_0 = \left(\frac{H + x}{100}\right)\rho_{Hg}\, g$

$P_{dry\,air} = \left\{\left(\frac{H + x}{100}\right)\rho_{Hg}\, g\right\} - P_0$



(03)

(03) I වැඩිම සංඛ්‍යාතයක් සහිත සරසුල, තාරතාව වැඩිම ශබ්දයක් සඳහා අනුනාද වන අවශ්‍ය තෙරපුම [illegible] නල [illegible], — (01)

[illegible] — $f \uparrow \lambda \downarrow$

II කම්පනය කරන ලද සරසුල විවෘත කෙළවර අසල තබා කම්පය සිරස්ව [illegible], නලය ඉහළට [illegible] අවස්ථාවේ [illegible] ශබ්දය [illegible] නලයේ [illegible] ශබ්දය [illegible] [illegible] — (01)

III
$$\frac{\lambda_0}{4} = (l_0 + e)$$
$$\lambda_0 = 4(l_0 + e) \quad — (01)$$

IV
$$\frac{\lambda_1}{4} \times 3 = (l_1 + e)$$
$$\lambda_1 = \frac{4}{3}(l_1 + e) \quad — (01)$$

V
$$\left.\begin{array}{l} V = f \times 4(l_0 + e) \times 10^{-2} \\ V = f \times \frac{4}{3}(l_1 + e) \times 10^{-2} \end{array}\right\} — (01)$$

VI
$$4(15 + e) \times 10^{-2} = \frac{4}{3}(48 + e) \times 10^{-2}$$
$$2e = 3$$
$$e = 1.5\,\text{cm} \quad — (01)$$
$$V = 512 \times 4(15 + 1.5) \times 10^{-2}$$
$$V = 337.92\,\text{ms}^{-1} \quad — (01)$$

VII නලයේ විෂ්කම්භය වන හෙයින් $e = 0.3D$ අනුභවයෙන් e සඳහා අගය ලබා ගත හැකි [illegible] නලයේ විෂ්කම්භය. — (01)

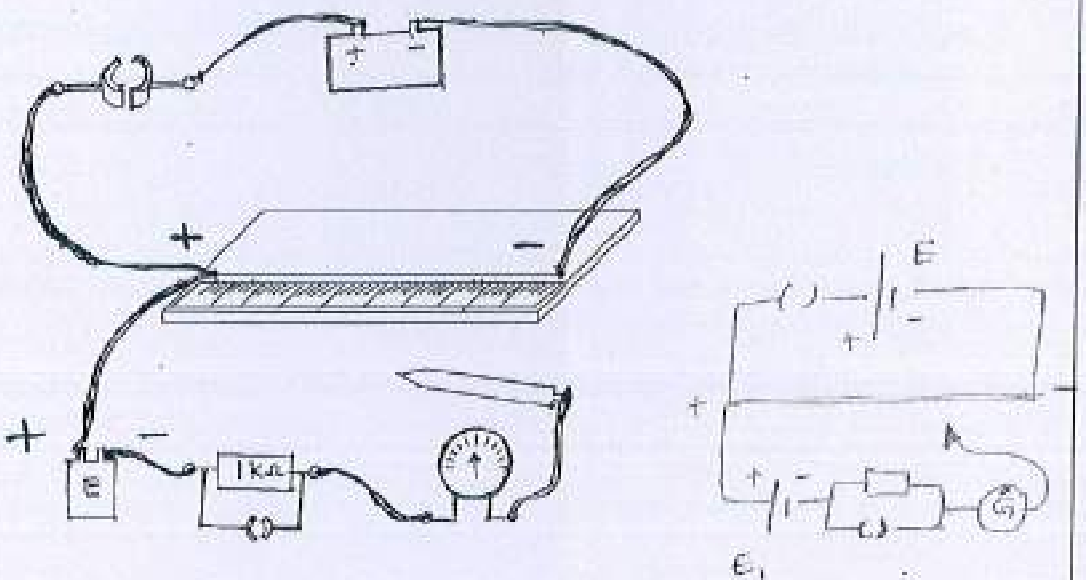
VIII
$$512 \times 4(15 + 1.5) \times 10^{-2} = 256 \times (l + 1.5) \times 4 \times 10^{-2}$$
$$512 \times 16.5 = 256(l + 1.5)$$
$$l = 31.5\,\text{cm} \quad — (01)$$

IX (වායු) උෂ්ණත්වය, (කාමර [illegible] ආර්ද්‍රතාවය) — (01)

[illegible]

AF

4. වෝල්ට්මීටරයට ආදේශකයක් ලෙස විද්‍යාගාර පරීක්ෂණවලදී විභවමානය භාවිතා කරයි. විභවමාන කෝෂය ලෙස වි.ගා.බ 2V හා අභ්‍යන්තර ප්‍රතිරෝධය 2Ω වන ඊයම් අම්ල ඇකියුමිලේටරයක් භාවිතා කරයි. විභවමාන කම්බියේ දිග නිශ්චිතවම 1m වන අතර එහි ප්‍රතිරෝධය 18Ω වේ.
ඉතා කුඩා විද්‍යුත් ගාමක බලයක් සහිත කෝෂයක වි.ගා.බ මැනීම සඳහා භාවිතා කෙරෙන විභවමාන සැකැස්මක අසම්පූර්ණ පරීක්ෂණාත්මක ඇටවුමක් රූප සටහනේ පෙන්වා ඇත.



(i) සියලුම උපකරණ නිසි පරිදි සම්බන්ධක කම්බි යොදාගනිමින් පරිපථයට සම්බන්ධ කරන්න. — 01

(ii) විභව මාන කම්බියේ දෙකෙළවර ධ්‍රැවීයතා සහ කෝෂයේ (E) දෙකෙළවර ධ්‍රැවීයතා පරිපථ සටහනෙහි ලකුණු කරන්න. — 01

(iii) සාමාන්‍ය වෝල්ට් මීටරයකට සාපේක්ෂ විභවමානයේ

1) එක් ප්‍රධාන වාසියක්

හඳුනාගැනීමේ ... කෝෂයෙන් ධාරාවක් ගලා නොයාම. (වෝල්ට් මීටරයක් මෙන් ...)

2) එක් අවාසියක් ලියා දක්වන්න.

භාවිතය අපහසුවීම / ... / ... ලබාගත නොහැකිවීම / ...

01

(iv) විභවමාන කම්බිය සතුවිය යුතු වැදගත් ගුණාංග දෙකක් ලියා දක්වන්න.

(1) ඒකාකාර හරස්කඩ වර්ගඵලයක් තිබිය යුතුයි.

(2) ප්‍රතිරෝධතාවයේ උෂ්ණත්ව සංගුණකය අඩුවිය යුතුයි. — 01

(v) ඉහත විභවමාන කම්බියේ ඒකක දිගක විභව බැස්ම (විභව අනුක්‍රමණය Vcm^{-1} වලින් සොයන්න.)

$k = \frac{2}{20} \times \frac{18}{100}$

$k = 1.8 \times 10^{-2}\ V cm^{-1}$ — 01

$= 0.018\ V cm^{-1}$ $\quad 1.8\ V m^{-1}$

(vi) මෙම විභවමානයෙන් 3.6mV වි.ගා.බ සහිත කෝෂයක් සංතුලනය කළ විට ලැබෙන සංතුලන දිග mm (මිලිමීටර) වලින් සොයන්න. එම දිග මැනීමේදී ඇතිවන ප්‍රතිශත දෝෂය ගණනය කරන්න.

$3.6 \times 10^{-3} = 1.8 \times 10^{-2} \times l$

$2 \times 10^{-1}\ cm = l$ — 01

$l = 2mm$

ප්‍රතිශත දෝෂය $= \frac{1mm}{2mm} \times 100\%$

$= 50\%$ —— 01

(vii) කුඩා විභව අන්තර මැනීමේදී සිදුවන ප්‍රතිශත දෝෂය අඩුකර ගැනීමට විභවමානය විකරණය (වෙනස්) කරනු ලබයි. ඒ සඳහා ප්‍රතිරෝධකය සම්බන්ධ කරන්නේ කෙසේද?

විභවමාන කම්බියට ශ්‍රේණිගතව ←—— 01

(viii) මෙම විභවමාන කම්බිය හරහා 20mV විභව අන්තරයක් පවත්වා ගැනීම සඳහා සවිකළ යුතු ප්‍රතිරෝධකයේ අගය ගණනය කරන්න.

$I = \frac{20mV}{18}$ $\qquad 198 = \frac{1}{9}(2+R)$

$= \frac{10}{9} mA$ $\qquad 1782 - 2 = R$

$R = 1780\Omega$ —— 01

(ix) විකරණය කරන ලද විභව මානයෙන් ඉහත ඉතා කුඩා වි.ගා.බ සහිත කෝෂය [redacted] සංතුලනය කළ විට ලැබෙන සංතුලන දිග mm (මිලිමීටර්) වලින් සොයන්න.

$K' = \frac{20mV}{100}$ $\qquad 3.6 = \frac{1}{5} \times l$

$K' = \frac{1}{5} mV cm^{-1}$ $\qquad 18.0 cm = l$ $\qquad l = 18cm$ —— 01

180 mm

(a). To have a clear space below the construction — 01

(b) (i) R ↑ W — 01

F — 01

(ii) 

— 01

(c) (i) $M = -W \times x$ — 01

(ii) 

— 01

(d) (i) $R = 20\,kN \uparrow$ — 01

$\curvearrowright M = -F \times d = -20\times10^{3} \times 5 = -1\times10^{5}\ Nm$ — 01

(ii) shear stress $= \frac{\text{shear force}}{\text{area}} = \frac{20\times10^{3}}{200\times10^{-4}}$

$= 1\times10^{6}\ Nm^{-2}$ — 01

(iii) yes: The shear stress it experienced is less than the maximum value — 01

(iv) (1) At A (Because max. M is at A) — 01

(2) at A; $\sigma = \frac{1\times10^{5} \times 5\times10^{-2}}{0.25} = 2\times10^{9}\ Nm^{-2}$ — 01

(e) (i) At A; $R = W$

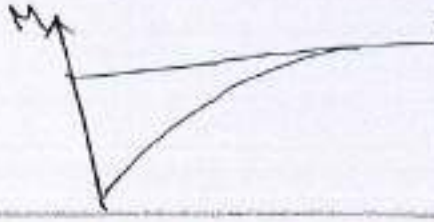
at middle; $R = \frac{W}{2}$

at B; $R = 0$ — 02

(ii) 

— 01

(iii) $M = -F \times d = -\left(\frac{W}{5}x\right) \times x = -\frac{W}{5}x^{2}$ — 01

(iv) 

— 01

15

(6) (a) (i) [illegible]
[illegible]
[illegible]
[illegible]
[illegible] (01)

(ii) $V = 5u$

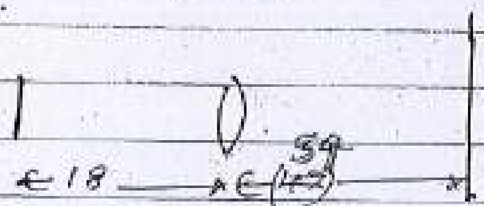
$\frac{1}{V} - \frac{1}{u} = \frac{1}{f}$ යෙදීමෙන්;

$\frac{-1}{5u} - \frac{1}{u} = \frac{-1}{10}$ (01)

$\frac{6}{5u} = \frac{1}{10}$

$\underline{\underline{u = 12cm}}$ (01)

(iii)



$\frac{1}{V} - \frac{1}{u} = \frac{1}{f}$

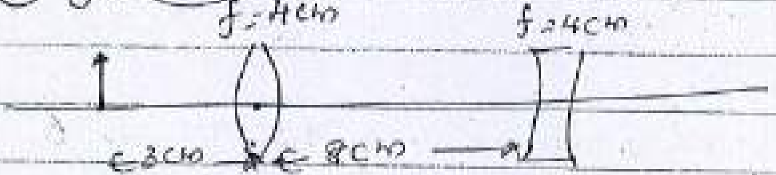
$\frac{1}{V} - \frac{1}{18} = \frac{-1}{10}$ (01)

$54 - 22.5 = 31.5cm$

$V = 22.5cm$ (01)

[illegible] 31.5 cm [illegible] (01) [illegible]

(b) (i)



[illegible]; $\frac{1}{V} - \frac{1}{u} = \frac{1}{f}$ යෙදීමෙන්

convex lens $\frac{1}{V} - \frac{1}{3} = \frac{-1}{4}$ (01)

$V = 12$

[illegible] $\frac{1}{V} - \frac{1}{u} = \frac{1}{f}$ යෙදීමෙන්

Concave lens $\frac{1}{V} - \frac{1}{20} = \frac{1}{4}$ (01)

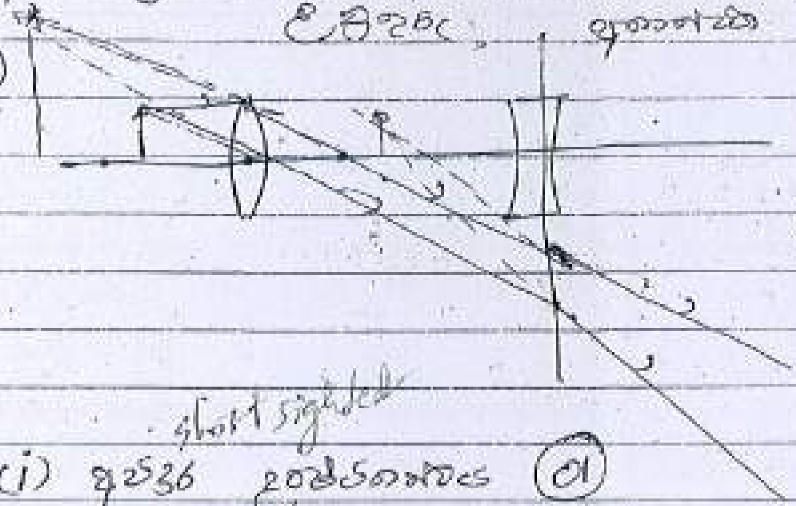
(01)

$v = 20/6$

අවසාන ප්‍රතිබිම්බයට ඇති කාචයේ සිට ඇති දුර $= \underline{3.3 cm}$

උඩුකුරු, අතාත්වික (01)

(iii)



upright
virtual

(01)

short sighted

(c) (i) අවිදුර දෘෂ්ටිකත්වය (01)

(ii) කාචය: $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

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

$f = \frac{1}{0.5} =$

$\frac{1}{x} - \frac{1}{25} = \frac{1}{200}$

$= 2$

$\frac{1}{x} = \frac{1}{25} + \frac{1}{200}$ $x = 200 cm$

(01)

නව දෘෂ්ටි පරාසය $25cm - 200c$

(iii) $P = 2 + 0.5 = 1.5 D$ දුර දෘෂ්ටිකත්වය

$f = -\frac{200}{3} cm$ (01) longsighted.

කාචය $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ යෙදීමෙන්

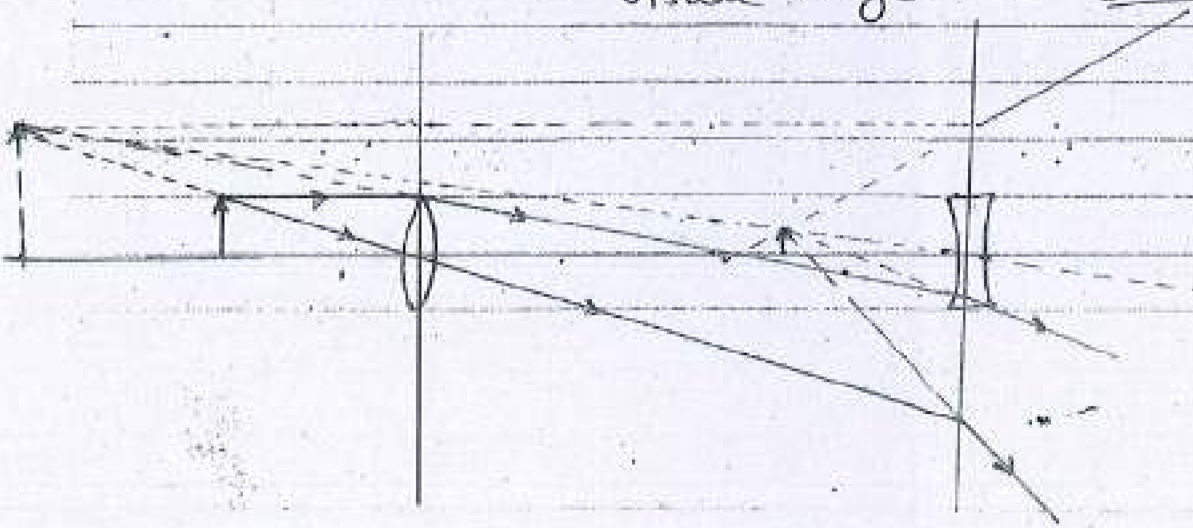
$\frac{1}{\infty} - \frac{1}{x} = -\frac{3}{200}$

(01)

$x = 66.67 cm$

නව දෘෂ්ටි පරාසය $66.67cm - 25 cm$

visual range



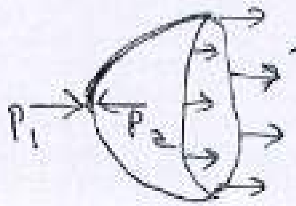
(i) ද්‍රවයේ මතුපිට ඒකක දිගක් හරහා පෘෂ්ඨික වර්ගඵලය හා පෘෂ්ඨික ශක්තිය ප්‍රමාණයක් කාරණ වැඩි වීමට ප්‍රතිවිරුද්ධව ඒකකයකි.

මුළු ලකුණු (02)

එක් ලකුණ - 01

(ii) බුබුල තුළ පීඩනය P_2 ද පිටත පීඩනය P_1 ද යැයි ගනිමු.

බුබුලේ අර්ධ ගෝලයක් සැලකූ විට



P_1 පීඩනය නිසා අන්තර්ගත වර්ගඵලය මත බලය $= \pi r^2 P_1 \rightarrow$

P_2 පීඩනය නිසා " වර්ගඵලය මත බලය $= \pi r^2 P_2 \leftarrow$

පෘෂ්ඨික ආතතිය නිසා " පරිධිය මත බලය $= 2\pi r T \rightarrow$

අර්ධ ගෝලයේ සමතුලිතතාව සැලකූ විට

$$\pi r^2 P_1 + 2\pi r T = \pi r^2 P_2 \quad \text{—— (01)}$$

$$P_2 - P_1 = \frac{2T}{r} \quad \text{—— (01)}$$

(iii) සබන් බුබුලේ පෘෂ්ඨික ශක්තිය $= TA = T \times 4\pi r^2 \times 2$

චාලක ශක්තිය $\frac{1}{2}mv^2 = T \times 4\pi r^2 \times 2$ —— (01)

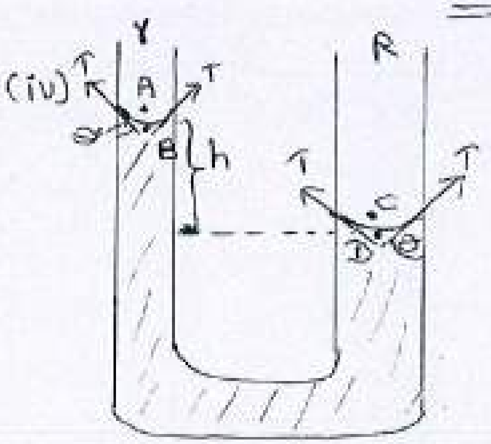
$m =$ පෘෂ්ඨික වර්ගඵලය × ඝනකම × ඝනත්වය

$$\frac{1}{2} \times 4\pi r^2 \times 20 \times 10^{-6} \times 1000\, V^2 = 8\pi r^2 \times 2.5 \times 10^{-2} \quad \text{—— (01)}$$

$$V = \sqrt{5}$$

$$V = 2.24\ \text{m s}^{-1} \quad \text{—— (01)}$$

(iv)



$R = 1\text{cm}$, $r = 1\text{mm}$ (01)

$$P_A - P_B = \frac{2T\cos\theta}{r} \Rightarrow P_B = P_A - \frac{2T\cos\theta}{r}$$

(01)

$$P_C - P_D = \frac{2T\cos\theta}{R} \Rightarrow P_D = P_C - \frac{2T\cos\theta}{R}$$

$P_A = P_C = P_0$, $P_B + h\rho g = P_D$

$$P_D - P_B = h\rho g = \frac{2T\cos\theta}{r} - \frac{2T\cos\theta}{R}$$

(01)

$$h = \frac{2T\cos\theta}{\rho g}\left(\frac{1}{r} - \frac{1}{R}\right)$$

$$h = \frac{2\times 30\times 10^{-3}\cos 30^\circ}{700\times 10}\left(\frac{1}{0.6\times 10^{-3}} - \frac{1}{0.6\times 10^{-3}}\right) \quad (01)$$

$$= \frac{2\times 3\times 10^{-3}\times 1.732}{700\times 2\times 10^{-3}}\left(\frac{1}{0.6} - \frac{1}{6}\right)$$

$$= \frac{3\times 1.732\times 5.4}{7\times 10^{2}\times 0.6\times 6}$$

$$h = 1.11\times 10^{-2}\ m \quad (01)$$

(v) $F - mg = 2\pi r T\times 2$ (01)

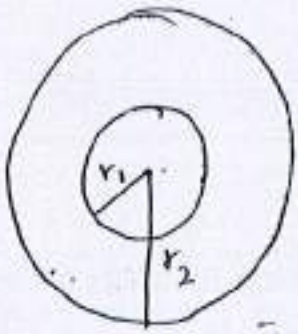
$$(12.8 - 4)\times 10^{-3} = 2\times\frac{22}{7}\times 2\times 10^{-2}\, T\times 2 \quad (01)$$

$$T = \frac{8.8\times 10^{-3}\times 7}{88\times 10^{-3}\times 2} = \frac{88\times 10^{-4}\times 7}{88\times 2\times 10^{-2}}$$

$$T = 3.5\times 10^{-2}\ Nm^{-1} \quad (01)$$

OR

15



$r_1 = 5 - 0.02 = 4.98\ mm$

Liquid volume $= \frac{4}{3}\pi(5\times 10^{-3})^3 - \frac{4}{3}\pi(4.98\times 10^{-3})^3$

$= \frac{4}{3}\pi\times 10^{-9}(5^3 - 4.98^3)$

$= \frac{4}{3}\pi\times 10^{-9}(5-4.98)\left(5^2 + \frac{5\times 4.98}{\approx 5^2} + \frac{4.98}{\sim 5^2}\right)$

$= \frac{4\pi}{3}\times 10^{-9}\times(0.02)(3\times 25)$

$= 4\pi\times 0.5\times 10^{-9}$

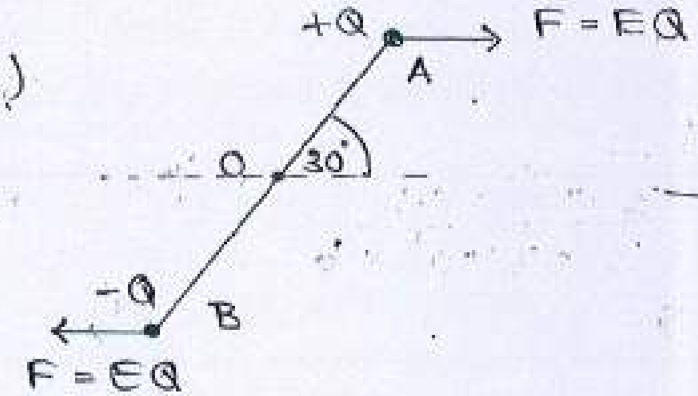
$8\pi r^2 T = \frac{1}{2}mV^2$

$8\pi(5\times 10^{-3})^2\times 2.5\times 10^{-2} = \frac{1}{2}\times 10^{3}\times 4\pi\times 0.5\times 10^{-9}V$

$V^2 = 5 \qquad V = 2.24\ ms^{-1}$

(08)

(a)



— (01)

(b) $\tau = Fr$

$= EQ\, l \sin\theta$

$= 4\times10^{-6} \times 6 \times 0.2 \times 1/2$ — (01)

$= \underline{2.4\times10^{-6}}$ Nm. — (01)

$\tau = I\alpha$ අවස්ථිති ඝූර්ණය / moment of inertia — (01)

$2.4\times10^{-6} = 2 \times (2\times10^{-6} \times 0.1^2)\,\alpha$ — (01)

$\alpha = \underline{60}\ \text{rad s}^{-1}$ — (01)

(c) $\tau = I\alpha$

$QE\, l \sin\theta = m\frac{l^2}{4} \times 2\,\alpha$. — (01)

$\theta <<<$ $\sin\theta \approx \theta$

$\alpha = (-)\left(\frac{2EQ}{ml}\right)\theta$ (*) α හි දිශාව θ වැඩිවන දිශාවට ප්‍රතිවිරුද්ධ නිසා (−) යොදයි — (01)

$a = -\omega^2\theta$

The direction of α is opposite to the direction of increasing θ.

$\omega = \sqrt{\frac{2QE}{ml}}$

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

$T = \frac{2\pi}{\omega}$. — (01)

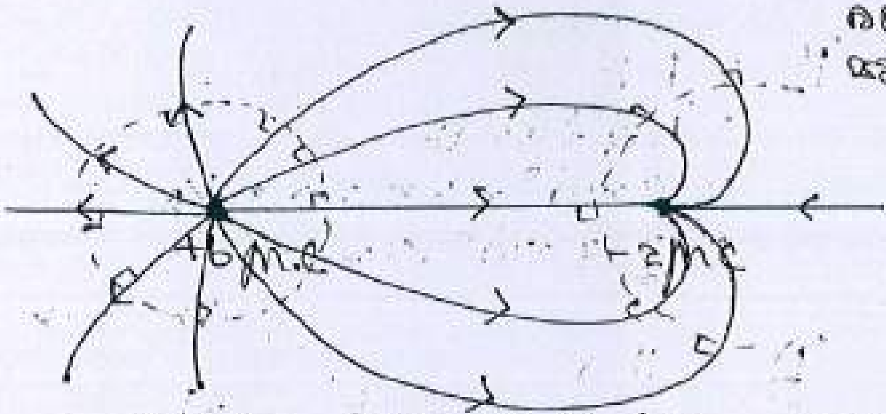
$$T = 2\pi\sqrt{\frac{ml}{2QE}}$$ ——— (01)

$$= 2 \times \frac{22}{7}\sqrt{\frac{2\times10^{-6}\times0.2}{2\times4\times10^{-6}\times6}}$$ ආදේශය: ——— (01)

$2\times\frac{22}{7}\times$

$= \underline{0.574\ s}$ ——— (01)

(d)



බලරේඛා හැඩය } ——— (01)

ශූන්‍ය ලක්ෂ්‍යය 2 } ———

බල රේඛාවලට ලම්බකව සමවිභව රේඛා තිබිය යුතුය. ——— (01)

equi - potential surfaces should be perpendicular to the field lines.

9(A)

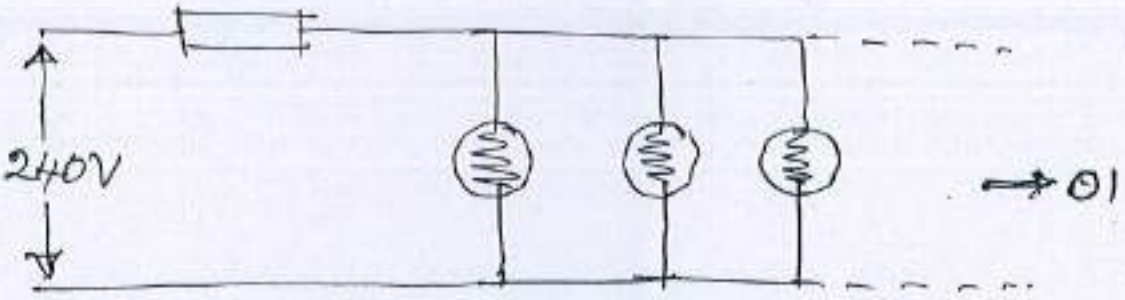
(a) (i) $I = \frac{P}{V}$ ⟶ 01

(ii) $I = \frac{100}{250}$

$= 0.4\,A$ ⟶ 01

(iii) උපරිම බල්බ ගණන = $\frac{5\,A}{0.4A}$
maximum no. of bulbs

$= 12$ ⟶ 01



⟶ 01

(iv) current across the oven
උඳුන හරහා ධාරාව = $\frac{1000}{250}$

$= 4A$

ඉතිරිය ධාරාව $5A - 4A = 1A$ ← current through the bulb

බල්බ ගණන = $\frac{1\,A}{0.4A}$ no of bulbs

$= 2$. ⟶ 01

(V) හෙයාර්ඩ්‍රයර් තුළ ධාරාව = $\frac{1500}{250}$
current through hair dryer

$= 6A$

උපාය සර්කිට් බිඳුම = 15 A ⟶ 01
The circuit brakter required.

(b) (i) $R = \frac{\rho l}{A}$ ⟶ 01

$R_{30} = \frac{1.7\times10^{-8}\times 3\times10^{-2}}{3\times10^{-8}}$ ⟶ 01

$= 1.7\times10^{-2}\,\Omega$ ⟶ 01

0.017 Ω

(ii) $P = I^2R$

$2.125 = 5^2 \times R_\theta$ ⟶ 01

$R_\theta = \frac{2.125}{25}$

$= 0.085\,\Omega$

$= 8.5\times10^{-2}\,\Omega$ ⟶ 01

0.085

$\frac{R_\theta}{R_{30}} = \frac{8.5\times10^{-2}}{1.7\times10^{-2}} = 5$

$R_\theta = 5\,R_{30}$ ⟶ 01

(iii) $R_\theta = R_0(1+\alpha\theta)$ ⟶ 01

$R_{30} = R_0(1+4/9\times10^{-2}\times30)$

$R_\theta = R_0(1+4/9\times10^{-2}\times\theta)$ } ⟶ 01 (අදාළතා විකාශය)

$\frac{R_\theta}{R_{30}} = \frac{(1+4/9\times10^{-2}\theta)}{(1+4/9\times10^{-2}\times30)}$

$5(1+4/9\times10^{-2}\times30) = (1+4/9\times10^{-2}\theta)$

$5 + \frac{20}{3}\times10^{-1} = 1 + 4/9\times10^{-2}\theta$

$\theta = 1050^\circ C$ ⟶ 01

7) (a) (1) $I_D = 16\,mA$ — (01)

(B) (2) $V_{DS} = 2V$ — (01)

(3) $\frac{2\,M\Omega}{R_3} = \frac{10}{5}$ $R_3 = 1\,M\Omega$ // — (01)

R_2 $V = IR$

$15 - 8 = \frac{16}{1000} \times R_2$

$R_2 = 437.5\,\Omega$ // — (01)

R_1 $V = IR$

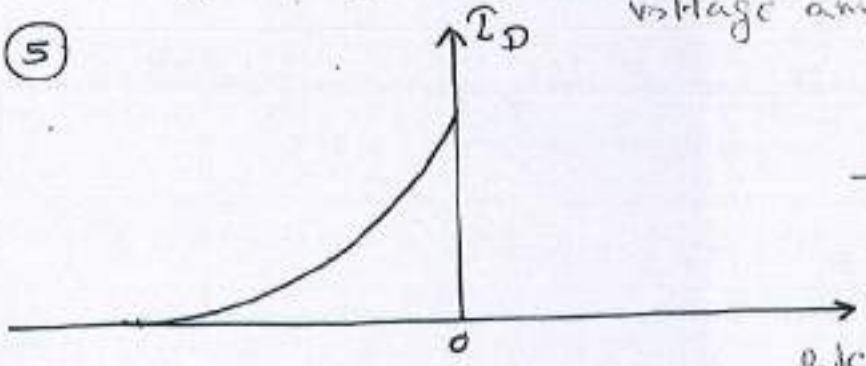
$V_{GS} = V_G - I_D R_1$ — (01)

$0 = 5 - \frac{16}{1000} \times R_1$

$R_1 = \frac{5000}{16} = 312.5\,\Omega$ // — (01)

(4) * සංඛ්‍යාතය සහිතවූ sinusoidal signal
* 180° ක කලාවෙන් වෙනස් shows a phase difference of 180°
* වෝල්ටීයතා වර්ධකයක් වෙයි voltage amplifier
— (01)

(5)



— (01)

(b) (1) $I_C = \beta I_B$ — (01)

$= 200 \times \frac{40}{1000}$

$= 4\,A$ // — (01)

(2) $V = IR$ භාවිතයෙන්

$5 - 0.6 = \frac{40R}{1000}$ — (01)

$R = 110\,\Omega$ //

— (01)

(3)

Potential at X කියවේ	Potential at Z කියවේ
0V	5V
5V	0

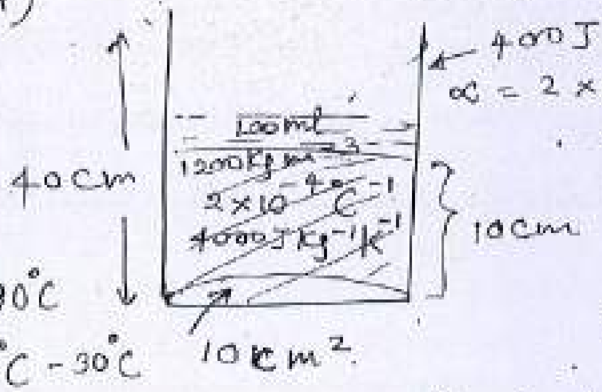
— (01)

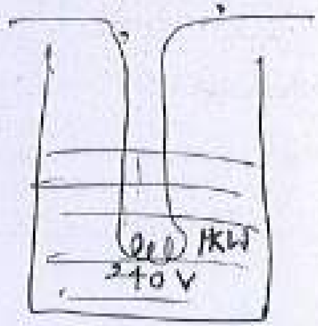
(4) කපාගත් තත්ත්වය cut off state — (01)

(5) NOT ද්වාරය NOT gate — (01)

(10-A)

10) A)





$\Delta\theta = 30^\circ C$

$= 60^\circ C - 30^\circ C$

ද්‍රවයේ ස්කන්ධය $= 10^{-4}\,m^3 \times 1200\,kg\,m^{-3}$

$= 0.12\,kg$

a) i) • පද්ධතිය සහ පරිසරය අතර තාප හුවමාරුවක් සිදු නොවන බව / උපකරණය මගින් සපයන මුළු තාප ශක්තියම බඳුන සහ ද්‍රවය මගින් උරාගනු ලබන බව (01)

$\theta_1 = C\Delta\theta \qquad \theta_2 = ms\Delta\theta$

$Pt = \theta_1 + \theta_2$

$1000\,W \times t = (400\,J\,^\circ C^{-1} \times 30^\circ C) + (0.12\,kg \times 4000 \times 30^\circ C)$ (01)

$t = (12 + 14.4) = 26.4\,s$ — (01)

ii) $P = V^2/R \qquad R = V^2/P = \frac{240\times240}{1000}$

$P' = V_1^2/R = (200\times200)\times1000/240\times240$ (01)

$P' = 10^5/6\times24\ W$

$P't' = 12000\,J + 14{,}400\,J = 26400\,J$

$t' = (26400/10^5)\times6\times24 = 38.016\,s \approx 38\,s$

$\Delta t = 38\,s - 26.4\,s = \underline{\underline{11.6\,s}}$ — (01)

b) i) • ද්‍රවයේ සංතෘප්ත වාෂ්ප පීඩනය වායුගෝලීය පීඩනයට සමාන වන උෂ්ණත්වය — (01)

ii) $\theta = Pt = mL \qquad L = Pt/m$

$L = 1000\,W \times 4\times60\,s / 0.12\,kg = 2\times10^6\,J\,kg^{-1}$ (01)

$= 2000\,kJ\,kg^{-1}$ — (01)

හෝ

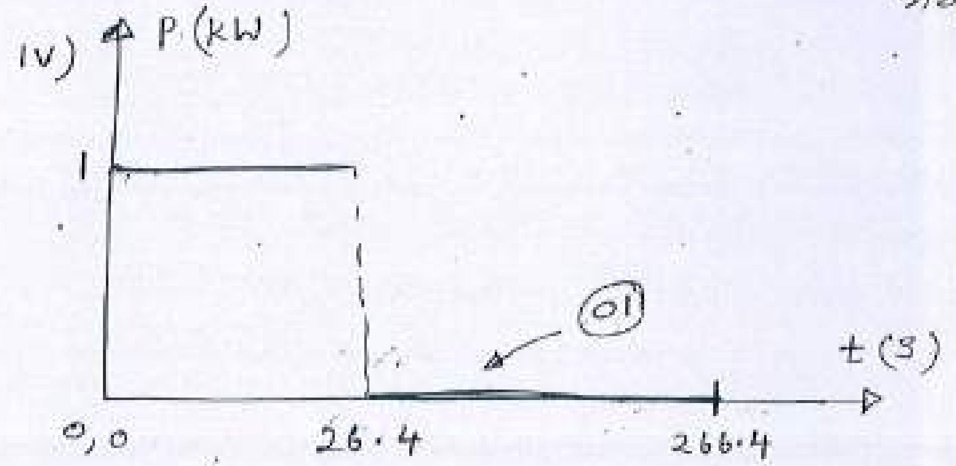
$L = P't/m = \{(10^5/6\times24)\,4\times60\}/0.12$ — (01)

$= 1388.89\,kJ\,kg^{-1}$ — (01)

iii) $60^\circ C$ ට වඩා වැඩිය.
මුහුදු මට්ටමේ දී වායුගෝලීය පීඩනය කඳුකර ප්‍රදේශයන්ට
ට වඩා වැඩිය. එයට සමාන වන ද්‍රවයේ සංතෘප්ත
වාෂ්ප පීඩනය ලබා දෙනුයේ වැඩි උෂ්ණත්වයක දීය.

නිවැරදි පිළිතුර සහ හේතුව → (01)

iv)



c) $\gamma_{දෘශ්‍ය} = \Delta V_{දෘශ්‍ය} / V_0 \Delta\theta$

ඒකක උෂ්ණත්ව වෙනසක් ($1^\circ C$ / 1K) සඳහා ද්‍රවයේ
ඒකක පරිමාවක සිදුවන දෘශ්‍ය පරිමා වෙනස (01)

i) ද්‍රවයට $V_\theta = V_0(1 + \gamma\Delta\theta)$

බඳුනේ වර්ගඵල ප්‍රසාරණය $A_\theta = A_0(1 + 2\alpha\Delta\theta)$

$V_0 = A_0 h_0$

$V_\theta = A_\theta h_\theta$ $\quad h_\theta = V_\theta / A_\theta$ $\quad h_0 = V_0 / A_0$

$h_\theta = V_0(1 + \gamma\Delta\theta) / A_0(1 + 2\alpha\Delta\theta)$ $\quad h_0 = 0.1\,m$

$$h_\theta = \frac{h_0(1+\gamma\Delta\theta)}{(1+2\alpha\Delta\theta)} = 0.1\frac{(1 + 2\times10^{-4}\times30)}{1 + (2\times2\times10^{-5}\times30)} \quad (01)$$

$h_\theta = 100.6/1001.2 = 10.047\,cm$ (10.04 – 10.05) (01)

i) බඳුනේ ප්‍රසාරණය = වීදුරු කූට්ටිය + ද්‍රවයේ සත්‍ය ප්‍රසාරණය

$(10\times40)\times10^{-6}m^3 \times (3\times2\times10^{-5})\,^\circ C^{-1} \times 30^\circ C =$ ← (01)

$V \times (3\times1.5\times10^{-5}\,^\circ C^{-1}) \times 30^\circ C + (10^{-4}m^3 \times 2\times10^{-4} \times 30^\circ C)$

$72\times10^{-8} = 9\times1.5\times10^{-4}\,V + 6\times10^{-7}$

$V = 1.2\times10^{-3} / 9\times1.5 = 8.889\times10^{-5}\,m^3$

$= 88.89\,cm^3$ (01)

expansion of container = Real expansion of liquid + volume expansion of glass cube

10 - B

$$^{210}_{84}Po \longrightarrow {}^{4}_{2}\alpha + {}^{206}_{82}Pb$$ ---------- (01)

(ii) ලෙඩ් (Pb) ---------- (01)

(iii) ඇල්ෆා සමාස්ථානිකයක ස්කන්ධය (පරමාණු ගණන / සන්නිවේදනාව)
මුල් ඇටයෙන් හරි අඩක් දිරීම ගණන කාලය අර්ධ ආයු කාලයයි ---- (01)
Half life →

(iv) $\lambda = \frac{0.693}{T_{\frac{1}{2}}}$

$\lambda = \frac{0.693}{138 \times 24 \times 3600} = 5.812 \times 10^{-8}\ S^{-1}$ ---------- (01)

(b)

(i) $1eV = 1.6 \times 10^{-19}\ J$

$6MeV = (6 \times 10^{6})(1.6 \times 10^{-19}) = 9.6 \times 10^{-13}\ J$ ---------- (01)

(ii) Po පරමාණු සංඛ්‍යාව $= \frac{6 \times 10^{23}}{210} \times 42$ no. of Po atoms

$= 12 \times 10^{22}$ ---------- (01)

(iii) Po, 42g කින් මුදා හරින ∝ අංශු සංඛ්‍යාව $= 12 \times 10^{22}$ ← no. of particles released

අදාළ ශක්තිය $= 12 \times 10^{22} \times 9.6 \times 10^{-13}$ ← corresponding energy

$= 115.2 \times 10^{9}\ J$ ---------- (01)

(iv) සක්‍රියතාව $= \lambda N_0$
initial Activity $= (5.812 \times 10^{-8})(12 \times 10^{22})$

$= 69.74 \times 10^{14}\ Bq$ ---------- (01)

(v) $42g \xrightarrow{138} 21g \xrightarrow{138} 10.5g \xrightarrow{138} 5.25g$

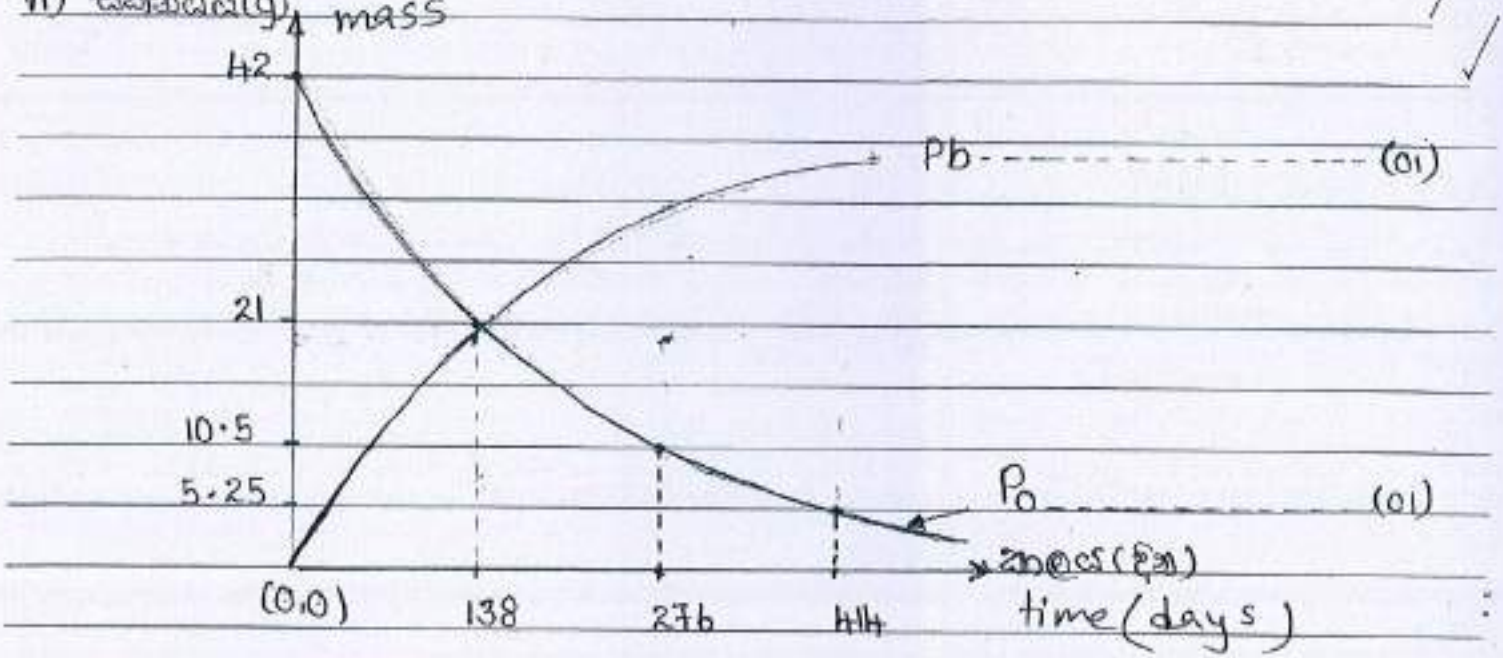
ඉතිරි Po ස්කන්ධය $= 5.25g$ ← remaining mass of Po ---------- (01)

∴ භාවිත වූ Po ස්කන්ධය $= 42 - 5.25$

$= 36.75g$ ---------- (01)

Decayed mass of Po ↑

vi) ස්කන්ධය(g) mass



:) (i) ග්‍රේ ඒකකය :- The unit of Grey :

1Gy යනු, 1kg ක පදාර්ථයකට 1J ක ශක්තියක් ලබාදීම සඳහා අවශ්‍ය වන විකිරණ ප්‍රමාණයයි. ..... (01)

(ii) සමාන මාත්‍රාව (Sv) = මාත්‍රාව (Gy) x QF ..... (01)
equivalent dose (Sv) = dose (Gy) x QF

(iii) $100 \times 10^{-6}(n) = 10 \times 10^{-3}$

$n = 100$

∴ දින ගණන 100 ..... (01)
no. of days

PR.

ඒ. පොදු සා. (උ.පෙළ) විභාගය / ப. கූඅන. සා. (ඉ.கූඅ) විනෝ / G. C. E. (A/L) - 2019

බහුවරණ උත්තර පත්‍රය / பොதுசாதாரண தர்ப்ப அதாரா / M C Q Answer Sheet

විෂය සහ විෂය අංකය
பிரிவும் பாட இலக்கமும்
Subject and Subject No

Physics - Gr. 13

June - 2019

Final test.

නම
தனிநபர் நுழைப்பு
Name

ශ්‍රේණිය
தரம்
Grade

විභාග දර්ශක සහ අනෙකුත් තොරතුරු නිවැරදිව ඇවිට නිරීක්ෂකගේ අත්සන යුතුය. නුවුවා සහ තවදුරටත් කෙරෙන්නා ගැනීම සඳහා
invigilator's signature and date for correct Index number and other details

01) ① ② ③ ④ ⑤	(11) ① ② ③ ④ ⑤	(21) ① ② ③ ④ ⑤	(31) ① ② ③ ④ ⑤	(41) ① ② ③ ④ ⑤
02) ① ② ③ ④ ⑤	(12) ① ② ③ ④ ⑤	(22) ① ② ③ ④ ⑤	(32) ① ② ③ ④ ⑤	(42) ① ② ③ ④ ⑤
03) ① ② ③ ④ ⑤	(13) ① ② ③ ④ ⑤	(23) ① ② ③ ④ ⑤	(33) ① ② ③ ④ ⑤	(43) ① ② ③ ④ ⑤
04) ① ② ③ ④ ⑤	(14) ① ② ③ ④ ⑤	(24) ① ② ③ ④ ⑤	(34) ① ② ③ ④ ⑤	(44) ① ② ③ ④ ⑤ all
05) ① ② ③ ④ ⑤	(15) ① ② ③ ④ ⑤	(25) ① ② ③ ④ ⑤	(35) ① ② ③ ④ ⑤	(45) ① ② ③ ④ ⑤
06) ① ② ③ ④ ⑤	(16) ① ② ③ ④ ⑤	(26) ① ② ③ ④ ⑤	(36) ① ② ③ ④ ⑤	(46) ① ② ③ ④ ⑤
07) ① ② ③ ④ ⑤	(17) ① ② ③ ④ ⑤	(27) ① ② ③ ④ ⑤	(37) ① ② ③ ④ ⑤	(47) ① ② ③ ④ ⑤
08) ① ② ③ ④ ⑤	(18) ① ② ③ ④ ⑤	(28) ① ② ③ ④ ⑤	(38) ① ② ③ ④ ⑤	(48) ① ② ③ ④ ⑤
09) ① ② ③ ④ ⑤	(19) ① ② ③ ④ ⑤	(29) ① ② ③ ④ ⑤	(39) ① ② ③ ④ ⑤	(49) ① ② ③ ④ ⑤
10) ① ② ③ ④ ⑤	(20) ① ② ③ ④ ⑤	(30) ① ② ③ ④ ⑤	(40) ① ② ③ ④ ⑤	(50) ① ② ③ ④ ⑤

: වැරදි පිළිතුරු සංඛ්‍යාව
: தவறான அம்சங்களை
: of Incorrect Responses

උත්තර පත්‍ර පරීක්ෂකගේ සංකේත අංකය සහ අත්සන
நுழைவு ஆ அளவாட்டக் கைகடல் நகுடா எண் நுயனம
Examiner's Code No. and Signature

1.
2.
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ගණිත පරීක්ෂකයා / Arithmetic Cheker

නිවැරදි පිළිතුරු සංඛ්‍යාව
மனதகளமுன அம்சங்களை எடுத்தை
No of Correct Responses

| 50 න් | ලකුණු
இடமுறை
Marks | 100 න් |
|---|---|---|
| | | |