Provincial Department of Education
Northern Province
Pilot Exam - 2019
Grade - 13

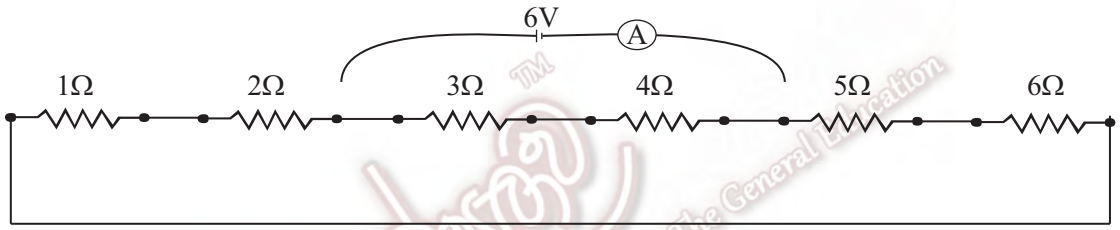
Physics - I | **01 E I** | **2 hours**

Use of calculators is not allowed ($g=10Nkg^{-1}$)

01. The dimension of energy stored in a unit volume of strain rod.
1. MLT^{-2} *2.* $ML^{2}T^{-2}$ *3.* $ML^{-1}T^{-2}$
4. $ML^{2}T^{-3}$ *5.* MLT^{-1}

02. The quak composition of a Proton
1. uud *2.* udd *3.* uuu
4. uu *5.* ud

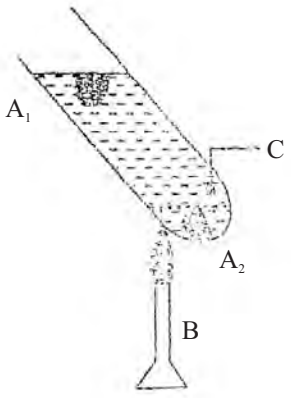
03. Conside six resistors connected to a circuit given below. observe us outer ends which were connected. A circuits with a 6V ideal cell and ideal ammeters canbe connected to any two points of the resister circuit. The least of amount of current flows through the ammeter



1. 0.29A *2.* 1.15A *3.* 1.17A
4. 1.41A *5.* 1.25A

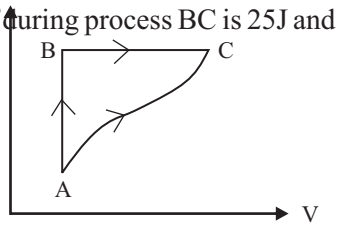
04) A 100W electric heater is immersed into a vessel containing 1*l* water. Though the heater was inside the water for a long time and the water reachers its boiling point; water didn't boil. How long does it take to cool by 1 ^{o}C after removing the heater (specific heat capaecity 4.2 $Jkg^{-1}C^{-1}$)
1. 20s *2.* 40s *3.* 60s
4. 130s *5.* 200s

05) An ice cube A_1 is Floating in a test tube containing water. Another ice cube A_z is traped at the bottom using awire gauze. Water is heated on a Bunsen burner whichone given below is the correct observation.
1. Both A_1 and A_z Start to melt at the same time
2. A_z Starts to melt long after A_1
3. A_1 starts to melt long after A_z
4. A_1 melts where as A_2 doesn't
5. A_z melts where as A_1 doesn't



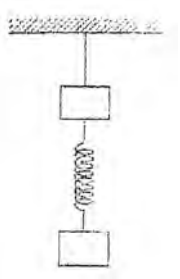
06) A black body at 400K is in an environ met at 300K. What is the initial met rate of radiation from a unit area of the object if stephani constant is equal to $5.7 \times 10^{8}\ Wm^{-1}K^{-4}$
1. $5.7 \times 5\ W\,m^{-2}$ *2.* $5.7x25\ W\,m^{-2}$ *3.* $5.7x10^{-8}\ W\,m^{-2}$
4. $5.7x7x25\ W\,m^{-2}$ *5.* $5.7 \times 400^{2}\ W\,m^{-2}$

07) A process with constant volume from A to B and aprocess with constant pressure from B to A are shown in the. The leat absorhed bg a system moving from A to C via55J. The work done during process BC is 25J and 15J work is done during the process CA. During the process CA



1. 15J heat is abosorved
2. 65J heat is released
3. 45J heat is released
4. 15J heat is released
5. 15J heat is absorved

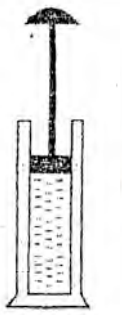
08) The identical logs are connected by a spring is hung from a roof by a robe is at rest as shown in the figure. If they robe suddenly collapses what will be the downward accelaration of the upper log



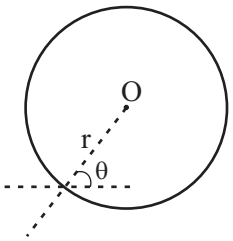
1. 0
2. g/2
3. g
4. $\sqrt{2}g$
5. 2g

09) A Cylinder is filled with an ideal gass with a piston A and B are two processes done on the piston. The tare statement regading the behavicour of the gars.

	A - Piston is Compresses Fastly	B - Piston is Compresses Slowly
(1)	$\Delta W > 0, \Delta U > 0, \Delta Q > 0$	$\Delta W > 0, \Delta U = 0, \Delta Q < 0$
(2)	$\Delta W < 0, \Delta U > 0, \Delta Q = 0$	$\Delta W < 0, \Delta U = 0, \Delta Q < 0$
(3)	$\Delta W > 0, \Delta U > 0, \Delta Q > 0$	$\Delta W > 0, \Delta U = 0, \Delta Q < 0$
(4)	$\Delta W < 0, \Delta U > 0, \Delta Q > 0$	$\Delta W > 0, \Delta U > 0, \Delta Q < 0$
(5)	$\Delta W > 0, \Delta U > 0, \Delta Q > 0$	$\Delta W = 0, \Delta U > 0, \Delta Q < 0$

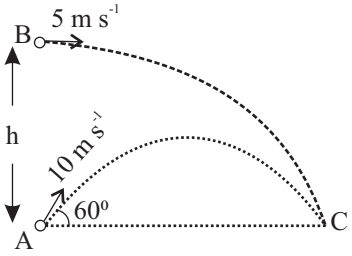


10) A bullet travelling with velocity V collides horizontally and penitrate in to a wheel which is n times greater than the mass of the bullet and has a radius r as shown in the figure. The penitrating length is negligible compared to the ratio of the wheel. The angle between the dierection of the velocity of the bullet add the radius of the wheel is θ, the anglular velocity of the system
(The moment of inertia of the wheel I = ½ mr²)



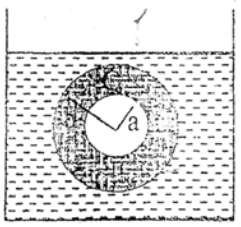
1. $\frac{2V\sin\theta}{(n+2)r}$
2. $\frac{2V\cos\theta}{(n+2)r}$
3. $\frac{2V}{(n+2)r}$
4. $\frac{V\sin\theta}{(n+2)r}$
5. $\frac{2V\tan\theta}{(n+2)r}$

11) A Particle A is projected 60^0 to the horizonal plane. Another particle B is projected horizontaly with the valocity of $5ms^{-1}$ from is a point which is h abovem A If both particels collie at a point C what is the height h.



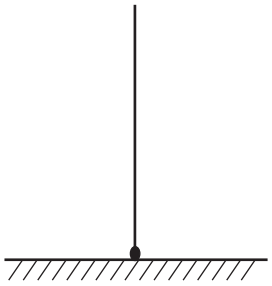
1. 10m
2. 30m
3. 15m
4. 25m
5. 60m

12) A metal sphere with an outter radi radius us b, has a hole inside with a radius of a, Look at the diagram. The sphere floats in a water contain in vessel. If the relative density of the metal is what will be the value of $\frac{a}{b}$



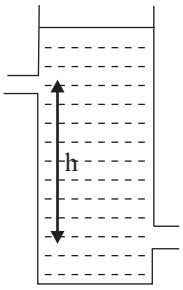
1. $\frac{l}{x^{\frac{1}{3}}}$
2. $x^{\frac{1}{3}}$
3. $\left(\frac{x+1}{x}\right)^{\frac{1}{3}}$
4. $\left(\frac{x^2}{x-1}\right)^{\frac{1}{3}}$
5. $\left(\frac{x-1}{x}\right)^{\frac{1}{3}}$

13) A thin even rod of length L and mass M is connected to the friction less ternninal point and placed vertically as shown in the diagram. Then it is allowed to fall on the ground What is the velocity of the free end of rod when it strikes the ground.



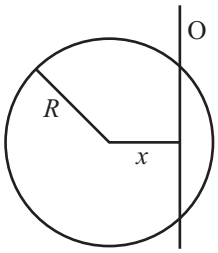
1. $\sqrt{1/3gL}$ 2. $\sqrt{gL}$ 3. $\sqrt{3gL}$
4. $\sqrt{12gL}$ 5. $12\sqrt{gL}$

14) There are two equal holes in the oppesite sides of a container as shown in the figure The hight between the two holes is h. when will the force act on the container becomes proportional when water colomn flows through the hole.



1. $h^{\frac{1}{2}}$ 2. h 3. $h^{\frac{1}{2}}$
4. $h^{\frac{3}{2}}$ 5. h^3

15) An infinite plate with a charge density 'σ' intersects the surface of a spherical gole use of radius R from a distance *x* from its centre, The Electric flux ϕ canbe given as

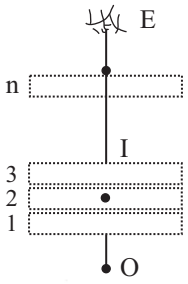


1. $\frac{\pi R^2\sigma}{\epsilon_o}$ 2. $\frac{2\pi R^2\sigma}{\epsilon_o}$ 3. $\frac{\pi(R-x)^2\sigma}{\epsilon_0}$
4. $\frac{\pi(R^2-x^2)\sigma}{\epsilon_0}$ 5. $\frac{2\pi(R^2-x^2)\sigma}{\epsilon_0}$

16) A, B are two strings with equal lenghts the cross sectional area of A is twice them B. The young modulus of A,B are Y_1 and Y_2. They are placed parallaly to make a combined string. when a mass is hung the extension was observed to be 'e' what will be the extension if the two strings are connected to the ends and the same mass is hung?

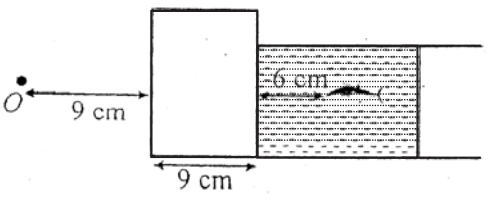
1. $\frac{(Y_1+Y_2)e}{2Y_1Y_2}$ 2. $\frac{(Y_1+Y_2)e^2}{2Y_1Y_2}$ 3. $\frac{(2Y_1+Y_2)^2e}{2Y_1Y_2}$ 4. $\frac{(Y_1+2Y_2)e}{2Y_1Y_2}$ 5. $\frac{2Y_1Y_2e}{(Y_1+2Y_2)^2}$

17) When an object was observed through n number of glass plates the image I was seen on the surface of the 3rd plate. If the refrative index of glass is 1.5 what will be the value of n.



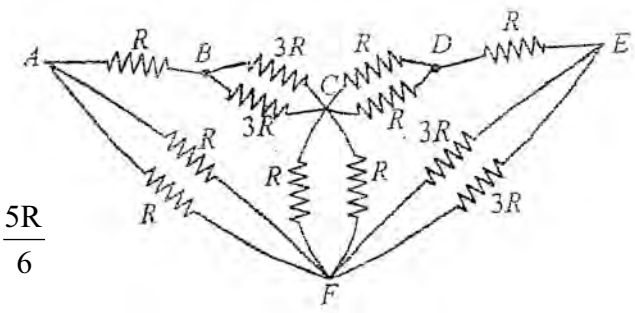
1. 6
2. 7
3. 8
4. 9
5. 10

18) The thickness of the front glass of a fish tanks is 9 cm. An insect 'O' was in the air in fornt of the front glass. what is the apprarent displacement of the insect for the fish in the water (refract index of water = 4/3, refract index of glass = 3/2)



1. 2 cm towards the object
2. 2 cm away from the object
3. 3 cm away from the object
4. 4 cm away from the object
5. 4 cm towards the object

19) The equivalent ressitance between B and E in the circuit



1. $\frac{3R}{2}$
2. $\frac{R}{2}$
3. R
4. $\frac{R}{4}$
5. $\frac{5R}{6}$

20) Among the charactors given below which one is not a characteristic feature of a stationary wave

1. The vibration frequency of all particles are equal
2. The frequency amplitude differs from particle to particle
3. The distance between the adjacent nodes is the wave length
4. The particles between two adjacent nodes have the same vibration phace
5. Energy won't be trasmitted to any side of the string

21) Consider the statements about a system of coplaner forces

a. When the lines in which the forces act, are extended they meet of a point
b. This system of forces can be represented by the magnitude and directions of a regular pentagon
c. the sum of momentum of for of each force on any axis is equal to zero

1. only a and b are correct
2. only b and c are correct
3. only a and c are correct
4. only b is correct
5. only c is correct

22) A magnetic field with an even flux density is applied from the south to North, A particle with mass M and charge q is projected from the west to south. The particle travels in a circular parthway of radious 'R' The magnitude and direction of the electric field to make the particle to move in a straight line is

1. $\frac{B^2qR}{m}$ Vertically upwards from the bottom
2. $\frac{BqR}{m}$ from East to west
3. $\frac{B^2qR}{m}$ Vertically dowards From the top
4. $\frac{B^2q}{mR}$ From South to North
5. $\frac{B^2q^2R}{m}$ From North to South

23) Figure (a) shows a progressive wave and figure (b) shows a ..... of static wave fromed by the over lapping of two was shown in Figure (a)

Look at the statements given below

(A) The velocity, wavelengh and frequency of both waves are equal
(B) The differences of phase of ponits A and B is equal to the difference of phases between the point A and B
(C) The amplitude of A is equal to that of B Among the Statements given below

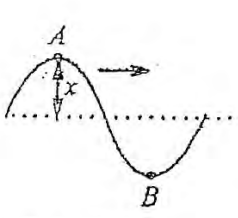


fig (a)

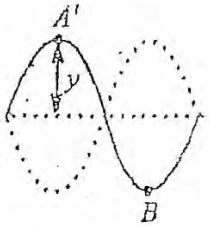
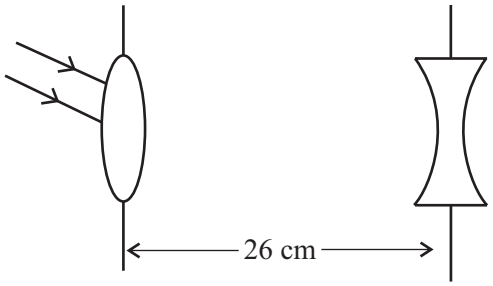


fig (b)

1. Only 'A' is correct
2. Only 'B' is correct
3. Only 'A' and 'B' are correct
4. Only 'B' and 'C' are correct
5. 'A', 'B' and 'C' are correct

24) A convex lense of focal length 30 cm and a Concave lense of focal length 20 cm are placed at 26 cm distance as shown in the figure. Height of the image produced by the convex lense for an object at infinite distance was 1.6 cm what is the height of the final image

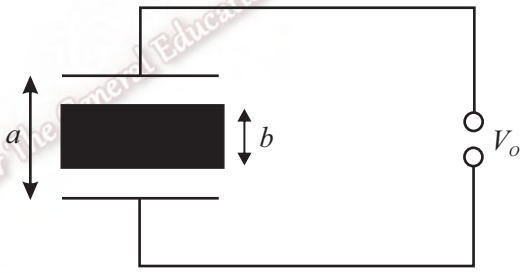
1. 0.4 cm
2. 0.8 cm
3. 1.2 cm
4. 2.0 cm
5. 2.4 cm



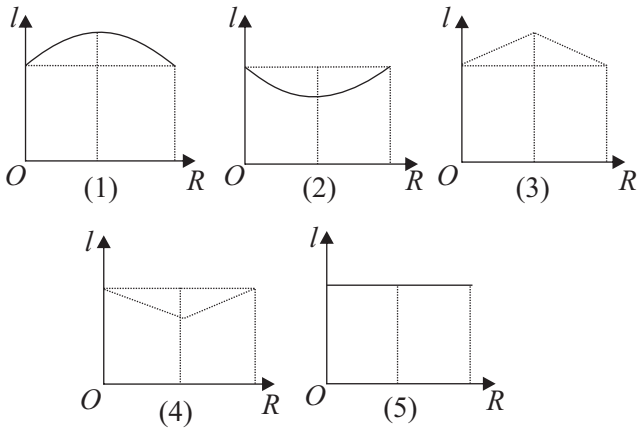
25) The resistance of a semi conducter decreases suddenly when the temperature increases The reason for this?
1. The Vibration frequency of atoms of the semi conductor
2. The amplitude of vibration of atoms of the semiconductor increases
3. Concentration of free Vectors of charges increases
4. Speed of motion of vectors of charges increases
5. The Speed of random motion of vectors of charges increases

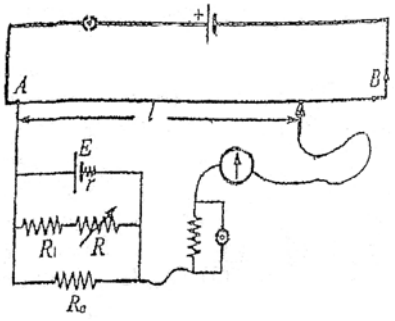
26) Consider the two movable capasitors connected at the centre in series, made of a strong metal of Length b The area of each plate is A The voltage between the outer plates V_o maintained to be constant what is the change in energy stored in the capacitor when the central part is removed.

1. $\frac{\in_o AV_o}{2(a-b)}\left(\frac{a}{b}\right)$
2. $\frac{\in oAVo}{2(a-b)}\left(\frac{b}{a}\right)^2$
3. $\frac{\in_o AV_o^2}{2(a-b)^2}\left(\frac{b}{a}\right)^2$
4. $\frac{\in_o AV_o^2}{2(a-b)}\left(\frac{b}{a}\right)$
5. $\frac{\in_o AV_o}{2(a-b)^2}\left(\frac{a}{b}\right)$



27) The value of R of the Rheostat is increased gradually from zero, in the voltmeter circuit shown in the diagram. The graph which Shows the change in the length of equillibrium is





28) The absolute temperature of a Black Body is increased by three factors. The correct statement / statements.

(A) The energy rediated by unit area at unit time is increased by 81 factor.

(B) The wave length of colour of high Concentration is decreased by 3 factor

(c) The intensity of the average radiation in infra red radiation decreased.

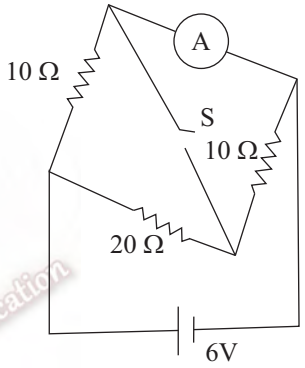
1. A only 2. B only 3. A and B only
4. B and C only 5. A, B, C all

29) The best explanation about the electromotive force of a Cell.

1. The energy provided by unit current
2. The rate of charge given by the cell
3. The rate of energy provided by the cell
4. The energy provided unit flow of charges by a cell
5. The energy provided by the cell by unit current

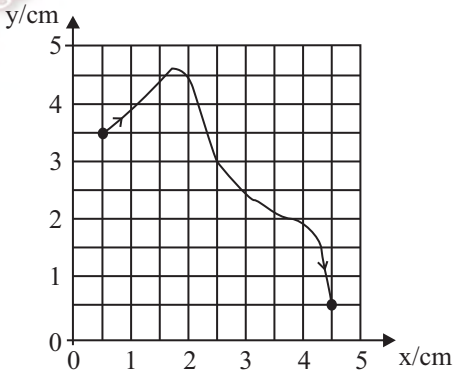
30) If the reading of the ammeter remains uncharged when clossing or opening the switch, what is the reading of the ammeter

1. 150 mA
2. 200 mA
3. 400 mA
4. 500 mA
5. 1000 mA



31) A part of a conductive wire is shown in the diagram. A magnetic flow density of 0.5 T acts inwards prendicular to the plane, The magnitude of the magnetic force action in the wire when 2A current flows through it.

1. 10^{3}N
2. $5x10^{-2}$N
3. $1.4x10^{-2}$N
4. $1.2x10^{-2}$N
5. 0.1 N



32) Consider the following statements regarding n - channel junction field effect transistor.

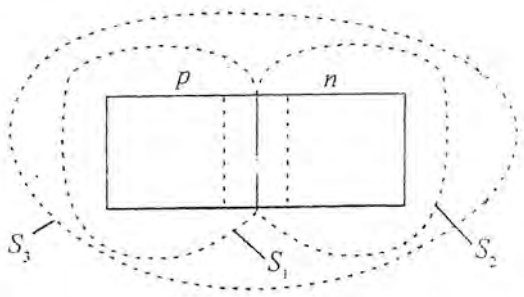
(A) The gate source voltage (V_{GS}) of the transisters is always made positive

(B) when V_{GS} decreases the follwing base emitter current will decrease

(C) The breadth of the depletion zone dominate the current flow though the transister. Among the state ments

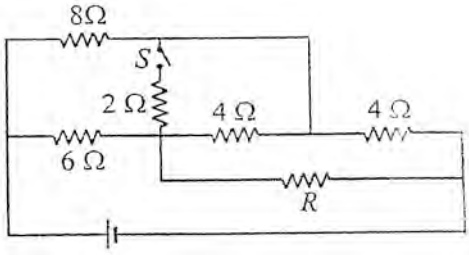
1. (A) only 2. (B) only
3. (A) and (C) 4. (B) and (C)
5. (A), (B), (C) all

33) p - n Junction diode is shown in the diagram S_1, S_2, S_3 three Gauss's Surfaces and the three cross Electric flux through these surfaces ϕ_1, ϕ_2, ϕ_3 which one given below is the true statement.



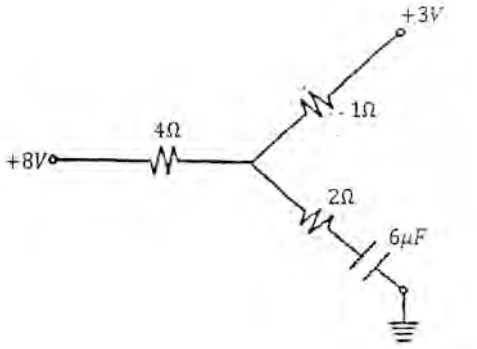
1. $\phi_1 > o,\ \phi_2 > o, \phi_3 = O$
2. $\phi_1 < o,\ \phi_2 > o, \phi_3 = O$
3. $\phi_1 > \phi_2 > \phi_3$
4. $\phi_1 = \phi_2 = \phi_3 = O$
5. $\phi_1 > \phi_2 \phi_3$

34) If the current flow through cell when the switch is opened or closed remained unchanged what is the value of the resister R



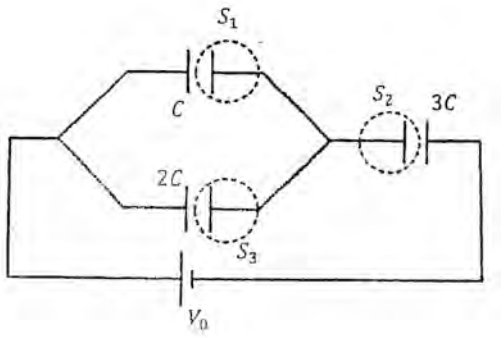
1. 2 Ω
2. 3 Ω
3. 4 Ω
4. 6 Ω
5. 8 Ω

35) The energy stored in the condensor shown in the figure



1. 12 μJ
2. 24 μJ
3. 36 μJ
4. 48 μJ
5. 60 μJ

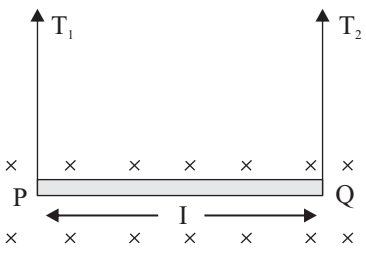
36)



The false statement about the Electic Flux through the surfaces S_1, S_2, S_3 of the Gauss's in the Circuit

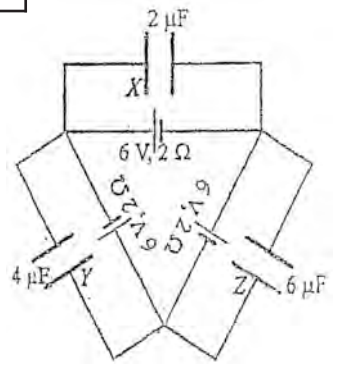
1. $\phi_1 + \phi_2 + \phi_3 = 0$
2. $\phi_1 + \phi_3 > O$
3. $\phi_1 + \phi_2 < O$
4. $\phi_3 = 2\phi_1$
5. $\phi_2 = -3\phi_1$

37) The centre of gravity P of a rod PQ of length $\phi_2 = -3\phi_3$ devides the length of the rod in 2:1. The rod is hung horizontally by two non - elastic threads at its ends as shown in the diagram. An even magnetic flux B is applied vertically to the rod. The current I Flows from P to Q. The tensions T_1 and T_2 in the threads respectively are



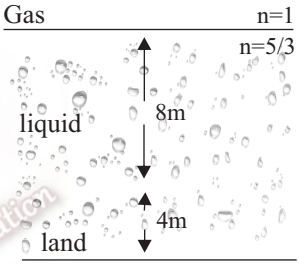
	(1)	(2)	(3)	(4)	(5)
T_1	$\frac{mg}{3} - Bll$	$\frac{mg}{2} - \frac{Bll}{2}$	$mg - Bll$	$\frac{mg}{3} - \frac{Bll}{2}$	$\frac{2mg}{3} - \frac{Bll}{2}$
T_2	$\frac{2mg}{3} - Bll$	$\frac{mg}{2} - \frac{Bll}{2}$	$mg - Bll$	$\frac{2mg}{3} - \frac{Bll}{2}$	$\frac{mg}{3} - \frac{Bll}{2}$

38) The charges in the capacitors in the circuit X, Y, Z are respectively



	(1)	(2)	(3)	(4)	(5)
X	12 μC	8 μC	24 μC	36 μC	0
Y	24 μC	16 μC	24 μC	24 μC	0
Z	26 μC	24 μC	24 μC	12 μC	0

39) A point luminus object O is placed in liquid of refract index 5/3 is shown in the figure. The radius of the dark region form at the bottom is



1. 4 m
2. 6 m
3. 9 m
4. 12 m
5. 15 m

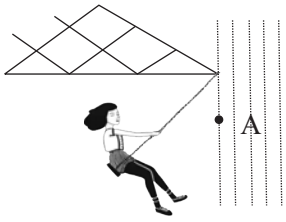
40) Two spherical water drops with the radious 1:2 ratio fall from a distant height. what will be the ratio of their moment un when they strike the ground.

1. 1:32 2. 1:16 3. 1:8 4. 1:4 5. 1:2

41) The correct sequence of changes in the factors function when the relative humidily of the at mosphere increase

	Rate of evaporation of water in an open Vessel	density of air	relative humidily
(1)	decreases	decreases	Increases
(2)	decreases	decreases	decreases
(3)	decreases	Increases	Increases
(4)	Increases	Increases	decreases
(5)	Increases	Increases	Increases

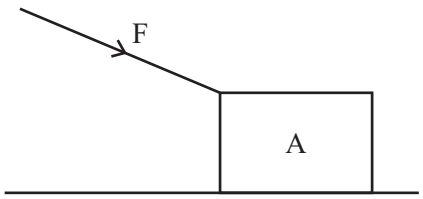
42) The figure shows a child swinging in swing which is tied to a roof. A block is placed at 1/3 rd of the length of the swing from the point where it is tied to the roof. The time of periodic movement of the swing is T When there is no blocking the time the child get wet when it is rainig if there is no block.

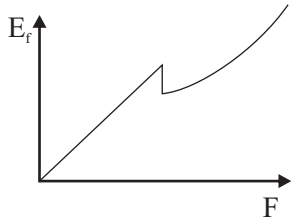


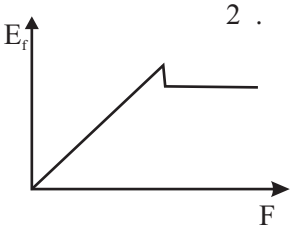
1. $\frac{T}{4}$ 2. $\frac{T}{\sqrt{6}}$ 3. $\frac{T}{\sqrt{3}}$

4. $\frac{T}{2\sqrt{3}}$ 5. $\sqrt{\frac{2}{3}}T$

43) A force F is excerted in a slant position on a body A which is placed on a rough horizontal plane. The force is increased gradually from zero, the body A starts to move Which graph shows the change in frictional force F_1 with respect to the force F.



1.


2 .


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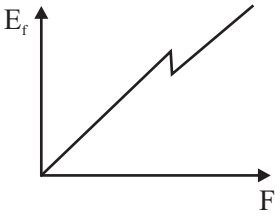
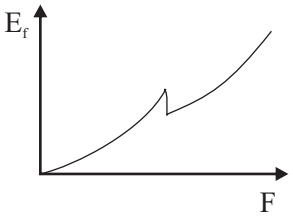
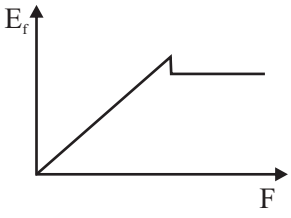


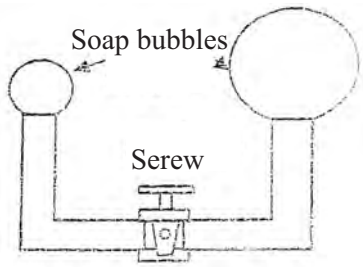
4.


5.


44) A tube which is opened at both ends resonates with a frequency of 440 Hz at 20°C. what will be the frequency of resonance on a day. when the temperatuer is 20°C and the velocity of Sound is 1% less than usual?

1. 414 Hz 2. 427 Hz 3. 436 Hz
4. 440 Hz 5. 453 Hz

45 The figure shows a glass tube with soap bubbles both ends. which statement / statements is are correct regrading to what happens when the screw is loosened?



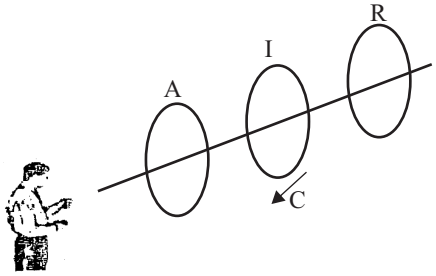
(A) The gass in the system moves from the small bubble to the big bubble

(B) The ratio of both bubbles become equal

(C) The surface energies of both bubbles become equal

1. A only 2. B only 3. A and B only
4. A and C only 5. all A, B, C

46) The figure shows an obersver and three rings. The central ring moves towards the observer with velocity u, at the same time a current I flows through it in anti clock wise direction. The ring A and B are stationary look at the following statements about the observations made by the observer.



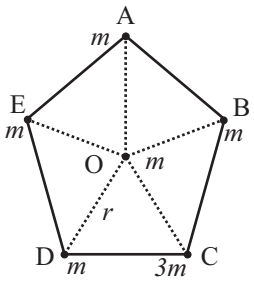
(A) A current flow in clock wise direction is induced in ring A

(B) A magnetic field is induced from A to B

(C) A current flow in anti clockwise direction is induced in ring B

1. A only 2. B only 3. A and B only
4. A and C only 5. all A, B, C

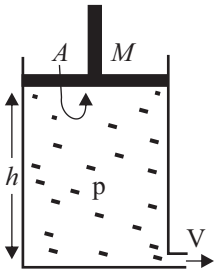
47) ABCDE is a regular pentagon. Mass m is placed at its four verteses. Another mass 3 m is placed at vertex C. The distance between the verteses and its center is r. what is the gravitational force acts on a mass M placed after center O



1. $\frac{GMm}{2r^2}$ 2. $\frac{GMm}{r^2}$ 3. $\frac{2GMm}{r^2}$

4. $\frac{3GMm}{r^2}$ 5. $\frac{7GMm}{r^2}$

48) A cylindrical vessel is filled with a liquid ρ to hight h. A piston with mass m and cross sectional area A is placed on it as shown in the diagram The velocity (V) of the liquid flows horizontally through the hole at the bottom is.



1. $\sqrt{2gh}$ 2. $\sqrt{2\left(gh+\frac{mg}{pA}\right)}$ 3. $\sqrt{2\left(gh+\frac{mg}{A}\right)}$

4. $\sqrt{2\left(gh+\frac{mg}{A}\right)}$ 5. $\sqrt{2\left(gh-\frac{mg}{pA}\right)}$

49) Look at the statements about 'the black hole'

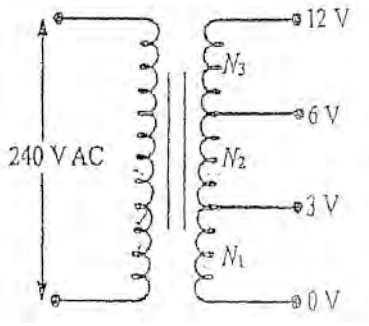
(A) Black hole is a region of high gravitational force, Therefore escape velocity takes the highest value.

(B) Asteroids travelling from other glaxisescanot be observed through teles copes because there may be black goles.

(C) A rotating object with electric charges is the black holes.

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

50) This is a transformer which can give an alternate current voltage the wire in the secondary coil is continuous is devided in to N_1, N_2, N_3 number of coils to get the out put voltage. If the no of coils in the primary coil is 1200 value of N_1, N_2, N_3 are respectively.



1. $N_1 = 15, N_2 = 15, N_3 = 30$
2. $N_1 = 15, N_2 = 30, N_3 = 30$
3. $N_1 = 15, N_2 = 15, N_3 = 60$
4. $N_1 = 15, N_2 = 15, N_3 = 60$
5. $N_1 = 30, N_2 = 60, N_3 = 90$

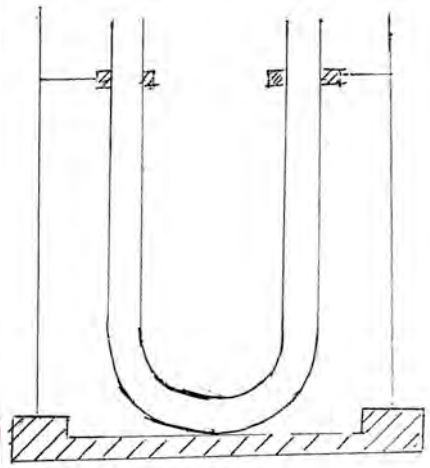
Provincial Department of Education
Northern Province
Pilot Exam - 2019
Grade - 13 (2019)

Physics - II	01 E II	Three Hours

Part A - Structured Essay

Answer all four questions on this paper it self **($g = 10N\ kg^{-1}$)**

1 The figure shows an experimental setup made by a Student in the school laboratory to compare the densities of two liquids. He has also placed a half meter rod.



a) 1. Explain an experiment to findout whether the two liquids are suitable for the experiment Before filling the tube and which liquid should be taken in the tube first.

.....

.....

.....

2. Enplain why is it necessary to carryout the experiment with the two liquids at the begining of the experiment.

.....

.....

b) *1.* Draw the possition of the two liquids as they were taken in the U tube. Mention the heights h_1, h_2 ($h_1 > h_2$) in the above figure.

2. Write the readigs to findout the value of h_1, h_2

(i) .....

(ii) .....

(iii) .....

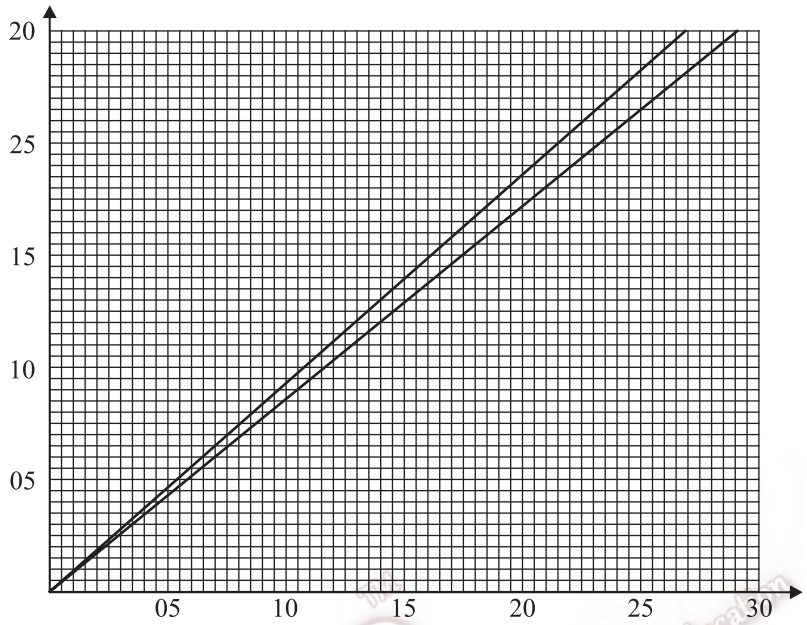
c) How should the plane of the setup be maintain edinorder to obtain the readings you obtain in question (b) How Can you find out the plane is in a correct position?

.....

d) When a straight line graph was drawn for the readings, The graph was included a intercept Mention the error which caused the intercept.

.....

e) The graphs drawn by the student according the readings is given below.



1. Mention the most suitable points selected by you from the more accurate graph using arrow marks.
2. Find the ratio of the densities of the two liquids

.....

.....

3. If water and mercury are used in the above experiment, Draw the graph using the above Xand Y ax is.

02 Conductivity of heat of a solid can be determined by using sherl's apparatus.

a) Mention the equipments other than sher's apparatus needed for this experiment.

1. ..... 4. .....

2. ..... 5. .....

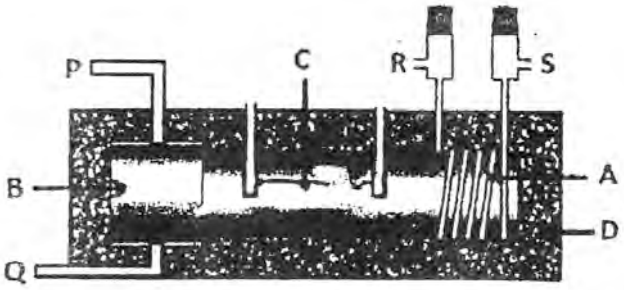
3. ..... 6. .....

b) This experimental setup can't be used to determine the heat conductivity of non conductors Explain.

.....

.....

c) The given figure shows sherls apparatus



1. Name letters A, B, C, D

A - .....

B - .....

C - .....

D - .....

P, Q, R, S denotes the gates for the entry and exit of water and steam

2. a. Which part involves in the entry of steam

.....

b. Which part is responsible for the releasing steam

.....

c. Write the reasons for your answers?

.....

.....

3. a. Which part pumps water in?

.....

b. Which part pumps out water?

.....

c. Write the reasons for your answer?

.....

.....

d. Draw the possitions of the Thermometers in the above set up.

e. 1. How can you confirm that the transformation of heat takes place across the rod?

.....

.....

2. If staple flow of water and steam are necessary to attain stability Exaplain the reason, (explain the precautions made in the experiments)

.....

f) The readings obtain in the experiments are shown below.
Thermometer readings :- 75.0°C, 61.0°C, 37.0°C, 28.0°C
The distance between the two thermometer :- 0.08 m
Mass of the water collocted in 3 minutes :- 0.4 kg
Area of the cross section of the rod :- 1.2×10^{-3} m^2
Specific heat Capacity of water :- 4200 J $kg^{-1}mol^{-1}$

Calculate the conductivity of the material used to make the rod

.....

.....

.....

03 A spring was hung vertically from its upper end and a variable mass M was hung at its lower end. The spring was made to oscillate vertically by extending it A student wanted to detemine the force constant (K) of the spring, measure to time for 20 oscillations for different valuse of mass M

a) *1.* What are the equipments needed additionally to carry out the experiment?

.....

2. Draw the diagram of the standard experimental setup for the experiment in the space given below.

b. *1.* Write an equation for the time of oscillation T for the mass M in terms of K and M.

.....

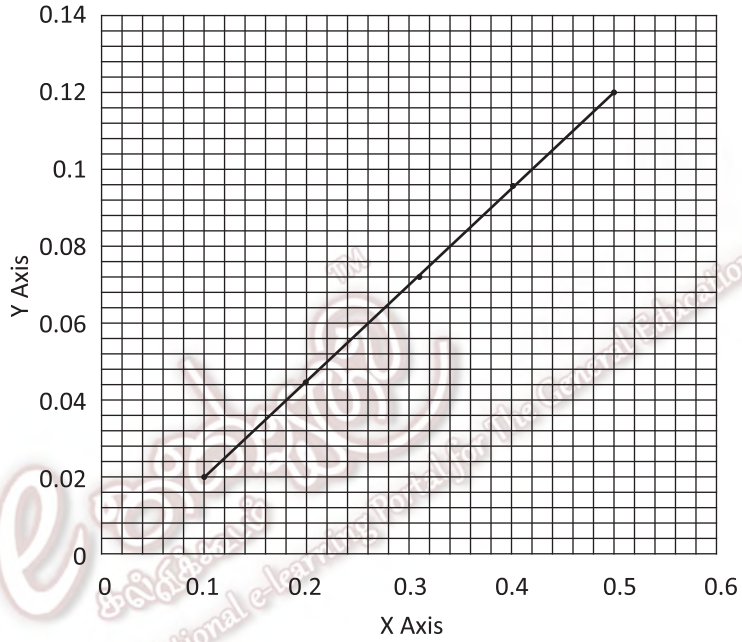
.....

2. Rearrange the equation in b (1) to determine the value of K by drawing a suitable graph.

.....

.....

c) Graph plotted y against x is shown below. All facters can provide in SI units.



1. Name the axis of the graph with units

X .....

Y .....

2. Calculate the value of K from the graph $(\pi^2 = 10)$

.....

3. Write the cordinates of the two points used to determine the value of K.

.....

d) The student did the experiment again using another spring with a high spring force constant. Draw an approximate graph on the same axis.

4. (a) A cell with internal resistance r and electromotive force E is connected to a circuit as shown the diagram.

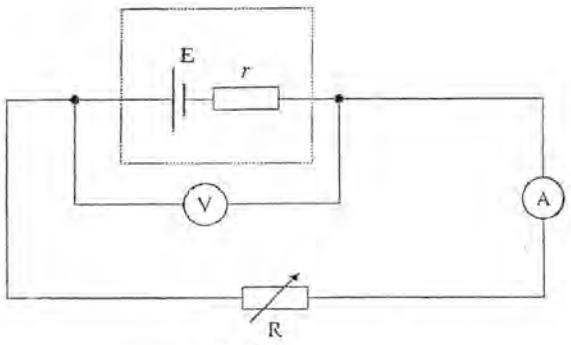


fig 4.1

The readings of voltmeter and ammeter were taken while changing the value of the variable resistor

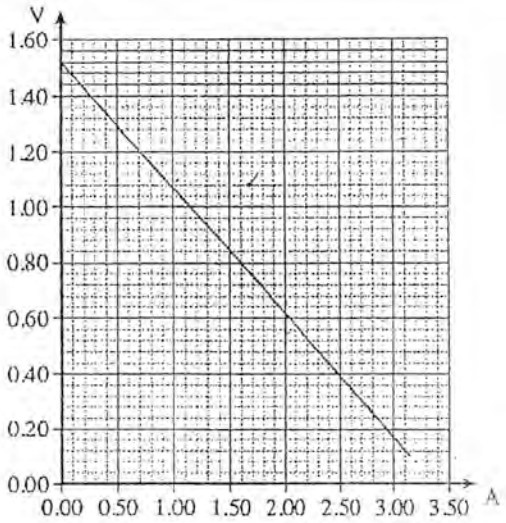


fig 4.2

(i) Explain why the readings of the voltmeter decreases with the increase of readings in the ammeter.

.....

.....

.....

(ii) Find the electromotive force and the internal resistance of the cell used the graph

.....

(iii) Draw suitable graphs in the same axis in the above graph during the following instances

1. Draw a graph by increasing the internal resistance twice while keeping the electromotive force constant and label it as 'A'

2. Keep the intenal resistance of the cell in its minimum value which is negliglble while keeping the electromotive force constant and Draw a graph and lable it as 'B'

(iv) The variable resister is adjusted to a suitable values inorder to obtain a current of 0.89A in the circuit shown in figure 4.1

1. What is the value of charge flows through the cell in 15 seconds?

.....

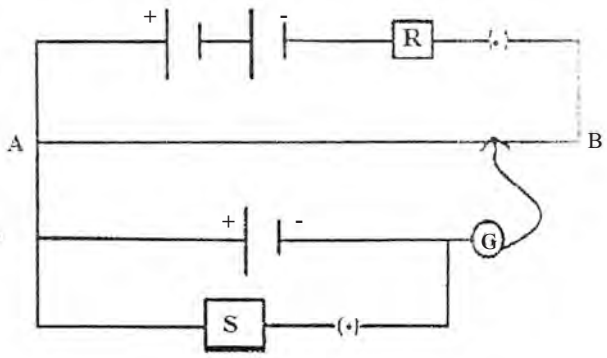
.....

2. What is the power wasted by the cell?

.....

.....

b. Two students X and Y have made a voltmeter circuit as shown in the diagram seperatly to conduct the following experiment.



உரு 3

Explian how the length of equillibrium changes during the following instances while maintaining the other factors constant and give the reason.

(i) Student X increases the valus of resistant R.

.....

.....

.....

.....

(ii) Student Y decreases the value of resistant S.

.....

.....

.....

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Physics II | **01** | **T** | **II**

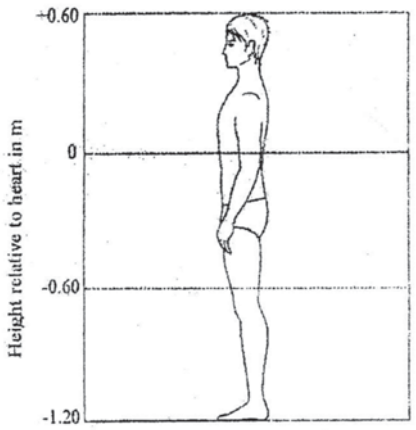
Part B Essay

Answer any four Questions

05 a. Human heart pumps blood into aota As a result the pressure inside arteries increases and decreases aleternatively Doctors diagnose the effect of diseases and body condition by measuring the pressure . In order to measure the blood Pressure the part of artery in the forearm is fted around by a rubber cuff. Then rubber cuff is pressed to increase pressure until the blood flow stops. The blood pressure at this stage is known as the systole pressure. It is recorded in mm Hg unit. Again the air inside the rubber culf is removed and the pressure when the blood flow begins is measured again. The pressure is known as the diastoline pressure. The pressure of a healthy adult is

$$\left(\frac{120(systolic)}{80(diastolic)}\right) mmHg \text{ (density of mercury is } 13600 kgm^{-3})$$

1. Write an equation for liquid pressure p at a depth of 'h' from the surface.
2. Write the blood pressure of a healthy adult in K pa.
3. Write the average (mean) arterial blood pressure in mm Hg.
4. The anatomic structure of a healthy adult is shown in the diagram. Density of blood is 1000 kgm^{-3}. The heights in relation to the upper arm are mentioned in the diagram. Write the average blood pressure in these positions
5. What is the systolic pressure on the feet?
6. Usually Blood pressure is measured in the upper arm. Explain why?



b. Blood flows from arteries in to veins via capillaries. So pressure inside capillaries is lower. In hospitable fluids such as platelet blood, Saline, liquid medicine are injected into the blood stream of patients.

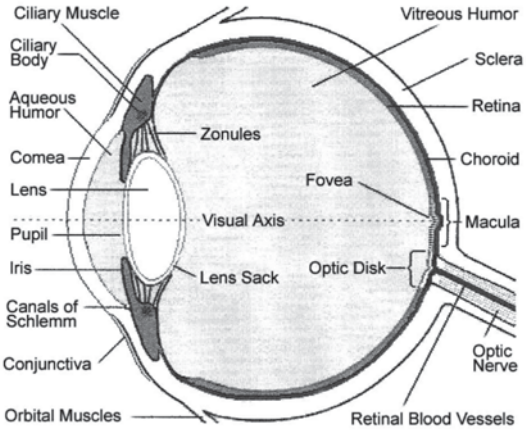
1. They are injected into veins write the reason.
2. If the blood pressure veins is 20mm Hg higher than the at morphemic pressure. what is the least height the fluid bags to be hung from the hand of the patient.

c. The diagram shows the structure of a strings used to inject liquid medicine into the vein. The liquid is pumped slowly into needle AB by a constant force D. The length of needle AB is 2cm Its radius 0.02cm. The time taken to pump 1cm^3 volume of liquid is 20 second and the.. in the broad tube is negligible and the diameter of the piston is 3.2 cm. $(\pi=3)$

1. What is the rate of flow of the liquid?
2. Draw the variation of a pressure from B to C

3. If the viscosity coefficients of the liquid is $6x10^{-3}$ Nsm^{-2} find the difference of pressure across AB
4. In order to maintain the amount of liquid send in 20s as 1 cm^3 what is the speed the pistond to be moved.

06



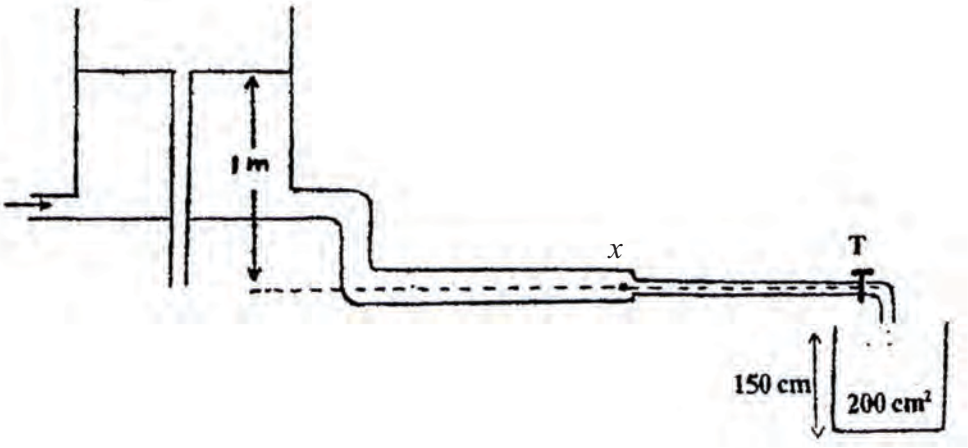
Human eye is a complex organ. Eye produces clear images with highest ranges and sensitive to small colour changes. It can be compared to the process takes place in a camera. It has higher sensitivity and has 576 mega pixel clarity. The outer layer is the camea
It's reflex index is similar to water. The region behind the lens is filled with a gel like fluid, If protects the eye and focuses the image. Other important parts are lris and pupil. Pupil is the darkened central part. Iris funtions like a camera hole and controls the diameter of the pupil profacts the pupil ..light ray the eye in high light intensity.

Retina senses the light reaches the eye. Light doesn't reflect at the pupil. That's why it appears black to others. Pupil is the center part parted inside the eye. Blue and brown eyes are the result of iris. However lens is the most important part of the eye. It reflects 30 % of the light. The lens filters most of the UV rays Lense. reduces the damages caused by UV rays and produce sharp images. Ciliary muscles changes the curvature of lens and helps in producing clear image for objects at different lengiths.

Retina is the screen in which images produced by the lens fall. It consist of 120 million rodells. and million cone cell, Rodcells sense the intensity of light. when the light intensity fulls it becomes impossible to feel the sense of light. Conceal identify different types of conceal which can trap light rays wilt short medium and longer wave long the

a. Some people have different eys colours. which part is responsible for this?
b. Write the to functions of cone cells.
c. What is the reason for pupil appears black?
d. "Man can't observe things inside water with out glasses clearly" Explain the physiological principal for this phenomenon.
e. When a child of 15 years, looking of a distant object the power of her/ his lense system is 50D. He was able to increase the power of lens by 14% find the least distance of his near point.
f. The diameter of eye of a normal person is 2.2cm. The high of letters in an advertisement board is 8.5mm. Find the hight of the image when he reads the letters from a distance of 5m.
(His eyes senses the clear image)
g. A short site person can't see objects beyond 2m. His near point 18 cm.
   1. To avoid this give the type of lens and its focal length.
   2. What will be the near point when he wears the spectacles?
h. The diameter of on eye of a person is 2.2cm (diameter of a healthy eye is 2.00 cm)
What type of defect he has? what type of lense he should wear and what is ti's focal length?

07 a) A system of tubes is connected to a tank of constant pressure the length of the wide tube is 0.8m. Its radious is 1 cm. The length of the narrow tube is 0.2m. Its radious is 0.5cm. A tap T was connected at the end of the narrow tube, The water level is as 1m height from the axis of the tube system. Atmosphere pressure is equal to 10m height of water colum. The viscosity coeffecient of water is $10^{-4}Nsm^{-4}$ and its density is $1000kgm^{-3}$, $\pi 3 = 3$

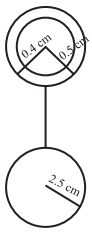


(i) Calculate the pressure at point X when the Tap is closed.
(ii) Calculate the pressure at point X when the tap is opened.
(iii) The cross sectional area of the tank is $200cm^2$ and height is 150cm. Calculate the time needed to fill the tank completely with water.

b) A metal sphere with radious 0.5cm and density $2000kgm^{-3}$ was slowly lowered into liquid from its surface.

(i) Calculate the initial acceleration of the sphere.
(ii) Calculate the terminal velocity of the sphere.
(iii) Assume that the sphere altain the final velocity at the moment it was immersed in the liquid. Calculate the time taken by the sphere to reaches the bottom.

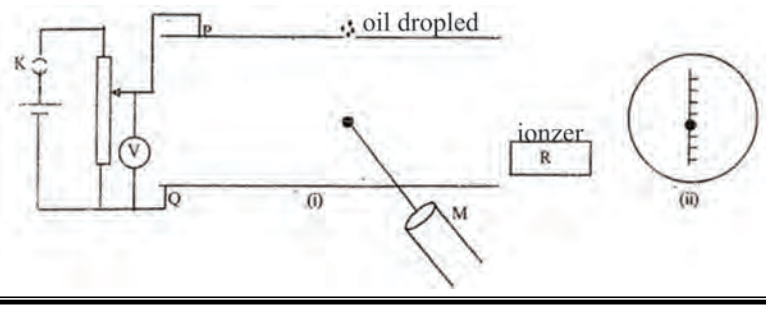
c) The above mention sphere is connected to another hollow sphere of inner radious 0.4cm and outer radious 0.5cm and made of the same material by a thin filament and slowly immersed into the liquid.



(i) Find the terminal velocity attained by the system.
(ii) Find the tension force in the filaments.

08 1. An experiment show 96500C electric change is needed for depositing 1 mole of. an element with valency one. Calculate the amount of charges carried by the ion on of the element. The avagadaros constant is $6.02x10^{23}mol^{-1}$.

2. Millikan has introduced an accurate method to measure the charge of an election e. The simple experimental set up used in the laboratory is shown below.



a) A ۱ / closing the switch K The

distance between the plate is d, An oil droplet was sent through the hole in the upper plate P into the space between the two plates P and Q and made to move. The experiment was carried out in a dark room while the oil droplet is illuminated and its motion is observed through a microscope m, with a vertical scale The droplet with mass m was observed to be at rest. Write an equation for the charge q of the oil droplet. The upthrust of the atmosphere is negligible. The voltage differs between the plates is V_O

b) In order to improve accurancy of the experiment switch K was opened, and it was observed that the droplet falls with a constant velocity Vo The radios of the droplet is a. The co-effecient of viscosity is η density of oil is ρ_a

1. Mark the forces act on the droplet
2. Write a simple formula relating these factors

c) The switch is was closed again, and a potential difference V is applied to make the droplet falls with a terminal velocity V

(ı) Mark the forces act on the droplet

(ii) Write an equation for q in relation to a, η, V, V_O, υ and d

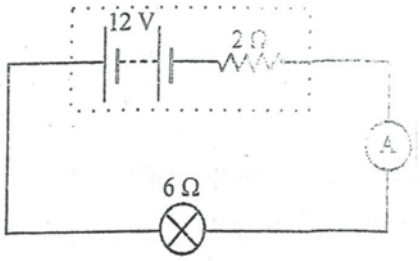
d) How does't the droplets get charged? What measures can be taken to confirm that all the droplets get charged?

e) Write an equation for the radius of the droplet?

f) The experiment was done with different droplets with charges q_1, q_2, q_3,.... which were calculated, what is the conclusion made from the experiment about the charges of the different droplets

09 **Answer part A or B**

A a. Two experiments were done by students by providing two different types of power supply for an electric bulb which has a resistance of 6 Ω



The circuit shows a power supply of E.M.V 12 V and 2Ω internal resistance is used to supply electricity to the bulb. Consider the ammeter used hear is an ideal one.

i. What is the reading of the ammeter
ii. The voltage supplied by the power supply
iii. The output power of the bulb

b. The bulb is connected to another power supply with the same E.M.V but a different internal resistance. The output power of the bulb is greater than that in question (a) (iii). If the resistance of the bulb remains the same, say whether the internal resistance of the new power supply is greater or equal or less than the previous one? Write the reason for your answer.

c. The two heating coils of an electric iron can be switched on separately using a switch, Three levels of temperature low, medium and high can be obtained using the switch. There is an indicator bulb which shows what type of temperature is attained. The circuit is shown in figure (1)

(i) When switch S_1 is closed the bulb glows with a power of 60 W. Find the current which flows though the bulb

(ii) Switch S_1 is open and S_2 and S_3 are closed.

1) Find the equivalent resistance of the two coils?
2) Find the total power production of the heating coils (element)
3) Which switch or switches are to be closed to get minimum temperatures

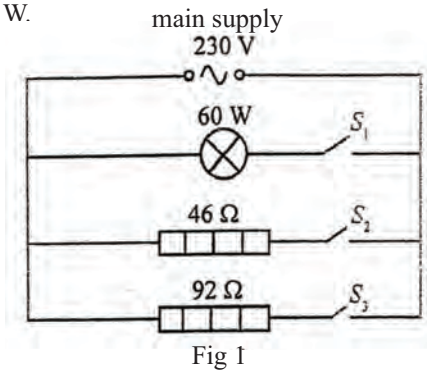


Fig 1

d. A circuit made by s student is shown in figure (2)

(i) Find the current through the circuit

(ii) Find the voltage difference across the bulb.

(iii) What changes can be made to control the power of the bulb?

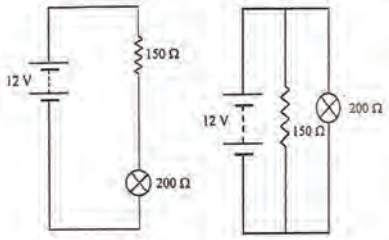


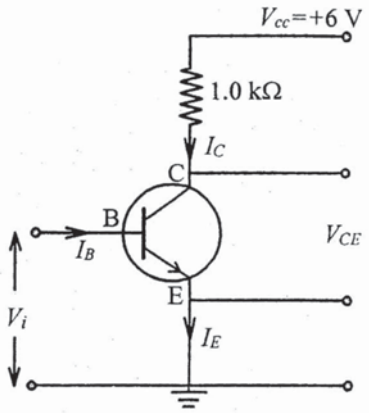
Fig 2 Fig 3

e. Changes were made in the circuit as shown in figure (3)

(i) What types of changes are made in the adjustment of the equipment?

(ii) Explain the power of the bulb by comparing it to the one in Fig 2

9B a. The figure shows the transistor in a common emiter transister It's the base - emitter voltage when (V_{BE}) $V_{BE} < 0.6V$ it takes switch off stage and when $V_{BE} > 1V$ it takes saturated stage



(i) A direct current voltage of 0.1V is supplied to input Vi. Calculate collector - emitter voltage and collector current (I_c)

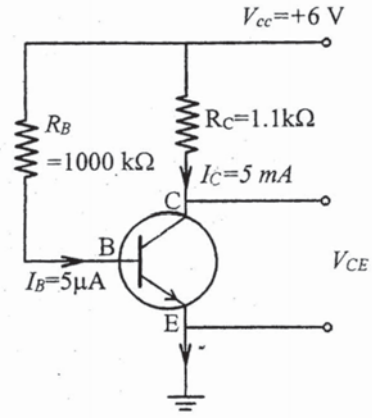
(ii) Calculate V_{CE}, I_C and when $V_1 = 2V$

(iii) Give the junctions when Vi = 0.1V and Vi = 2V at forward biased and backwardly biased stages respectively?

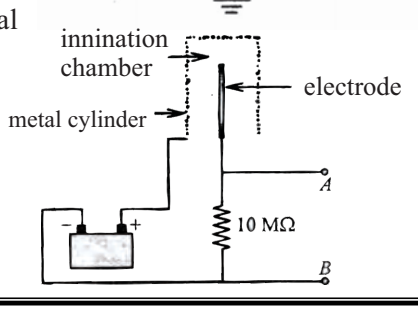
b. (i) Calculate Base - emitter voltage (V_{BE}) in the given circuit

(ii) Say whether this circuit can be used as an amplifier? Give your reasons clearly

(iii) If R_c was changed to 400 Ω and all other factors were unchanged write the answer for question b(ii)

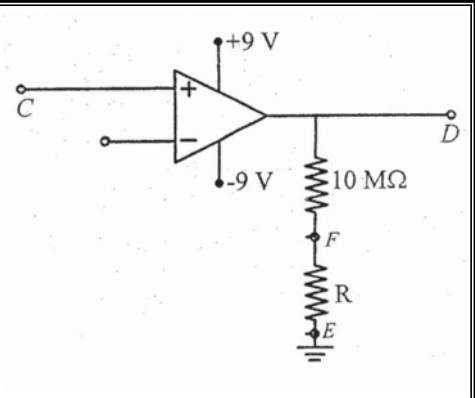


c. The figure shows an ionizing chamber which is used to find radiation. It contains a metal cylinder surrounding an electrode. Metal cylinder has a voltage of + 50V in relation to the electrode. when radiation enters the chamber the air inside undergoes ionization resulting in a small increase of current through10M Ω resister. This current is directly proportional to the radiation



(i) The current sensed by the sensor is $2x10^{-10}$ A What is the voltage across is 10M Ω resister?

(ii) If the voltage difference is 200m V. If a voltage what can show a full voluation, What will be the factor causing voltage amplification.



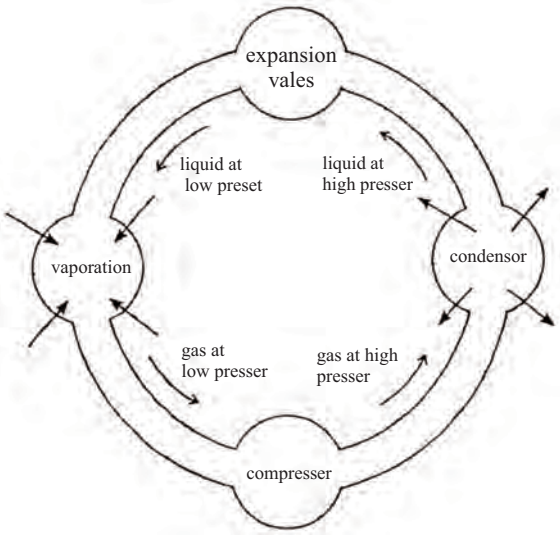
(iii) A non inverting amplifier is used to a amplify the above voltage. In complete inverting amplifier is shown in the figure. Copy this in your answer sheet, complete it, and say to which terminals the A, B should be connected and how would you connect the terminals of the voltmeter to the terminals of the amplifier

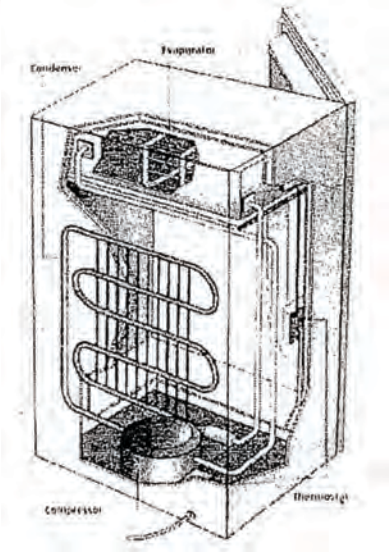
(iv) Calculate the relevant value of R for the voltages gain you obtained?

(v) 5kΩ, 10 k Ω, 50k Ω, and100k Ω resistor are provided to connect R at Which resistor resistors could be used to measure the voltage with higher sensitivity. If you use it to connect two resistors, give reason for your answer.

10 **Answer part A or B**

A) Food and medicine are kept in refegerators for a long time to prevent spoilage. The structure and mechanisms are illustrated in the figures given below.





The basic functional mechanism is compression, condensation and evaporation. In the part where compression takes place a piston moved by an electric motor compress the gases which is then sent through a condensation tube (The capillarity tube at the end of the condenser compressed the gass immediately) When the gass is compressed its temperature increases when the gas flows through the tube the heat is lost to the environment by conduction. Convention and radiation Conducting wires and plates are used to increase the surface area hence increases the rate of heat loss. When heat is lost the gass condenses into liquid. The specific feature of the gass used in the condenser is that it has the ability to be condensed into liquid at room temperature.

the gass which reaches the terminal of the capillary completely turns into liquid at room temperature. The liquid at high pressure turns into lower pressure (6 atm). It Starts to boil at the lower pressure. As the latent heat needed for this is obtained from its internal energy the temperature of the area starts to decrease. The gasses is sent to the condensation area. Again. This cycle process continues.

Refrigerator removes heat from high temperature area to lower temperature area, So It can be considered as a reverse engine.

The external work done by electric energy supplied to basic power supply W, and the heat obtained by the liquid and compressing part Q_2 are lost to the environment by the cooler

The process take place in the air conditioner is also similar the above process. The air inside the closed room is brought by an electric fan sent to the cooler. The temperature becomes Ice point water vapour is condensed and removed. So air at room temperature with less humidity is sent to the room by a device.

a. (i) Write to features of the gass found in the cooler?

(ii) Explain the temperature of a gass increases during adiabatic compression with the help of the 1st law of the thermo dynamics.

(iii) If the compressor tube is made of copper its surface should be darkened. Explain?

(iv) The compressor tube is fixed at the outer surface of the cooler. Explain?

(v) Write the reason for keeping the vapourization dence at the upper part of the cooler

(vi) If rate of external work done is W, the power received by the cooling part is Q_z what will be the rate of heat loss to the envoirment

(v) The co efficient of performance of the cooler is given as $E = \frac{Q_2}{W}$ The gass used in the cooler is an ideal gass $E = \frac{T_2}{T_1 - T_2}$ T_1 is the highest and T_2 is the lowest temperatures

.

(i) Heat is transformed from the cold part at 10^oC to the hot part at 30^oC at a rate of 263 W consider the gass used in this cooler as an ideal gass find the power of consumption?

(ii) Although the door of the cooler is closed tightly power supply takes place very of len due to the small exchang of heat from the environment. Draw a graph to show how the power consumed by the cooler changed with time?

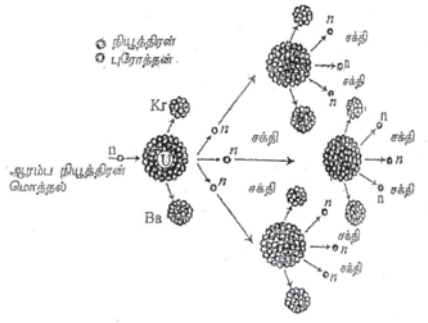
(iii) If the door of the cooler (or air conditioner) is opened in a room which is highly is insulated to heat, say whether the temperature of the room will decrease or not? Explain

(iv) The temperature of a closed room is 30^oC and its humidity is 80%. An air conditioner is switched on to decrease the temperature of the room to 20^oC and the relative humidity was made to suitable value. If the mass of condensed water during this period is 77.5g find the relative humidity of the room.

Density of saturated water vapour at $30^oC = 30 \times 10^{-6}\ kg\ m^{-3}$

Density of saturated water vapour at $20^oC = 17 \times 10^{-6}\ kgm^{-3}$

B) The bond between proton and a neutron in an atom is very strong when this bond is broken a very large amount of energy is produced. This phenomenon is large as nuclear reaction.



$$\frac{238}{92}U + {}^1_0n \rightarrow {}^x_{56}Ba + {}^{92}_yKr + 3{}^1_0n + \text{Power}$$

A heavy nuclei split into many small nuclei is known as nuclear fission when uranium $^{235}_{a2}U$ is bombard by a neutron with a high velocity, Nuclear fission takes place and Radioactive elements like Ba, Kr and three neutrons and large amount of energy is released. These neutrons further collide with many uranium nuclei and continues as a chain of reactions The loss of mass is converted into energy according to Einstein equation $E=mC^{2.}$ Here C is the velocity of light in the air

The atomic mass unit (u) is used to measure small masses 1 u = 1.66×10^{-23}kg

u Nuclear mass of u = 235.0439 u
Ba Nuclear mass of Ba = 137.9050 u
Kr Nuclear mass of Kr = 94.9 u
n mass of nuclears = 1.008665u

The nuclear mass of $^{235}_{a2}U$ can be give as 235 u

In nuclear power plants nuclear reaction occur under controlled condition and the heat energy released is converted into electric energy.

In nuclear power plant an outer concrete protective wall and an inner thin lead wall are constructed to prevent the leakage of α, β particles and r rays, emitted from unstable Ba, Kr atoms. Radioactivity is defined as the rate of radiations emitted from a radioactive element in one second. It is also known as decay

The activity of a radioactive element is given as in the following formula $R = \lambda N$. Here n is the number of radio active nuclei in the sample and λ is the decay constant.

$\lambda = \frac{0.693}{T_{\frac{1}{2}}}$ $T_{\frac{1}{2}}$ is the half life times of the radio active element.

The half life time of Krypton (Kr) is 15minutes. The radiation emitted from radioactive element are damgerous to human body. They cause different types of illness. These are known as health hazards. IJ radiation energy absorbed by kg of a living body is known as 1 grey radiation dose 1 Gy = 1 J kg^{-1} If the value of radiation does exceeds 20 Gy. It will lead to sudden death. If it is 3.5 Gy bodies immune system will get affected. Therefore living beings should be protected from radiation.

a. (i) Find the value of *x, y* in the above mentioned nuclear fission reaction?
(ii) What is the loss of mass in the uranium nuclear fission reaction?
(iii) How much of energy is released during the nuclear fission reaction of uranium?
(iv) 120 GW Electrical power is produced from the atomic power plant. How much of Uranium is need to produce this amount of energy A vagadoces constant = 6.022×10^{23}

b. (i) Write the characteristic features of α β articles and γ rays?
(ii) Give an example for sensors of radiation
(iii) Write the nuclear equation for the emission of β particles?

c. (i) What do you understand by the half life time of a radioactive element.
(ii) What is the number of nucleus found in 60 μg radioactive sample of ^{95}Kr
(iii) What is the initial function of Radioactive sample?
(iv) Write the uses of radio active elements in the field of medicine, engineering and agriculture?
(v) Write three precaution made by you to protect yourself from radiation when you are engaged in radio active experiments?