WESTERN PROVINCIAL DEPARTMENT OF EDUCATION 01 E I

GENERAL CERTIFICATE OF EDUCATION ADVANCED LEVEL
PREPARATION PROGRAMME - 2022

Subject - Physics | **Paper I** | **Time - 02 hours**

01. Out of the following in which quantity has the similar dimensions.
    1. Frequency 2. Power 3. Force
    4. Energy 5. Angular moment

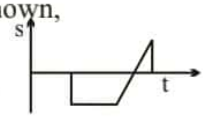
02. There are 50 parts of vernier caliper which is attached to a mobile microscope. This is equal with 49 parts of main scale. What is the smallest measurement in vernier calliper.
    1. 1/50 mm 2. 49/50 mm 3. 1/100 mm
    4. 49/100 mm 5. 2/100 mm

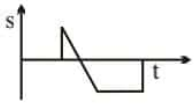
03. A lift with a mass of 1000kg goes down with a $5ms^{-1}$ uniform speed, comes to rest after 10m of uniform deceleration. If friction is negotiable , what is the tension attached to the cable when it decelerates ?
    1. 7500 N 2. 8750 N 3. 10000 N
    4. 11250 N 5. 12500 N

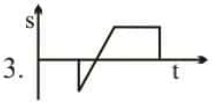
04. A 100 kg mass within 2 seconds pulled to a higher position by a electric mortor. Find the minimum power needed it.
    1. 2000 kW 2. 1000 kW 3. 200 kW
    4. 100 kW 5. 10kW

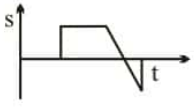
05. The range of horizontally projected is doubled as its maximum height. What is the project angle?
    1. $\tan^{-1}(4)$ 2. $\tan^{-1}(1/4)$ 3. $\tan^{-1}(1)$
    4. $\tan^{-1}(2)$ 5. $\tan^{-1}(3)$

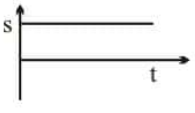
06. The following diagram shows how a pulse travelled along a streatched coir. The displacement (s), with time (t) on the place indicated at 'p' is correctly shown,

1. 

2. 

3. 

4. 

5. 

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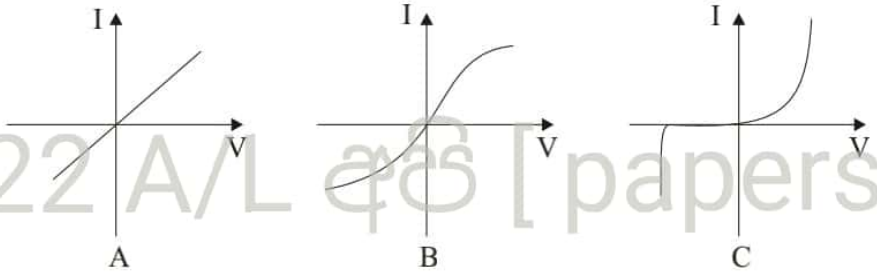
07. $^{220}_{86}X$ is a radio active element. During the decay it emits two α particles and two β particles and forms new element. What are the values for A and Z.

1. A - 218 Z - 84
2. A - 216 Z - 84
3. A - 212 Z - 82
4. A - 216 Z - 82
5. A - 212 Z - 84

08. Conside the following graphs,



of these , those that most suitable equipment for V - I characters, (V - Voltage, I - Current)

	A	B	C
1.	Transistor	diode	Filament bulb
2.	resistors	Filament bulb	transistor
3.	resistors	Filament bulb	diode
4.	transistor	resistors	diode
5.	resistors	diode	transistor

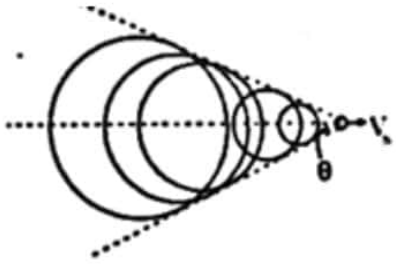
09. A telescope has a magnifying power of 20 when it is in normal adjustment. It ' s net length is 52.5 cm. If its eye piece is taken as a simple microscope when it is in normal adjustment and its near point is 25cm, what is the angular magnification of it?

1. 5 2. 6 3. 8 4. 11 5. 12

10. 2400mc charge is flowed through a metallic coil of $1cm^2$ cross area in 20 seconds. Find the current that flows through the coil in amperes,

1. 1200 2. 120 3. 12 4. 1.2 5. 0.12

11. An aeroplane Vs (Vs > V) travels with supercausal / superluminal speed. Mac number of the aeroplane is 3. When it forms mac cone θ is its half angle. The value of θ is .



1. $\sin\theta = 3$
2. $\cos\theta = 3$
3. $\cos = 1/3$
4. $\sin\theta = 1/3$
5. $\tan\theta = 1/3$

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12. What is the minimum time taken to boil 2kg of water from 20°C to boiling point using 1.5kW immersion heater ? (Specific heat capacity of water is 4200 $Jkg^{-1}k^{-1}$)

1. 3.7 min 2. 7.5 min 3. 8.5 min
4. 10.2 min 5. 15.0

13. Consider the following statements on vapours.

A. When the temperature increases during absolute humidity high, the relative humidity can be decreased.

B. When humidity of air is high the density of air is increased.

C. When relative humidity is 100%, at dew point saturated vapour pressure becomes half compared to vapour pressure at room temperature .

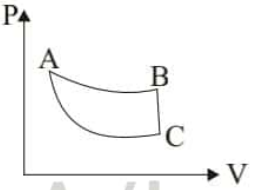
Out of the above , What is the true statement,

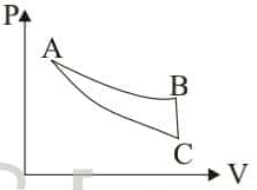
1. A Only 2. B only 3. A and B
4. A and C 5. A, B and C all

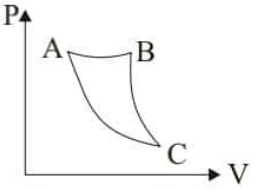
14. The intensity of 80dB siren is heard by him after passing 10m from the ambulance, What is the distance that he should pass the ambulance to hear half of the initial sound intensity ?

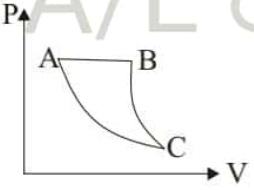
1. 20 m 2. 100 m 3. 10 km 4. 200 m 5. 1 km

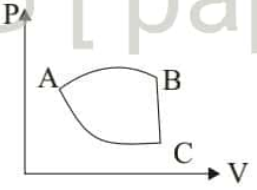
15. AB is an isothermal process. BC is a contant volume process & AC is adiobatic process. The graph which shows these three processes correctly.

1. 

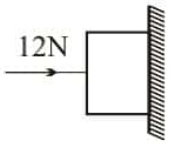
2. 

3. 

4. 

5. 

16. According to the diagram given a cube of 5N mass is pulled against horizontal wall by 12N force. If the cube remains stationary what is the magnification of the force exert by the wall against it.



1. 17 N 2. 13 N 3. 12 N 4. 7 N 5. 5 N

17. It is heard 15 pulses when A and B tuning forks vibrates at the same moment. Lead is applied to a one side of the B tuning fork and heard 10 pulses. The frequency of tuning fork A is 256 Hz, After apply lead an B tuning fork and when it vibrates together with the frequency of 252 Hz another source of sound find the number of pulses that can be heard,

1. 12 2. 11 3. 7 4. 6 5. 0

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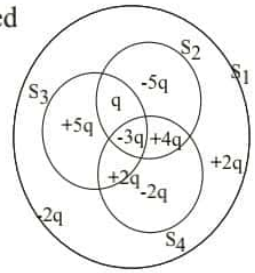
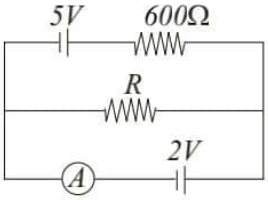
18. Conside the following statement on photones emmited at stimulated emmision,
    A. The frequency of the photone used for stimulation is equal to the photone released.
    B. Stimulated photone has more energy than the photone used for the stimulation.
    C. Born used photone for the stimulation and stimulated photone travels towards same direction.
    1. A Only. 2. A and B only. 3. A and C only.
    4. B and C only. 5. A, B, C all.

19. Which answer shows correctly the resultant flux across closed surfaces S_1, S_2, S_3, S_4 shown in the figure.



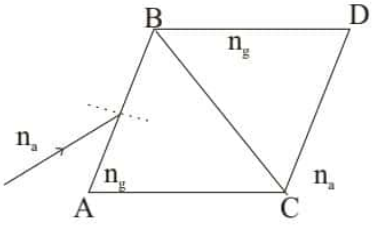
    1. $S1 > S2 > S3 > S4$
    2. $S_2 > S_3 > S_4 > S_1$
    3. $S_1 > S_4 > S_3 > S_2$
    4. $S_2 > S_1 > S_3 > S_4$
    5. $S_3 > S_4 > S_1 > S_2$

20. 

Internal resistance of cells showing the circuit is very less and considered uncountable. If A shows Zero reading find the resistance of R in Ω

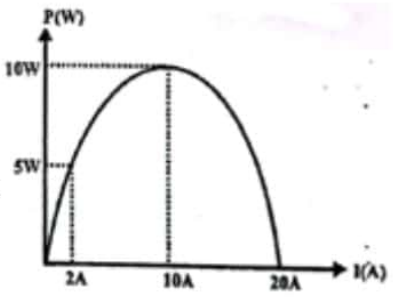
    1. 240 2. 300 3. 400
    4. 440 5. 500

21. what is the angle of the emergent ?
    The following diagram indicates two equivalent triangle prisons placed together.
    A monocromatic ray is incident to CD side.
    When this light ray emergent to air , find the angle between the normal and the emergent angle (ng > na)



    1. (90 - θ) 2. θ 3. $\text{Sin}^{-1}\left[\frac{na}{nw}.\sin(90-\theta)\right]$
    4. $\text{Sin}^{-1}\left[\frac{na}{nw}.\cos\theta\right]$ 5. $\text{Sin}^{-1}\left[nw.\sin(90-\theta)\right]$

22. A circuit has made by connecting a variable resistor to the terminals of a cell. The electric current that flows through the circuit is changed by providing different values from the variable resistor. The following graph shows the electric current that changes with the out put power. Find the Electro motive force and the internal resistance of this.



    1. 2v , 0.1Ω 2. 1v , 0.1Ω
    3. 3V, 0.2 Ω 4. 2V, 0.2 Ω
    5. 1V, 0.2 Ω

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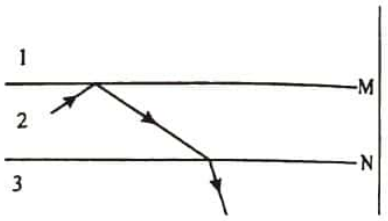
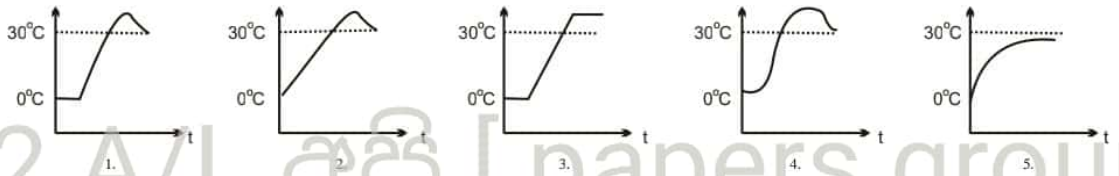
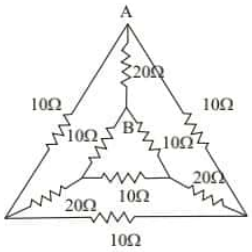
23. M and N are two boarders that separate three different mediums. The diagram shows the a light ray that refract after total internal reflection. The correct relationship that shows velocities of light in three different medium is.., (velocity of light in 1,2,3 media are v_1, v_2, v_3 respectively)



1. $V_1 > V_2 > V_3$
2. $V_1 > V_3 > V_2$
3. $V_2 > V_3 > V_1$
4. $V_3 > V_1 > V_2$
5. $V_3 > V_2 > V_1$

24. At time t=o , a calori meter that contains a mixture of ice and water of 0^0c is introduced a 100^0c metallic globe. The room temperature is 30^0c . In which graph shows the variation of the temperature of calori meter $(T)^0$c and time (t)

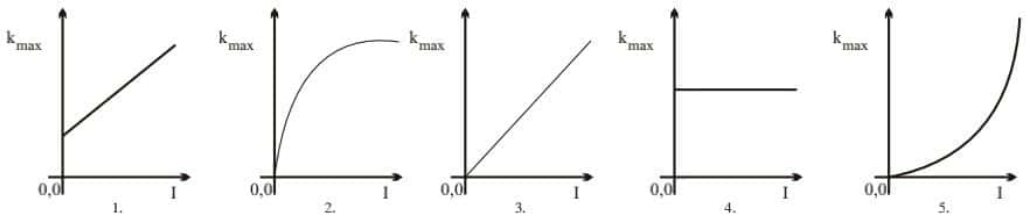


25. 

What is the equivalent resistance between A and B in the given system of resistance.

1. 10Ω
2. 40Ω
3. $\frac{40}{7}\Omega$
4. $\frac{60}{7}\Omega$
5. 50Ω

26. At time t=o , a calori meter that contains a mixture of ice and water of 0^0c is introduced a 100^0c metallic globe. The room temperature is 30^0c . In which graph shows the variation of the temperature of calori meter $(T)^0$c and time (t)



27. When a wire loop is taken out from a soap solution a soap membrane can be seen, A loop made out of 6.28 cm length thread is kept slowly over the above mentioned soap membrane. Later using a needle the soap membrane is pinned. Then the loop made by using the thread is taken a circular shape. If the surface tension of soap solution is 0.03 Nm^{-1}, What is the tension of the thread ? ($\pi = 3.14$)

1. 3×10^{-4} N
2. 3.14×10^{-4} N
3. 6×10^{-4} N
4. 9×10^{-4} N
5. 12×10^{-4} N

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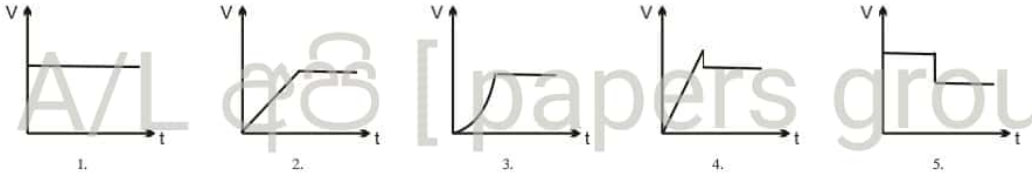
28. What is the extreme speed of one air bubble, if an air bubble is moving upward in a lake with a extreme speed of X0 break in to three ideal bubbles.

1. $3\,x_o$ 2. $\frac{xo}{3}$ 3. $\frac{3^{2}/_{3}}{xo}$ 4. $3^{2}/_{3}\,x_o$ 5. $3^{-2}/_{3}\,x_o$

29. What will be velocity time graph of an object dropped/ rough slowly and horizontally on to a rought uniform belt which is moving with a constant velocity



30. What is the total change of momentum of a gas molecule when it is moving with velocity and collide with a surface waking 60° incident angle and reflect with the same angle.

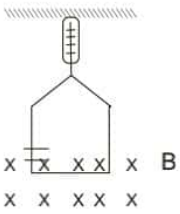
1. $m\,v/2$ 2. $\sqrt{3}\,mv/2$ 3. mv 4. $\sqrt{3}$mv 5. 2mv

31. A particle with 2m radius moves with a constant velocity of rotational period (T) what is the acceleration towards the center of the circle.

1. 1/2ms-2 2. 2ms-2 3. 8ms-2 4. 2π2ms-2 12N 5. 8π2ms-2

32. A metal loop is has a R radius, A rod made of some metal fixed to the loop through its diameter. The circumference of the loop is in creased by X when there is a temperature change find the diameter angle that deflects in radian.

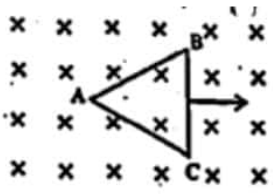
1. $\left(\frac{x}{r}\right)$ 2. $\left(\frac{x}{x\text{-}r}\right)$ 3. $\left(\frac{x}{x+r}\right)$ 4. $\left(\frac{2\pi x}{r}\right)$ 5. 0

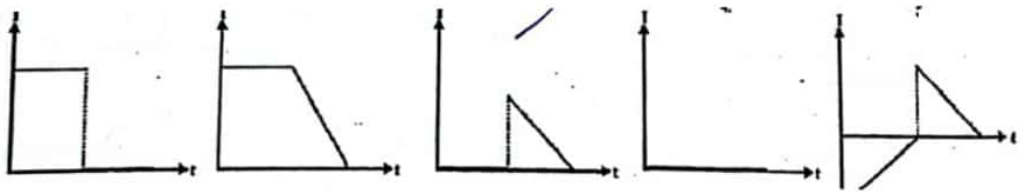
33. 

Spring balance reading is 1.44 N. What is the spring balance reading if there's no current flowing through it.

1. 1.42 N 2. 1.48 N 3. 1.50 N
4. 1.52 N 5. 1.54 N

34. ABC is an equilateral triangle conductive loop. It is pulled towards the direction indicated with v velocity from the point shown in the graph and away from the magnetic field. Select the graph which varies with induced current and time.





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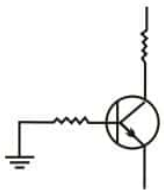
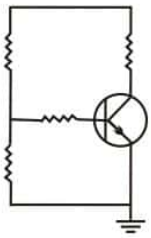
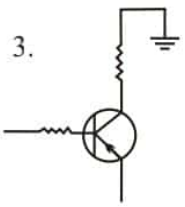
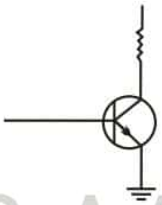
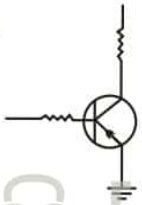
35. Which of the following transistor circuit correctly displays the forward bias circuit.

1. 

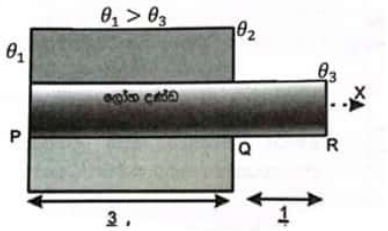
2. 

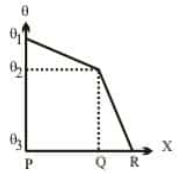
3. 

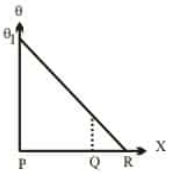
4. 

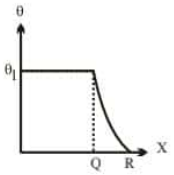
5. 

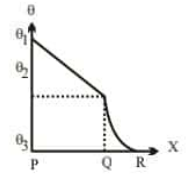
36. 3/4 length of metal rod is covered well and 1/4 is kept exposed to air. which of the following graph correctly shows the temperature change (θ) at continuars :

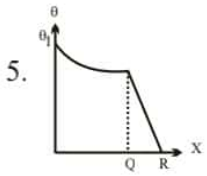


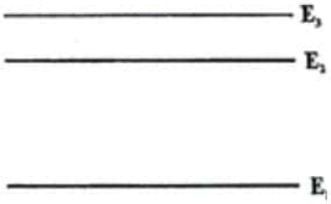
1. 

2. 

3. 

4. 

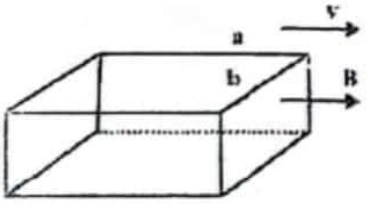
5. 

37. 

The following diagram shows three energy levels which are used to produce laser rays. [$E_1 < E_2 < E_3$] . What is the wave length of the laser ray. [h - plank constant c – velocity of light].

1. $\frac{(E_2 - E_1)}{h}$
2. $\frac{(E_3 - E_1)}{hC}$
3. $\frac{hC}{(E_2 - E_1)}$
4. $\frac{hC}{(E_3 - E_1)}$
5. $\frac{hC}{(E_3 - E_2)^C}$

38. A wire frame which has a cuboid shape with given lengths moves in a B magnetic field with V velocity towards the direction of the magnetic field. What is the maximum electro motive force induced in a given side ? (a > b)



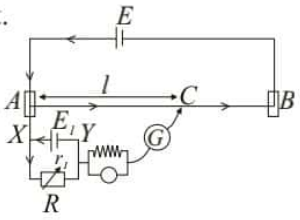
1. Bav
2. Bbv
3. B (a+b)v
4. 0
5. $\frac{B(a+b)}{ab}$ v

Seen on Page 08]

39. Satallites moves 2R and 3R distance away from the surface of the earth. R is the radius of the earth what is the acceleration of satellites to words the earth in ratio?

1. $\frac{3}{2}$ 2. $\frac{2}{1}$ 3. $\frac{4}{9}$ 4. $\frac{16}{9}$ 5. $\frac{4}{3}$

40. Below given is a counterpoised arrangement of potential meter circuit, Which is used to find internal resistance of a cell. Out of the following find the correct statement.



A. Potential difference of xy is less than AB.
B. Electro motive force of E1 cell is more or less the voltage between A and B.
C. (+) terminal of AB Voltage should be connected to (-) terminal of XY.
D. A constant current should be kept in the potential meter circuit.

1. A, B, C 2. B,C,D 3. A,C,D 4. A,D 5. C, D

41. Two strings which has equal lengths and equal cross area show Y_1 and Y_2 young modules respectively. When they are connected series and M load is suspended X is the strain it shows. IF Two strings connected parallely and suspended m mass, to obtain some x strain that should be the m,

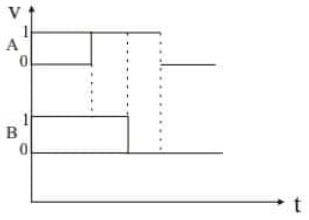
1. $\left(\frac{Y_1 + Y_2}{Y_1\ Y_2}\right) M$ 2. $\left(\frac{Y_1 + Y_2}{Y_1\ Y_2}\right)^2 M$ 3. $\frac{(Y_1 + Y_2)^2}{Y_1 Y_2} M$

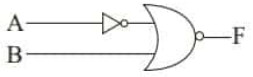
4. $\frac{Y_1\ Y_2}{Y_1 + Y_2} M$ 5. $\frac{Y_1\ Y_2}{Y_1^2 + Y_2^2} M$

42. A sportsman can jump 1.5 high from the earth. What is the height he can jump from a planet which has 1/8 of mass and 1/4 th of radius of the earth?

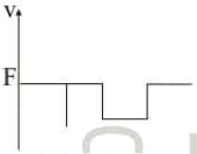
1. 0.75 m 2. 1.5 m 3. 3m 4. 6m 5. 2.5 m

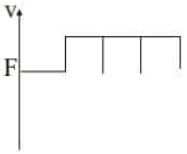
43. What is the correct output signal for the electric signal given by the input logic gate given below.

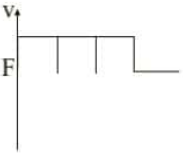


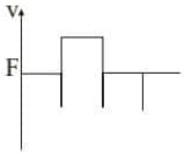


1. 

2. 

3. 

4. 

5. 

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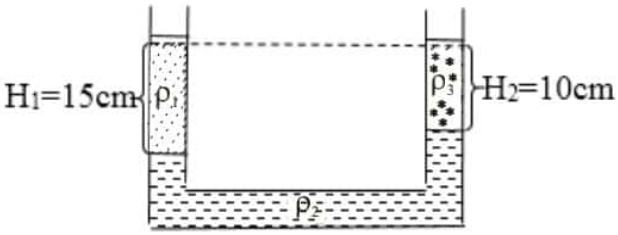
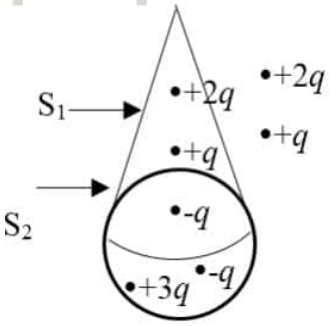
44. There are three liquids with three different densities p_1,p_2 and p_3 in u shape vessel. Out of the following which one shows the correct relationship among these liquids with different densities?



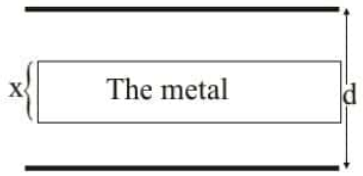
1. $3\rho_1 = 2\rho_3 + \rho_2$
2. $\rho_3 = 2\rho_1 + 3\rho_2$
3. $2\rho_3 = 3\rho_1 + \rho_2$
4. $\rho_1 = 3\rho_1 + 2\rho_2$
5. $\rho_3 = \rho_1 + \rho_2$

45. S_1 a cone of a surface and its base radius is r and height is 3r. S_2 is a circular surface with r radius what is the ratio of

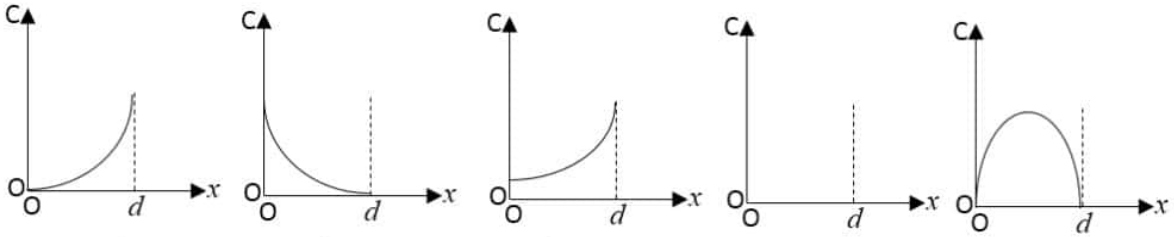
$$\frac{S_1 \text{ travels through net electric flux}}{S_2 \text{ travels through net electric flux}}$$



1. 1
2. 2
3. 4
4. 15
5. 16

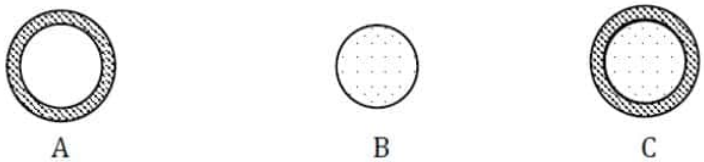
46. 

According to the picture given which closed surface shows the net secretion accurately?



1. 2. 3. 4. 5.

47. A is a circular shape plate with a cavity. The radius of B plate is equal. When exert equal and separate torque, they get α_A and α_B angular acceleration.



A B C

What is the angular acceleration of C. C is an object formed by combining A and B.

1. $\alpha_A + \alpha_B$
2. $\alpha_A - \alpha_B$
3. $\alpha_A \alpha_B$
4. $\frac{\alpha_A + \alpha_B}{\alpha_A \alpha_B}$
5. $\frac{\alpha_A \alpha_B}{\alpha_A + \alpha_B}$

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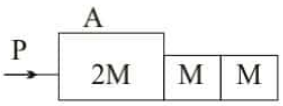
48. A satellite orbits around a planet with the radius r in learn steer T. What is the leamstear of that same satellite orbit around the planet with same density and 3R radius.

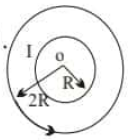
1. $\frac{T}{3\sqrt{3}}$ 2. T 3. 3T
4. $3\sqrt{3}$T 5. 9T

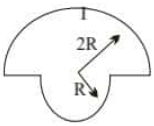
49. 2M , M and M are three masses kept on a smooth surface.
What is reaction between B and C when P force is exerted on A

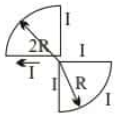


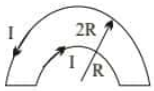
1. 4P 2. 2P 3. P 4. P/2 5. P/4

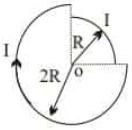
50. Given below are coil loops which carries 1current. which loop has the maximum net magnetic flux density.

1. 

2. 

3. 

4. 

5. 

WESTERN PROVINCIAL DEPARTMENT OF EDUCATION 01 E II

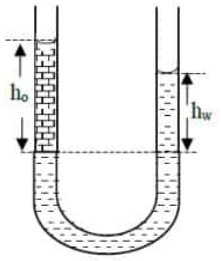
GENERAL CERTIFICATE OF EDUCATION ADVANCED LEVEL
PREPARATION PROGRAMME - 2022

Subject - Physics | **Paper II** | **Time - 03 hours**

Part A - Structured Essay

✹ Answer all the four questions in this paper.
$g = 10 Nkg^{-1}$

01. The figure shows a U tube that is used to compare the densities of two liquids that do not mi coconut oil is added to one arm such that a coconut oil column is placed on water column.



i. What is the diameter of the U tube used in school laboratory?

.....

ii. What is the problem created if coconut oil is added before water?

.....

.....

iii. If the densities of water and coconut oil is d_w and d_o respectively and the heights of water and oil columns from common interface are how and respectively state the relationship between those qualities.

.....

.....

iv. State the three reading that you take when measuring h_o and h_w

a. .....

b. .....

c. .....

v. Re-arrange the relationship in (3) above which is suitable to plot / a graph

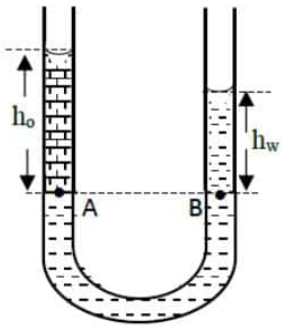
.....

.....

vi. Find the density of coconut oil if the gradient of the graph is 8-1?

Seen on Page 02]

vii. Consider the radii of the arms r and the surface tension in this temperature are Tw and to and the heights of water and coconut oil columns are hw and ho if the pressures art A and B are P_A and P_B write expressions for P_A and P_B with respect to relevant parameters Consider the contact angles of water and coconut oil as zero
(Atmospheric pressure = π)



P_A .....

P_B .....

viii. Hence Drive a expression for Hw in the from of y= mx+c with respect to T_w , T_o , d_o , d_w , h_o

.....

.....

.....

.....

2. a. Waves are formed by vibrating the turning fork at the end of a tube of length and uniform cross sectin the piston can be moved alone the tube.

i. Explain how the waves pattens are formed in the tube length of *l*.

.....

.....

ii. What is the end correction.

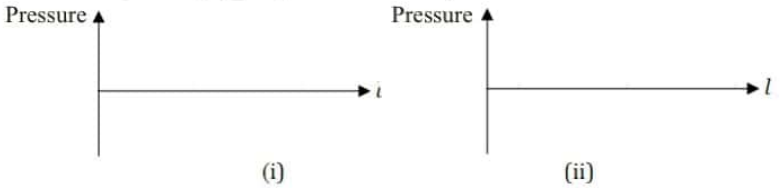
.....

.....

iii. When the piston is moved the first sharp sound is heard at an l_1 length from B the second sharp sound is heard at on l_2 length of B

a. Draw the wave patterns for the first and second sharp sounds and name them.

b. Draw the corresponding Pressure variation for those instances.



(i) (ii)

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iv. Considering the first resonance moment derive and expression for V with respect to e,f,l_1

.....

.....

.....

v. Considering the second resmance in inoment drive and expression for V with respective to e,f,l_2

.....

.....

.....

vi. Obtain a value for V if F =512Hz L_1 and L_2 = 17 cm and 50 cm.

.....

.....

.....

.....

vii. What is the sound intensity level at the certain place where the sound intensity is $10^{-7} Wm^{-2}$ ($I_o = 1x10^{-12} Wm^{-2}$)

.....

.....

viii. The sound intensity fall on the drum is 0 -1 wm^{-2} and the area of the ear drum is $0.2cm^{-2}$ what is the sound energy he hears for 6 hours.

.....

.....

.....

3. The figure shows an apparatus made by a student to obtain the latent heat of vaporization of water.

i. what is the purpose of having the tube A

.....

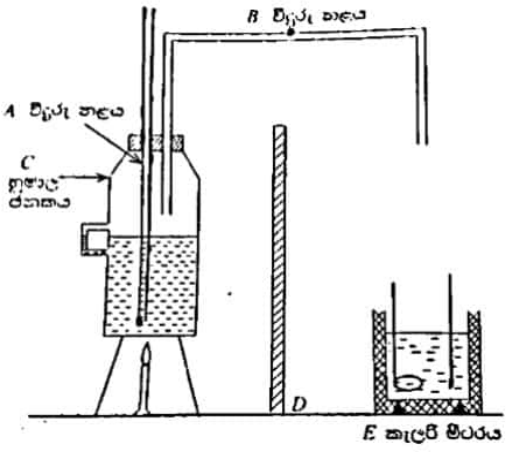
.....

ii. Draw the part needed to be joined at the end of the tube B.

iii. Name D and Mention it's usage.

.....

.....



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iv. Write down the measurement taken in water.

I. ..... (m_1)

II. ..... (m_1)

III. ..... (m_1)

IV. ..... (m_1)

V. ..... (m_1)

v. What are the additional data needed in the experiment.

x - .....

y - .....

vi. Write down an expression for the latent heat of vaporization (L) using the symbols above.

.....

.....

vii. State a precaution that can be taken to enhance the accuracy of the particular.

.....

.....

viii. Below given are the reading taken in above experiment

m_1,= 200g m_2 = 280g m_3 = 288g $Q_1 = 25^{O}C$

$Q_2 = 35^{O}C$ X = 4200J mol^{-1} k^{-1} Y = 400mol K^{-1}

Temperature of vapor = $100^{O}C$

Finds the specific latent heat vaporization.

.....

.....

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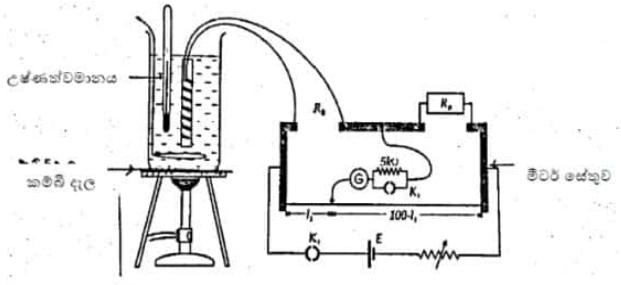
.....

.....

4. Below given is the appeatur to find the temperature coefficient of a metal wire spring AB is a metal wire winded in a pocelain rod the meter bridge has been used to measure the resistance of the wire.



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i. Is Water or coconut oil is most stable give reasons.

.....

ii. What is the purpose of using a wire mesh to heat the liquid.

.....

.....

iii. what is the reason fro using a liquid heater instead put the wire spring directly to the burner.

.....

.....

iv. Had to you prepare the wire spring satiable for the experiment.

.....

v. What are the essential steps to be followed to find the resistance of the wire.

.....

.....

.....

vi. Give two reasons for bringing balance length closer to the mid point of the meter bridge wire

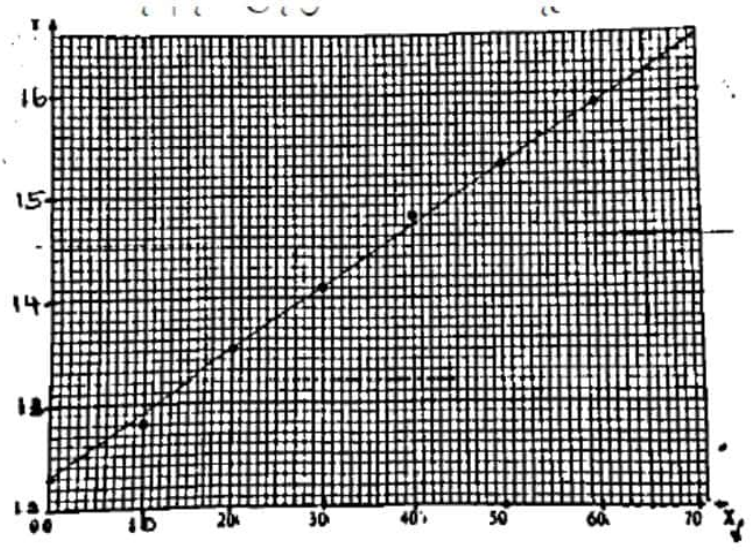
a. .....

b. .....

vii. Write down the equation to find the resistance of the wire in a given temperature.

.....

viii. Give below is the graph platted in an experiment like this



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a. name x,y axis.

.....

b. Find the gradient and the intercept of the graph

.....

.....

c. Hence obtain the coefficient of temperature of the wire.

.....

.....

d. Find the resistivity of the wire at $O^{o}c$ if the length of the wire is 30 cm and the cross section is $1.6mm^{2}$

.....

.....

.....

.....

Seen on Page 07]

Part B - Essay

Answer four questions only.
($g = 10ms^{-2}$)

5. Below figure shows a gate constructed by connecting four doors perpendicularly, that can rotate around middle axis of AB, placed at the entrance of a building moment of inertia of the complete system around middle axis of. AB is $54kgm_2$. P & Q connectors provides constant torque of friction to of 24Nm against the rotation of the system consider that is covers a circular area of radius 2m and ac=bd=4cm rods were used to construct the gate. system is at rest at the initial stage.

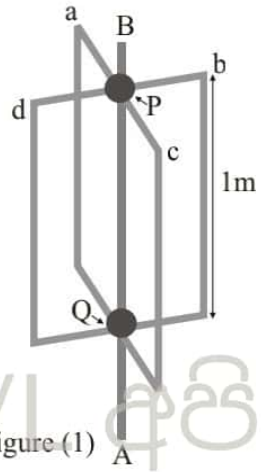


figure (1)

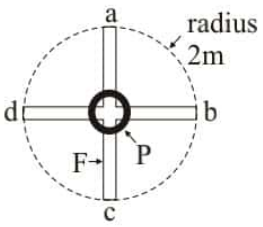


figure (2)

a) A person entering through the gate exerts a perpendicular horizontal force F,1.2m away from the AB axis (Figure 02). Then the system rotates with constant angular acceleration of 2.4 $rads^{-2}$
   i. What is the torque of rotation around AB by force
   ii. How much is the imbalanced torque over the gate to sustain this angular acceleration
   iii. Calculate the magnitude of the force F

b) After the person entered into the building force F is removed that the gate comes rest after 3.65
   i. Through this time period if the gate is rotating under constant angular retardation, show its value is equal to 419 $rads^{-2}$
   ii. Using the answer in b(i), calculate the angular velocity gain by the gate, when force F is removed
   iii. Find the number of rotation that the gate rotates in this time period of 3^{-6}s (Take ½ = 0.32)

c. If the same force as show in figure (03) is acting with a angle with the force F Excreted in above (a),
Explain whether the new angular acceleration is greater or less than the value obtain in above (a)

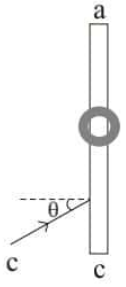


Figure (3)

Seen on Page 08]

d. Setup of a rotating swing is constructed adding equal parts of length of 0.5m and seat X at the end of the cords a,b,c,d, as shown in figure (04) After adding these parts to the system moment of inertia of the system increased by 16kgm^2

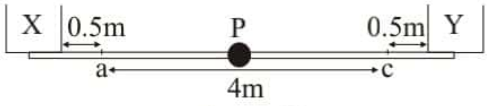


Figure (4)

i. Two small children mass of 20kg and 30kg are seated on the seats fixed at the end of a and c. How much is the new moment of inertia of the system?

ii. It is expected to give a constant rotating frequency of two rounds per minute by fixing the rotating swing into a motor how much is the angular momentum gain by the rotating swing? (take π=3)

iii. what is the new angular velocity, if the above mentioned children in d (i) is seated without exerting any resistive torque on the rotating swing mentioned in above (ii).

e. Write down the principle you used to obtain the answer in above d (iii).

6. a. i Explain the way that occur stationary waves on a stretched string.

ii. Sketch the fundamental and first overtone on a stretched separately and mark nodes and anti-nodes.

b. Below musical instrumental was constructed by a student fixing 7 metal wires on to a thin wooden board.

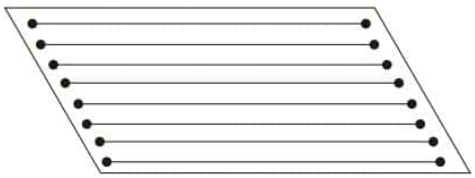


Figure (5)

One end of the wire is fixed on to the board and the other end is connected to the pin over the board. the tension of these wire is 0.5m (length of the parts used to tie is negligible)

i. Write down step by step of the process to tune the musical instrument for each tone.

ii. Write down a statement f or the frequency of fundamental using below rotations when the tension of the string is T length & mass of unit length m.

iii. Calculate the tension of the wire produces tone 'C' of frequency 260Hz. mass of the metal wire is 50g.

iv. Another musical instrument same as above is constructed using another metal with the same length as above calculate the ratio between the tension of the wire & unit mass of wire when the tuned folk produce 'C' Sound vibrating with fundamental.

Seen on Page 09]

v. It is produced beat frequency of 2Hz when simultaneously vibrated two folks produced ‘c” tune in both instruments afterward it is observed that, although one instrument produce the frequency of tone ‘c’, other instrument has produced another frequency due to instant change of head affected to it what is the frequency of the changed tune?

c. The student has fixed hollow box under the thin wooden board with metal wires to increase the sound.

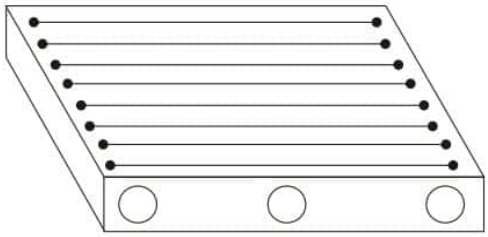
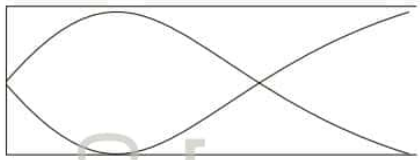
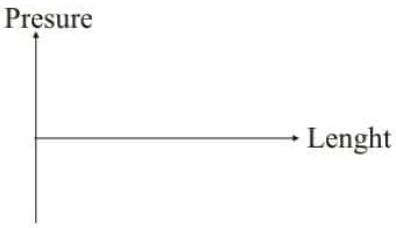


Figure (6)

i. How would you explain the increment of the sound of the musical instrument by above method.

ii. Below sketch shows the air column vibrated under first overtone, trapped in a one end closed pipe. Draw the chase of pressure according in the below space.





iii. Speed of the sound in air at room temperature is 330m 51 of the closed end is removed in the above pipe length of 50cm, find the tone of vibrating air column now.

iv. Clearly mark the direction of moving air particles at B, when the air particles at A moves to left as shown in below situations.

Figure (7)

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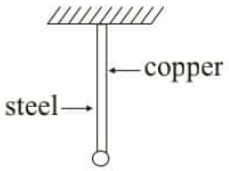
7. a. A metal ball having a radius of 1mm and a mass of 50mg traveling downwards in glycerine.
   a) What is the viscous force on the ball when its speed is $1cms^{-1}$.
   b) What is the viscous force on the ball by Glycerine?
   c) What is the final velocity on the ball when it's moving without a accelation.
   Density of Glycerine = $1260\ Kgm^{-3}$
   The viscous co-efficent of glycerine at room temparature (μ) = *0.8*

   b. Write down an expression for the Young's modules of a string using strain and stress.

   a. A ball having a mass of 2000kg and a radius of 20cm is hung with steel and copper wire of 2m each. The diameter of the copper and steel wires are 2mm and 4mm respectively.
   ($\pi = 3$)
   Young's modules of copper *(Cu)* = $1.2 \times 10^{11} Nm^{-2}$
   Young's module's of steel = $2 \times 10^{11} Nm^{-2}$

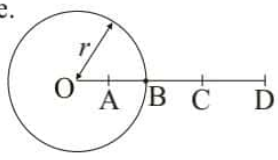


   i. Find the fore through copper wire.
   ii. Find the fore through steel wire.

   c. Identify the factor on which the breaking force or a wire is depended and explain why.
   i. Material of the wire.
   ii. Length of the wire.
   iii. Radius of the wire.
   iv. Cross sectional area.

8. The radius of an isolated conductor sphere is r_0 This sphere in free space has been connected to two conductors wires. A current of I_1 passes in to the sphere and A current of I_2 passes away from the sphere $I_2 < I_1$ if this process lasted a time of it.

   a. Write an expression for the amount of charges given in a time t.
   b. It has been found that the amount of charges Q_1 in a t_1 time has resulted in a increment of potential at a point on the surface is V. Derrine an equation for t_1 with respect to V,r_0, I_1 & I_2.
   Rearrange the above equality to draw a graph to show the variation between V and t.
   c. Calculate the charge of the sphere if the radius of above sphere ro = 10cm and the potencial on the sphere is 1000V.
   If $I_1 = 1.00002A$ and $I_2 = 1.00000A$ Calculate the time taken for the potencial to reach 1000V.
   d. Consider the pointsA,B,C,D such that $OA = r_A (r_A < r_0)$, $OB = r_B (r_B = r_0)$, $OC = r_c (r_0 < r_C < r_D)$ and $OD = r_D (r_D > r_C)$
   If there is a charge on the surface of the sphere.



   i. Write down expression for the potential at down expressing for electric field intensives at points *O,A,B,C,D.*
   ii. Write down expressions for electric field intensities at points *O,A,B,C,D.*

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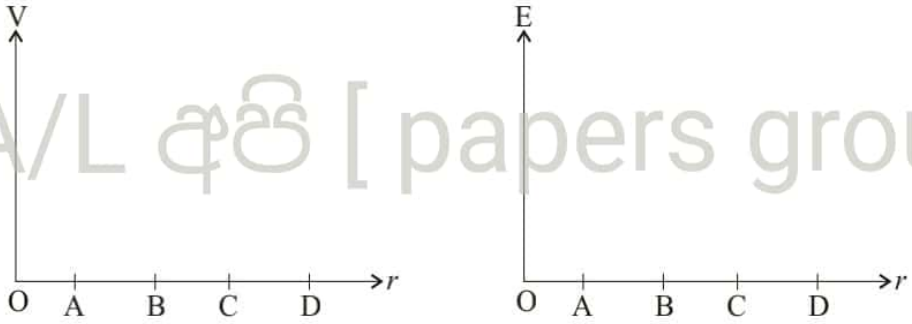
e) If a sphere having O as center an r_c as the radius places outside the +Q charged sphere.

i. Draw how the charge has been distribution in sphere system.

ii. If the system was charges as shown in the part i, How much does the potential of O,A,B,C,D changes.

iii. Write down expressions for the potentials and electric field intensities if a (-Q) charge is given to outer sphere.

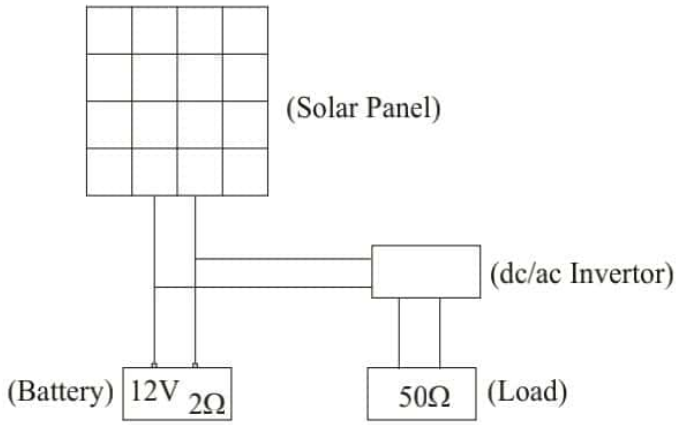
iv. Copy down the axis in the paper and draw the variation of the field intensity with the distance messured from O, using the expressions written in e(iii)



v. Draw the exitance of equi-potential surfaces relevant to the eutine sphere system including the positions such that $r < r_B$, $r_B < r < r_C$, $r > r_C$.

9. Part A

Solar power is one of the common energy to produce electricity these days. below given a simple diagram for the usage of a solar panel system. Here the solar panel is connected to a invertor and it's connected to a load through it. The direct current (DC) produced by the solar panel is directly used to charged the battery and it is converted in to A/C current by the invertor and supplied to the load.



a) The above solar panel consists of a large number of cells and its rough diagram is given below. Consider the E.M.F of one cell as E_0 and internal resistance as r_0.

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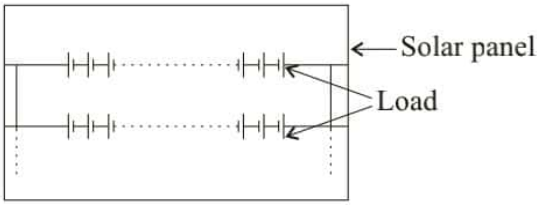


i. What is the E.M.F and the internal resistance of one horizontal line if n number of cells are connected in serious.

ii. If the complete cell is made up with connecting m number of lines mentioned above in parrellel. Write an expression for the effective. E.M.F of the panel with respect to h, m,E_o and r_o.

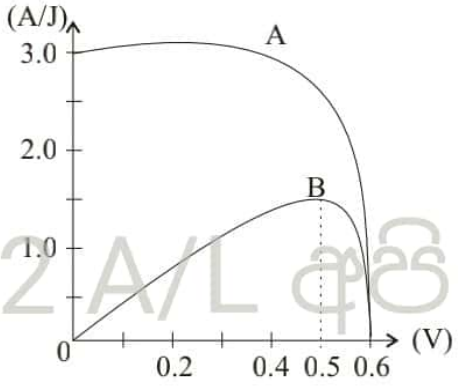
b. Consider the occasion when the battery is being charged using the panel. This panel is made up with 36 cells of 0.5V and the EMF of the battery is 12V and the internal resistance is 2Ω. Regleet the internal resistance of solar cells.

i. The entire capacity of the battery is 10 Ah. That means if a 1A curtrent is given continuously by this. battery it is fully, discharged within 10 hours. what is the total electric energy of the battery when it is fully charged?

ii. What is the current drawing from the solar panel to the battery when it is fully discharge in the process of charging.

iii. Find the time taken for the battery to charge fully.

c. Practically the current at highest power dissipation is Im and re voltage is Vm one factor. That messures the efficiency of a panel is fill factor is the ratio between the real maximum power dissipation and the expected maximum power dissipation and the expected maximum power dissipation.



i. Write down an expression for the Fill Factor with respect to Vm, Im Voc and Isc.

ii. Calculate the fill factory using the above graph.

d) State two advantages of using solar panel to produce electrical power.

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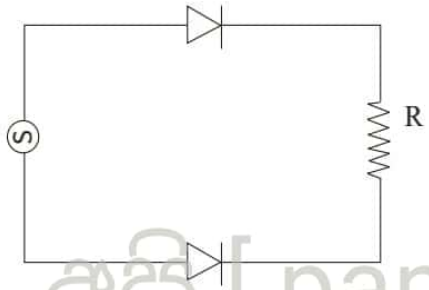
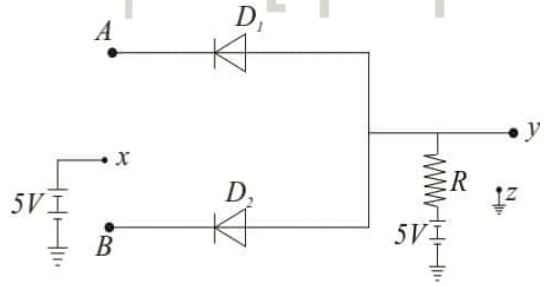
Part B

a. i. Draw the I-V characteristics curves for both Si and Ge on same diagram.

ii. Draw a graph to show the potential difference between R_C when two Si and Ge diodes and connected to an alternative source having a peak voltage of 4V (mark the peak voltage of the output correct)



b.



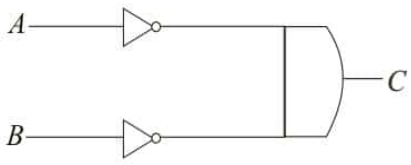
In the above circuit made with ideal diode, the input when A and B is connected with X is considered as logic "1"

i. What is the voltage at y relative to z, when A is connected with A or not connected with A.

ii. Complete the truth table below considering the higher voltage of y realative to z as logic"1" and lower voltage of that as logical "o"

A	B	Y
1	1	.....
1	0	.....
0	1	.....
0	0	.....

c.



i. Write down the bolean expression of the output of C, connecting A and B.

ii. Identify a similar logic gate for this by simplyfing the above expression.

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d. Following is the pattern now light are lit for vehicles near a pedestrian crossing.

- Red light is given for pedestrians when only green is given for vehicles.
- Red light is given for pedestrians when, green and orange is lit for vehicles.
- Green light is given for pedestrians when red light is given for vehicles.
- Green light is given for pedestrians when red and orange is given for vehicles.

The output connected for green light for vehicles is connected to red light for pedestrians and considered as X.

For vehicles,

ON/OFF for green light is G.

ON/OFF for orange light is O.

ON/OFF for red light is R.

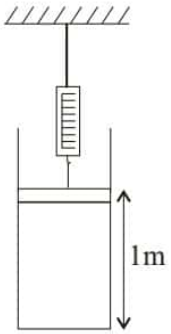
Complete the truth table below. If the boolean expression for this circuit is $X = \overline{G}OR + \overline{G}.\overline{O}.R$.

Use only three inputs, (G,O and R)

G	O	R	X

10. Part A

a. State Boyle's law and Charles Law Derive the equation of state $\frac{PV}{T} = k$ for a ideal gas using them.

b. 

(Assume that there is no heat waste for the question below) A mixture of O_2 and N_2 is trapped in a closed tube of length 2m with a surface area of $2.5 \times 10^{-4} m^2$ and a mass of 10kg which is connected to a light string cross sectional area of which is negotiable the temperature in the tube is $27^{o}C$ and the atmospheric pressure is 1×10^{5} pa (The gasses behave ideal)

i. Find the total Pressure if the spring balance reading is 25N .

ii. If the practical pressure of O_2 is 8×10^{4} pa find the practical pressure of N_2

iii. Find the number of moles of O_2 and N_2 and find their masses separately and find the total mass (relative molar masses O_2 32g mol^{-1} $N_2 = 28g\ mol^{-1}$)

iv. When the temperature of the gas mixture is increased the Zero reading of the spring balance is reached find the new pressure for that moment and find the find temperature of the mixture using the equation of states.

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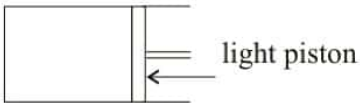
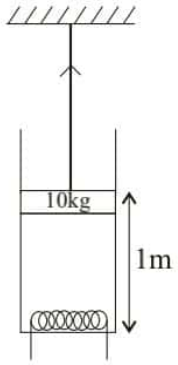
c. The value of a chamber with a light piston as shown in the figure is expanded from V_1 to V_2 by increasing the internal temperature while keeping the pressure (p) of a mono atomic gas constant



i. Drive an equation for the work done by the gas with respect to the values given above.

ii. If the gas behaves ideal and the increment of the internal energy is as show that $\Delta u = \Delta w$ using the equation of kinetics of gasses.

d. The volume of the tube mentioned in part (a) is doubled by further heating the gas with a heating coil having a negotiable heat capacity, putting into the tube as shown in the figure, when the string is looser (atmospheric pressure is $1x10^5$ pa)



i. Find the work done by the gas.

ii. When the tube is heated is there a permanent change of the pressure inside the system or most explain.

iii. Find the increment of internal energy.

iv. Find the total amount of heat given to the gas by the heating coil.

Part B

a. Sate the Stephan law for black bodies.

b. The sun can be considered as a black body and it's surface temperature is 6000K. The radius of the sun is 7×10^3m.

i. Calculate the total radiation power emitted by the sun
(Stephan's constant - $5.7 \times 10^{-8} Wm^2K^{-4}$)

ii. Name the three regions which include the radiation of the sun.

iii. Calculate the wave length from which the sun emits its highest intensive radiation.
(wein's constant - 2.9×10^{-3}mK)

iv. Calculate the deduction of sun per one of electro magnetic radiation. ($c - 3 \times 10^8 ms^{-1}$)

v. Find the distance between the sun and earth assuming that 20% of the radiation energy by the sun is absorbed by the atmosphere, when the radiation flux intensity given to the earth from sun is $1000 Wm^{-2}$.

c. It is found that 3.0×10^{17}Kg of sea water is evaporated, due to the heat of sun in the noon in tropical countries.

Calculate the sea area from which the water evoporated assuming that the time taken is 6 hours
(Latent heat of the solar constant is $1400 wm^{-2}$
vaporization of water, $2.0 \times 10^6 Jkg^{-1}$
Assume that the sun rays fall on the earth perndiculary.