PHY I

AL/2016/01/S-II

De Mazenod College - Kandana

PHYSICS I | 01 | F | I | 2 Hours

23.02.2016

Grade - 13

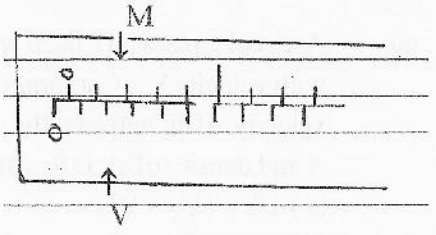
2016 A/L

(1) Electric Field intensity is a unit of

(1) Nkg^{-1} (2) Nms^{-1} (3) Nm^2C^{-2} (4) VC^{-1} (5) Vm^{-1}

(2) If 20th division on Vernier scale coin sides with 19 th division on main scalc zero error of instrument is,

(1) 0.2 mm (2) 0.75 mm
(3) 0.80 mm (4) 0.95 mm
(5) Datas not Sufficient



(3) If A & B are cross Sectional area & density the formula can never be existed as

(1) AB (2) A/B (3) A(B+1) (4) A^2/B (5) $\frac{\text{Log A}}{\text{Log B}}$

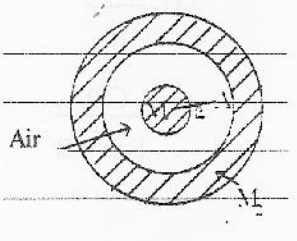
(4) Most suitable thermometer in order to measure small amout of liquid

(1) Constant Pressure gas thermometer (2) Constant Volume gas thermometer
(3) Mercury - in - glass thermometer (4) Thermocouple (5) Clinical thermometer

(5) Masses of Concentric shell and sphere are M_2 & M_1 respectively. Field intensity at a distance of "a" from the centre

(1) $\frac{GM_1}{a^2}$ (2) $\frac{G(M_1+M_2)}{a^2}$ (3) $\frac{G(M_2-M_1)}{a^2}$

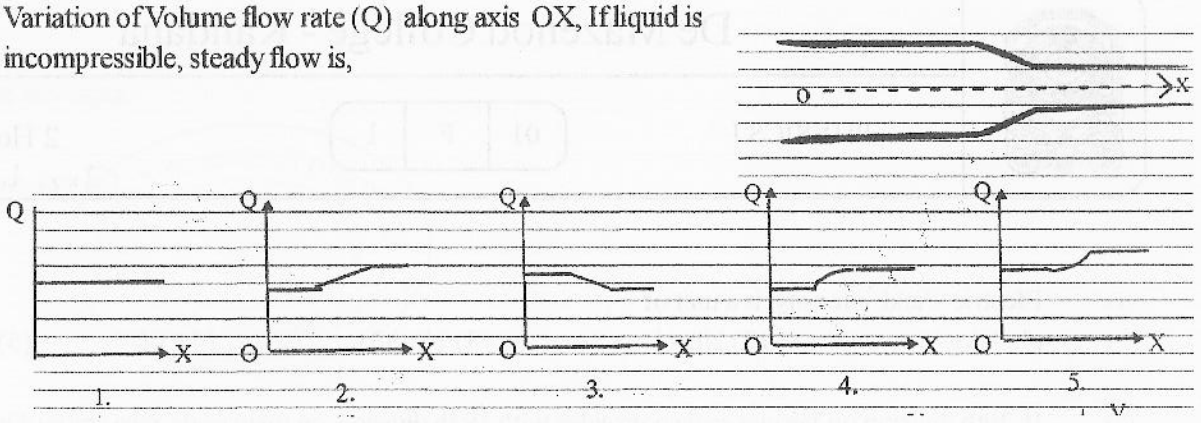
(4) $\frac{GM_2}{a^2}$ (5) $\frac{G(M_2+M_1)}{a^2}$



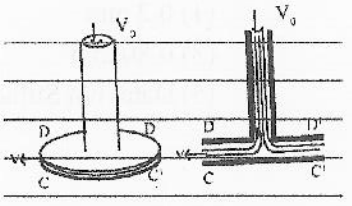
(6) The total energy of a Particle executing simple Harmonic motion of amplitude A is Proportional to

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

(7) Variation of Volume flow rate (Q) along axis OX, If liquid is incompressible, steady flow is,



(8) A circular plate DD' fixed with hallow tube when air is blown with velocity V_0, Cardboard is attracted in the upwards. If veloeity of air between the plates is V cross sectiona area is A and density of air is P . Attraction force on CC' be



(1) 1/2 p $(V_0^2 - V^2)$ (2) 1/2p $(V_0^2 - V_2)A$ (3) $P(V_0 - V)A$

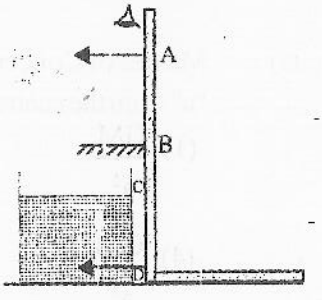
(4) 1/2p $V_0^2 A$ (5) 1/2p $V^2 A$

(9) Metal sphere is Fully immersed in the liquid by means of string. The tension in the string while heating the liquid will

(1) Remain Uncharged (2) Increase first then decrease

(3) Decrease gradually (4) Increase gradually (5) Decrease first then Increase

(10) If the image of pin A made by plane mirror coinsides with the image of pin D the refracfive index of water is



(1) $\frac{BD}{AB}$ (2) $\frac{CD}{BC}$ (3) $\frac{CD}{AB-BC}$

(4) $\frac{CD}{BD-AB}$ (5) $\frac{CD}{CD-[AB-BC]}$

(11) If Young modulus and tensile Strain of metal wire are $2 \times 10^{10} Nm^{-2}$ & 0.06% The stored energy per unit volume in Jm^{-3}

(1) 0 (2) 16×10^2 (3) 36×10^2 (4) 28×10^2 (5) 54×10^2

(12) A mass m attached to a spring oscillates with a period of 3s. If the mass is increased by 1 kg the period increases by 1s The initial mass m is

(1) 7/9 kg (2) 9/7 kg (3) 14/9

(4) 18/7 (5) 17/9

(13) When water is inside, heated calorimeter rate of heat loss is Q at particular temperature, Under the same room temperature and same temperature of water,

(A) When liquid with same amount of water added, rate of heat loss is Q

(B) When liquid with same amount of water but double the specific heat capacity of water added rate of heat loss is 2Q

(C) When liquid with same amount of water but double the specific heat capacity of liquid added rate of heat loss is Q of the above statements

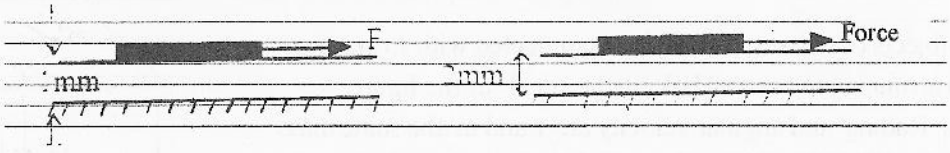
(1) Only A (2) Only A & B (3) Only A & C

(4) All are false (5) All are correct.

(14) An object released at a height of h from ground level find velocity of the object when it is incident on the earth if gravitational field strength is g

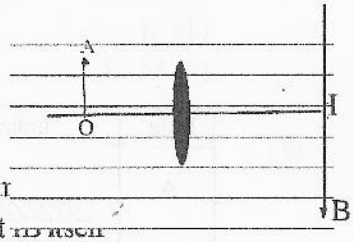
(1) $\sqrt{gR}$ (2) $\sqrt{2gR}$ (3) $2\sqrt{2gR}$ (4) $2\sqrt{gR}$ (5) $2gR^2$

(15) If the required force to move a glass slab of 1mm thickness of glycerine with velocity 10 ms^{-1} is F. If thickness is 2mm and velocity 20ms^{-1} the required horizontal fore.



(1) F (2) 2F (3) 4F (4) F/2 (5) F/4

(16) It IB is image of Object OA formed by convex lense



(A) When object is moved marginally away IB forms marginally away from lense

(B) When lense is moved marginally to wards OA, Image IB becomes sm

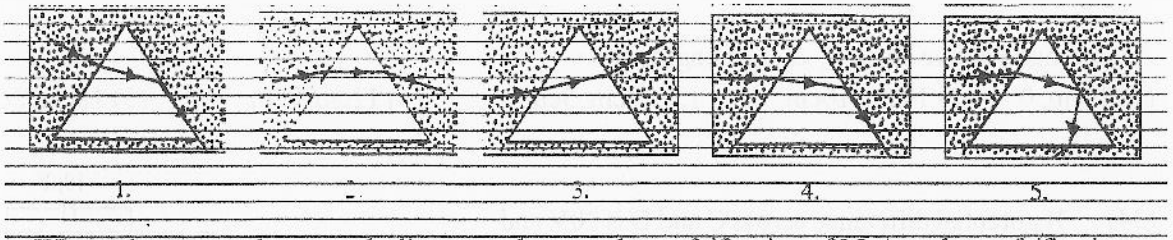
(C) When only the lense moved towards IB much smaller image forms at

in the above statements,

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

(4) All are false (5) All are correct.

(17) If cavaty prism is inside rectangular glass block. The correct path followed by light is



(18) When telescope under normal adjustment, has angular mafnification of 25. Angular mafnification when final image forms at minimum distant (25cm) is

(1) 25 (2) Marginally greater than 25

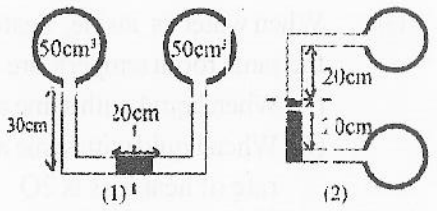
(3) Marginally less than 25 (4) Either grenter or less than 25

(5) Datas not sufficient

(19) Mecury coloumn locates at the centre of figure 1. If mercury coloumn locates as the figure 2 shown pressure inside bulb is.

(1) 75cm Hg (2) 88cm Hg

(3) 100cm Hg (4) 60cm Hg (5) 0



(20) S-t graphs for two objects X & Y shown in the figure

(A) Velocities are the same at $t = t_0$

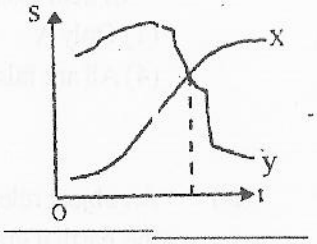
(B) when $t = t_0$ they are moving to wards in the same direcrion

(C) When $t = t_0$ direction of velocity of x is reversed

In the state staremens

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

(4) All are false (5) All are correct.



(21) If pressure of ideal gas is doubled wrile temperature is half. The average kinetic energy of a molecule will

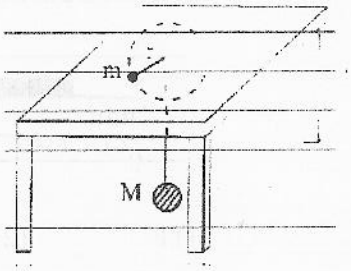
(1) double (2) remain unchanged (3) half

(4) four times (5) One fouth

(22) Two objects of masses m and M are connected with string and which is running over small hole on the desk as the figure shows. Rading and angular velocity are r and m .the same mass rotates with half the radius what would be hanging mass in order to be at rest.

(1) M (2) M/2 (3) 2 M

(4) M / 2 (4) M / 4



(23

Type	Initial	Final length after increasing	Change in lengh
A		20.075cm	0.075cm
B	20cm	20.045cm	0.045cm
C	20cm	20.060cm	0.060cm

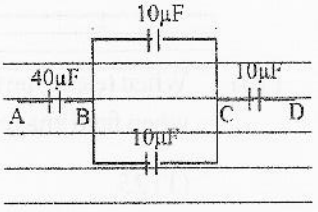
According to above datas L_1 & L_2 Lengths are

(1) 20cm, 0 (2) 10cm, 10cm (3) 15cm, 5cm (4) 12cm, 8cm (5) 18cm, 2cm

(24) If potential differance across C and D is 20V and The potential differance across A and D is

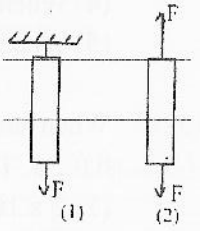
(1) 140V (2) 130V (3) 80V

(4) 35V (5) 70V



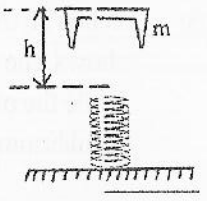
(25) Accoring to Figure I when force F applied on the bottom of the rod, extension is e
Extension when two equal forces F each act on both the side as figure 2 shows,

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

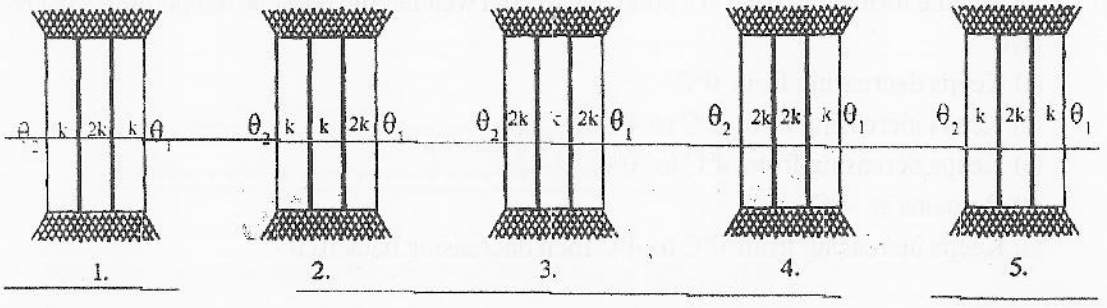


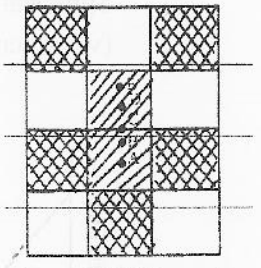
(26) Object of mass M released at height h towards a vertical spring the maximum compression is given by

(1) $Mgh = 1/2Kx^2$ (2) $Mgh = Kx$ (3) $Mgh = Kx^2$
(4) $Mgh = 1/2Kx^2 - Mgx$ (5) $Mgh = Kx^2 - Mgx$



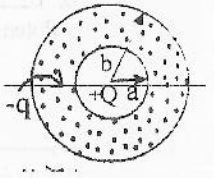
(27) Which instance shows the maximum heat flow Q_1 if k & 2k are thermal condnctivities & Q_2 and Q_1 are temperatures at two ends under steady flow





(28) The location of Centre of gravity of uniform coloured metal sheet is,
(1) A (2) B (3) C (4) D (5) E

(29) Point charge +Q is kept at the centre of Spherical shell of inner and outer radius a and b. If charge -q given to the surface. The distribution of charge on shells
(1) On outer & inner surfaces are zero and - q respectively
(2) On inner & outer surfaces are - Q and -q respectively
(3) On inner & outer surfaces are - Q and (Q-q) respectively.
(4) On inner & outer surfacces - Q and (-Q-q) respectively
(5) Charge - q distribntes through out Spherical shell



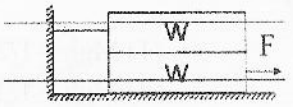
(30) In the above question, Electric potential at a distance of R ($b \geq R > a$)
(1) 0 (2) $\frac{1}{4\pi\varepsilon_0} \times \frac{Q}{a}$ (3) $\frac{1}{4\pi\varepsilon_0} \times \frac{Q}{R}$ (4) $\frac{1}{4\pi\varepsilon_0} \times \frac{(Q-q)}{R}$ (5) $\frac{1}{4\pi\varepsilon_0} \times \frac{(Q-q)}{b}$

(31) When you're given convex and concave lenses of focal length 10cm & 20cm respeetively, Virtual, large and errect image is possible. When,
(1) When object at 5cm away from convex lense
(2) When object at 15cm away from convex lense
(3) When object at 25cm away from convex lense

(4) When object at 15 cm away from concave lense
(5) When object at 25cm away from concave lense.

(32) When temperature of Aluminium rod increased by 100°C ratio between expansion & initial length is 0.02% . The linear expansivity of aluminium is,
(1) $2 \times 10^{-3}\ K^{-1}$ (2) $2 \times 10^{-4}\ K^{-1}$ (3) $2 \times 10^{-5}\ K^{-1}$ (4) $2 \times 10^{-6}\ K^{-1}$ (5) $2 \times 10^{-7}\ K^{-1}$

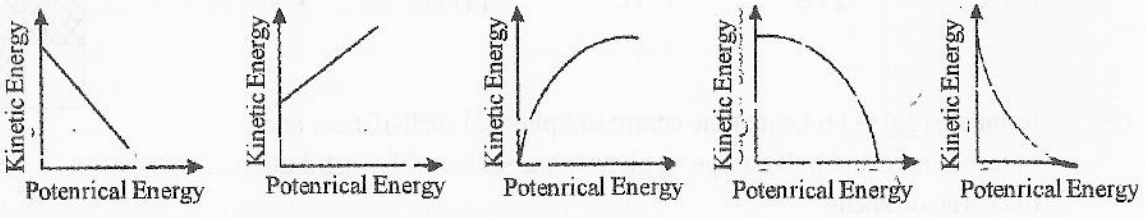
(33) When an object of weight W is right on the identical object as the figure shows, the upper block connected with vertical wall through a string while the other block pulled by force F until system reaches limitting equilibrium if coefficient of friction is μ The maximum value of F



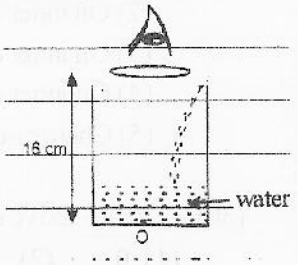
(1) μW (2) $\frac{3}{2}\mu W$ (3) $5\mu W$ (4) $\frac{5}{2}\mu W$ (5) $3\mu W$

(34) During the formation of ice in a pond due to cold weather the possible temperatures below the ice layer
(1) Keeps decreasing from 0°C
(2) Keeps increasing from 0°C to 4°C
(3) Keeps dereasing from 4°C to 0°C
(4) Remains at 4°C
(5) Keeps increasing from 0°C to 4°C then decreasing back to 0°C

(35) Spherical object released at high altitude . If drag force is directly proportional squared of velocity (v^2) when velocity is v . The variation of kinetic energy (E_k) with potential energy (E_p)



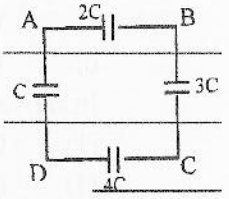
(36) [illegible] is observed through a convex lense of Focal length 14 cm, While pouring water to the vessel. If convex lense is at 16cm from the object. The water height in side the vessel when object is begun to observe clearly is, (Refractive index of water 4/3)
(1) 8 cm (2) 9 cm (3) 10 cm (4) 12 cm (5) 14 cm



(37) Satellite has Velocity V, angnlar velocity ω, period T and Energy - E on particular orbit. If arother satellite has twice the mass & radius the above quantities would be,
(1) 2v, 2ω, T & -E (2) 2v, 2ω, T/2 & -E/2 (3) $v/\sqrt{2}$, $\omega/(2\sqrt{2})$, $2\sqrt{2}T$ & -E
(4) $v/\sqrt{2}$, $\omega/(2\sqrt{2})$, $2\sqrt{2}T$ & -2E (5) $v/\sqrt{2}$, $\omega/2$, $\sqrt{2}T$ & -E

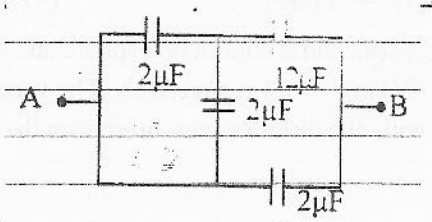
(38) Two spheres of radius R & 2R are heated up to the same temperature then allow to cool under same room temperatures. If the nature of spheres are same the ratio of rate of temperature lost
(1) 1 : 2 (2) 1 : 4 (3) 2 : 1 (4) 4 : 1 (5) 2 : 3

(39) The maximum equivalent capacitance of the circuit records in between
(1) AB (2) BC (3) CD
(4) AD (5) AC

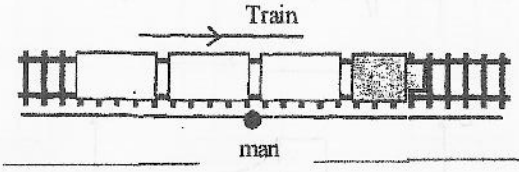


(40) Equivalent capacitauce in between AB of given circuit

(1) 28/9 μF (2) 4 μF (3) 5 μF
(4) 18 μF (5) 1.2 μF

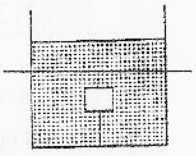


(41) The force, acting on man standing close to fast moving train, is

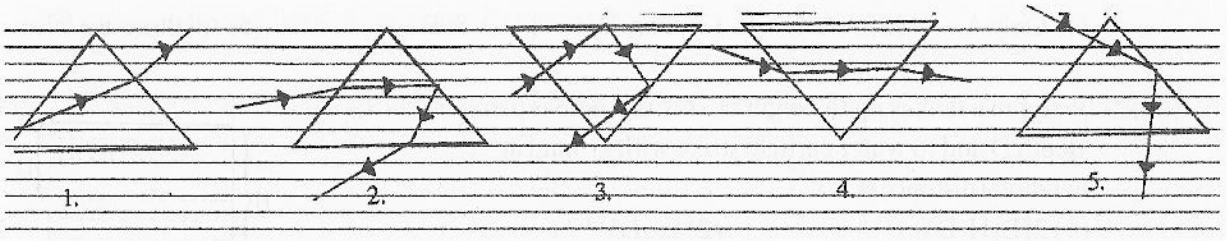


(1) When heading direction of the train reversed, force will reverse.
(2) Occurs due increasing pressure in between man and train.
(3) Occurs due increasing kinetic energy of air in between man and train
(4) Occurs due decreasing density of air in between man and train.
(5) Due to gravitational force in between man and train.

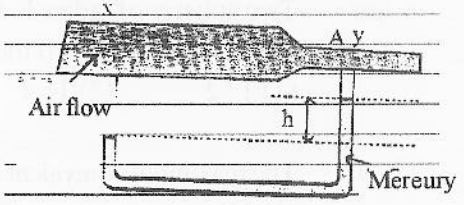
(42) A wooden block of weight w connected to the between of beaker through string. If beaker is moving under gravity the tension in the string
(1) W (2) 0 (3) W/2 (4) 2W
(5) Could n't be found exactly



(43) The correct path followed by monochromatic matic light in side equilateral glass prism when it's incident from air.



(44) When horizontal air flows along glass apparatus from x to y the height differance inside "U" tube is h, following statements related



a) When air flow from y to x h remains unchanged

b) When low dense air flows from x to y h decreases.

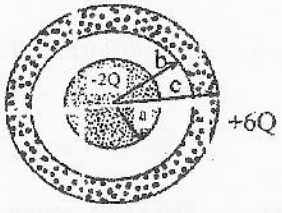
c) When small hole is pierced h goes down

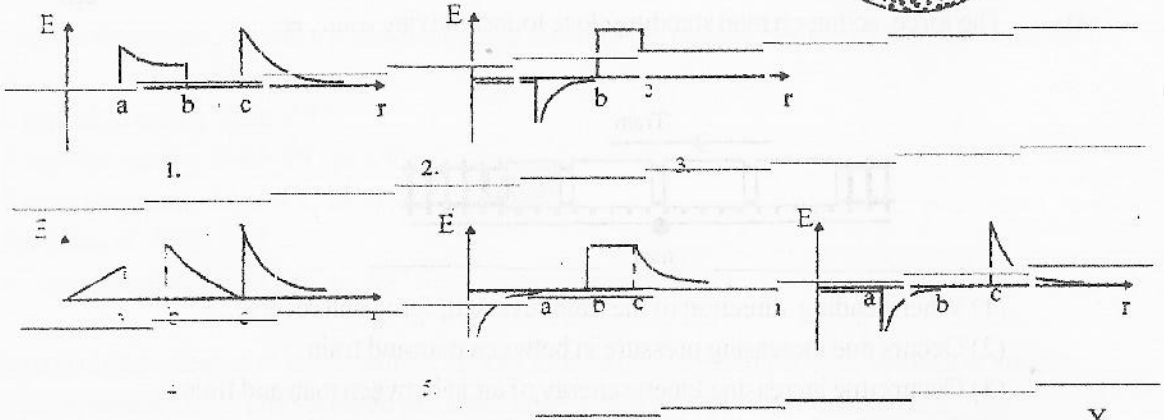
In above correct statements

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

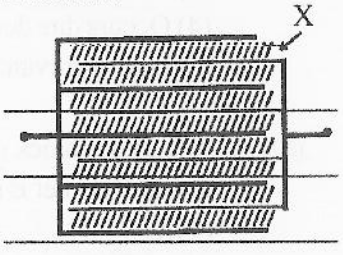
(4) Only C (5) All A, B & C are false

(45) A concentric conducting sphere and spherical shell are given -2Q and +6Q respectively. The variation of field intensity (E) with the distance measured from the centre.





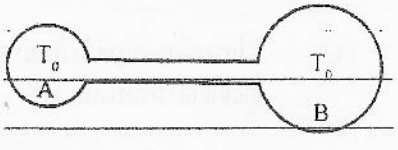
(46) Dielectric constant of medium inside poly sheets capacitors is 10. If equivalent capacitance of the circuit is 400μ F. The new capacitance after removing a medium at X.



(1) 410μ F (2) 390μ F (3) 355μ F

(4) 360μ F (5) 850μ F

(47) Two glass spheres at same temperature connected through a capilary tube. If A is heated up to temperature T while B remains unchanged



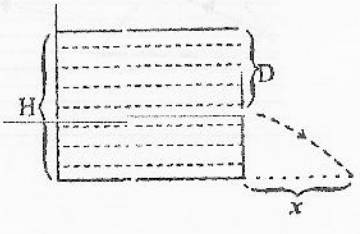
(A) After heating pressure inside A is less than of B

(B) After heating density inside A is less than of is

(C) of the obove statements

(1) Only A (2) A & C (3) Only B (4) A & B (5) All three are false

(48) Water in a tank is up to height H . It small hole is pierced at depth D and to water particle strike with ground at horzontal distunce is

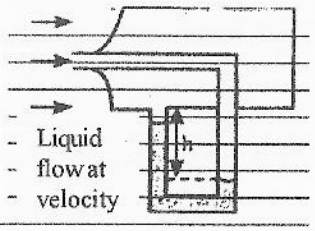


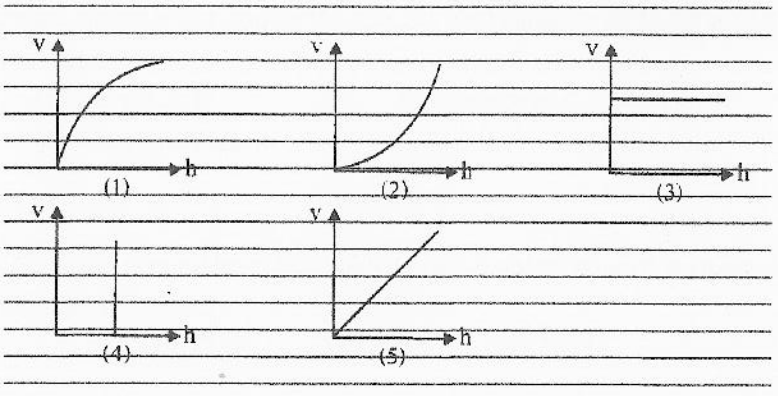
(1) $2[D(H-D)]^{1/2}$ (2) $2(gD)^{1/2}$

(3) $2[D(H+D)]^{1/2}$ (4) $2[g(H-D)]^{1/2}$

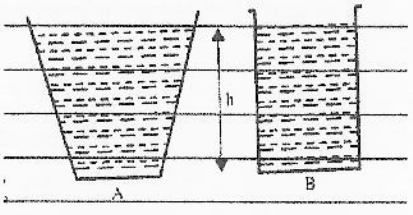
(5) none of above

(49) The figure shows a pitot - tube in side liquid flow. The variation of velocity V with the height differance h , best represetes by





50) Figure shows different shaped vessels A & B with same areas of base. If these filled with water up to same height h If forecs given by water are F_A and F_B respectively and weights are W_A are W_B



(1) $F_A > F_B$; $W_A > W_B$ (2) $F_A = F_B$; $W_A > W_B$ (3) $F_A = F_B$; $W_A < W_B$
(4) $F_A > F_B$; $W_A = W_B$ (5) $F_A < F_B$; $W_A > W_B$

De Mazenod College – Kandana

Grade - 13

Physics II
Grade 13

Part A – Structured Essay

❖ **Answer all four questions on this paper itself.**

1. In the laboratory experiment to find the density of glass lid and piece of wax, you are provided with spring balance, beaker with water, & piece of nylon string. Take density of water as d_w.

   a) State Archimedes principle.

   .....

   .....

   .....

   b) State what two experimental readings in order to estimate density of glass lid.

   (i) ..... (X_1)

   (ii) ..... (X_2)

   c) Write down an expression for density of glass lid in terms of your readings.

   .....

   d) State what two experimental readings in order to estimate density of wax.

   (i) ..... (X_3)

   (ii) ..... (X_4)

   e) Write down an expression for density of wax in terms of your readings

   .....

   f) What would be additional reading in order to obtain low dense material than glass.

   .....(X_5)

   g) Write down an expression for density of material in terms of your readings.

   .....

h) If you are given another glass lid with cavity and whose weighs in air and water are W_1 & W_2 respectively. Write down an expression for volume of cavity.

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.....

.....

i) State the conditions under which Bernoulli's equation is valid

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.....

2. A convex lense of focal length 5cm can be utilized as simple microscope. A student with least distance of distinct vision 25cm, observes an object through the lense.

a) (i) What would be object distance in order to form the image at minimum distant.

.....

.....

.....

(ii) Calculate linear magnification in a)(i)

.....

.....

.....

(iii) Calculate angular magnification when object kept at focus of lense?

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.....

.....

b) Using above lense and another convex lense of focal length 60cm, make astronomical telescope under normal adjustment.

(i) Draw a ray diagram for above mentioned telescope.

.....

.....

.....

(ii) What would be eyepiece of telescope, is it lense A or lense B?

.....

(iii) What would be the distance in between two lenses.

.....

(iv) Calculate angular magnification of telescope?

.....

.....

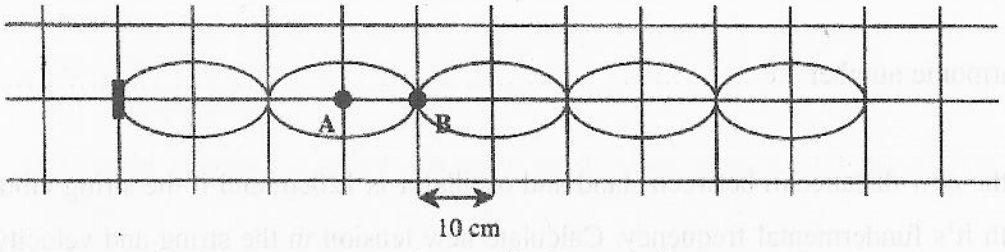
(v) Draw the image of following letter when it's observed through the telescope.

.....

(vi) Find angle subtented by final image. If the angle subtented by object with objective lense is 2° while observing an object through the telescope.

.....

3. Rubber band of length 80cm is used to do experimental analyzation of stationary waves. The free end of this horizontal rubber band connected with frequency changing oscillator while the other end connected with fixed stand. The distance between stand and oscillator can be changed. The following graph shows a model of stationary waves of frequency 300Hz. Both axes illustrated with same scale.



a) What would be wave length & Amplitude according to graph

(i) Wave length = ...

(ii) Amplitude = ...

b) What's nature of motion at point A and point B

(i) A = ... (ii) B = ...

c) Find maximum oscillating speed?

.....

.....

d) Calculate velocity of transverse wave through the wire?

.....

.....

e) (i) What are the factors affecting on velocity of transverse wave through wire?

.....

.....

(ii) State formula relating above mentioned factors.

.....

.....

(ii) Calculate tension in the string if the mass of rubber band is 10g.

.....

.....

f) What are the numbers of overtone and harmonic?

Overtone number = ...

Harmonic number = ...

g) If the new distance in between stand and oscillator is 120cm and if the string vibrates with it's fundermental frequency. Calculate new tension in the string and velocity of transverse wave.

.....

.....

.....

4. Expansivity of air at constant pressur (γ_p) need to be calculated.

a) Write the formula relating γ_p and name all physical quantities.

.....

.....

.....

b) Re-arrange the above relationship in order to plot straight line graph

.....

.....

.....

c) Plot graph and state how you obtain γ_p using graph itself.

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.....

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d) Give a list of items needed to carry out this experiment accurately.

(1) ..... (3) .....

(2) ..... (4) .....

(5) .....

e) Draw experimental set-up and name them.

.....

.....

.....

f) Why is it important to be uniform cross section hole through out the tube?

.....

g) what's reason for taking a reading while increasing and decreasing temperatures.

.....

.....

h) How would you get absolute Zero using graph?

.....

.....

i) In order to take well distributed graph the volume of trapped air should be high. How do you increase trapped air?

.....

.....

.....

j) How would you get the length of trapped air?

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Part B – Essay Question

1. Amazon river in Sounth america is the widest fresh water river in the world. It finally discharges in to Atlantic ocean At which has high concentrated saline water at Angola Nowadays passenger ships travel through river from Brazil to Africa by crossing Atlantic ocean.

   a. (i) Mark Free body force diagram for ship with luggage's when it is at rest. (state symbols used in the diagram)

   (ii) Explain why the reason the ship is further floating as it enters from fresh water to Saline water.

   (iii) State the reason why luggage's are kept at the base of the ship.

   b. If mass of ship with the luggage's is 1000 m.t. if the maximum speed along the river is $40ms^{-1}$. If the drag force is 50N per metric tone.

   (i) Calculate total drag force acting on the ship.

   (ii) Calculate minimum power of the engine in order to move with maximum speed.

   c. If the cross sectional area of rotor blades is $2m^2$.

   (i) Calculate force given by rotor blades in order to move in the forward direction?

   (ii) Explain how the force given by rotor blades occurs?

   (iii) Calculate velocity of water when 20kg of fresh water pushed in one second by rotor blades? (Density of fresh water 1000 kgm^{-3})

   (iv) Calculate velocity of water pushed by rotor blades when it is inside saline water (Density of saline water $1200kgm^{-3}$ and assume the drag force is same as above)

   (v) Calculate velocity of water pushed by rotor blades' when ship moves with $2ms^{-2}$.

   (vi) State the laws which relate with above calculation.

   (vii) Calculate total work done when it moves with 16km.

(viii) The temperature in north Atlantic ocean is law due to presence of ice bergs. It is hard to be sailed in north Atlantic ocean because there is a risk of toppling ships in this regent. What would be physical explanation?

2. a. (i) Using two convex lenses of focal length. 50mm and 500mm are used to utilized astronomical telescope. Calculate angular magnification when it is under normal adjustment using first principles.

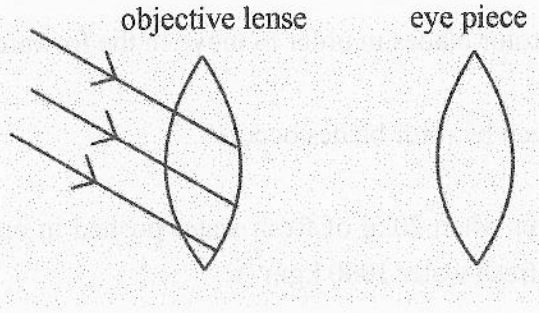
(ii) Find length of the astronomical telescope?

b. (i) Calculate angle subtented by the image of moon if it makes 0.5° with normal eye. (Unaided eye)

(ii) Safe is kept on focal plane in order to take a picture of moon find diameters of moon which occurred on the safe of camera if angle subtented by the moon with the objective lense 9.0m rad = 0.54°

c. If there is a screen at a distance of 300mm behind the eye peace. If angle subtented by sun is 0.01 rad with the objective lense.

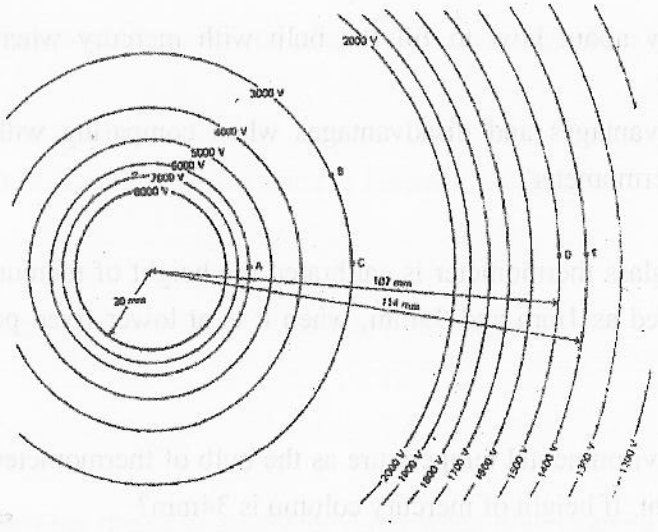
(i) Copy the diagram Illustrate the path followed by 3 light rays emited by the sun as a figure bellow.



(ii) Obtain diameters of image of sun?

3. Write 2 similarities between gravitational force and electro static force.

The following figure shows a charged cavity metal sphere with of 20mm radius which kept in free space. The figure shows number of equipotential surfaces around the sphere and given the potential values of each faces as well. ($\varepsilon_o = 8.8 \times 10^{-12}\ Fm^{-1}$)



(i) a) Explain why althrough the gap in between surfaces are the same but potenrial difference are not the same while moving away from sphene.

b) What amount of energy do you need to bring 8 nC of charge from B to A?

(ii) Consider a situation where 1nC point charge is brought from point E to point D.

a) Find the magnitude of the electric field between these two points by considering the electric field is uniform.

b) Calculate the average force between these two points.

(iii) a) What's the amount of given charge on sphere?

b) Calculate the charge density the sphere surface?

c) Calculate the field intensity of the surface of sphere?

(iv) Another conductive sphere of radius 10mm has same amount of charge going to be contantced as follows.

a) Internally

b) Externally

touched together calculate the quantity of charges stored on the surface of large sphere.

4. Glass – mercury thermometer is commonly used to obtain the temperatures in day today life This thermometer consists with a glass bulb in the bottom and with a capillary tube with uniform cross section area. The bulb is filled with mercury and top end is sealed.

(i) a) What is the thermometric property used in this thermometer?

b) Explain briefly about how to fill the bulb with mercury when creating this thermometers?

c) Mention 2 advantages and disadvantages when comparing with the constant volume gas thermometer?

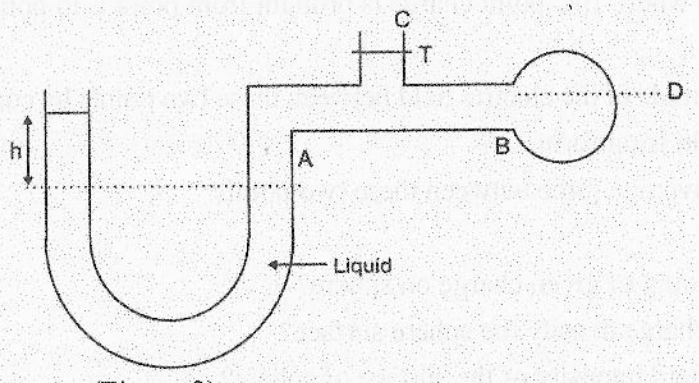
(ii) When mercury in glass thermometer is calibrated the height of mercury columns are respectively recorded as 1mm and 99mm, when it is at lower fixed point and upper fixed point.

a) What is the environmental temperature as the bulb of thermometer is exposed to the environment. If height of mercury column is 34mm?

b) It's calibrated 1^0C as lower fixed point and 99^0C as upper fixed point by misstate. What is the correct reading when this thermometer shows a reading of 30°C?

c) Find the temperature at which false thermometer reading is equal to the correct one.

5.



(Figure 3)

You are given U tube connected with manometer as figure above if the density of the liquid is 800kgm^{-3} soap bubble of radin R, at end B is created by blowing through C
In that instance if the height difference in the u tube is 2.5cm.

a)

(i) Calculate radius of soap bubble (take coefficient of soap solution as = 30 x 10^{-3} Nm^{-1})

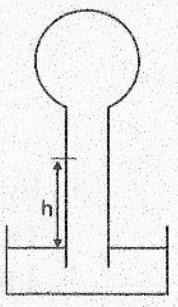
(ii) Plot the variation of pressure with the distance with a long line ABD.

(iii) Find work done in order to maintain soap bubble.

(iv) Find the excess work in order to puff the soap bubble.

(v) What happens to the height difference inside U tube when increasing radius of soap bubbles give reasons.

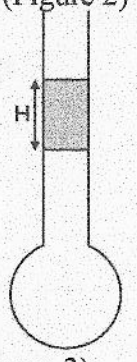
a) Calculate capillary rise when tube is dipped in a soap solution container as the figure shows. Take the diameter of soap bubble as 20mm (density of soap solutions $1000kg^{-3}m$) Assume the angel of contact is zero.



(Figure 2)

b) (i) Calculate height of soap solution column (H) when the diameter of soap bubble is 20mm when it is at bottom capillary tube as figure shows.

(ii) Calculate maximum height of soap column (h_1) when the soap bubble is split.



(Figure 3)

6. i) a) Explain Doppler effect

b) What caused for the Doppler effect when the observer in moving and the source is moving

c) A source of sound is moving a speed U_s and an observer to moving with a speed U_o. The frequency of the source is f_o the apparent frequency heard by the observer is given by $\left(\frac{V \pm U_o}{V \pm U_s}\right) f_o$ V is the speed of sound in still air.

Re write the above expression selecting the appropriate sign convention when the source is moving behind the to the same direction

ii) An ambulance is traveling behind a car sounding its whistle of frequency 100Hz with a velocity $40ms^{-1}$, The velocity of the car is $25ms^{-1}$. Find the frequency heard by the car driver if V = 320 ms^{-1}.

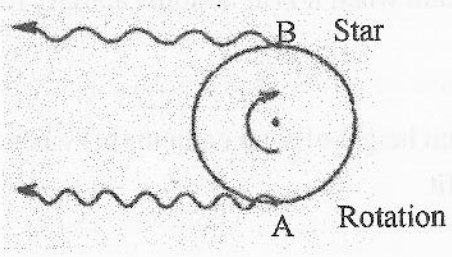
a) Assume that a wind flows with speed $30ms^{-1}$ to the same direction of the vehicle

1. What's the speed of sound relating to the earth?

2. Find the apparent frequency of the whistle heard by the car driver under this situation.
3. The sound wave is reflected by the cars back and the acts to heard by the ambulance drive Find the beat frequency heard by the ambulance drive

b) By finding the Doppler shift, the speed of rotation of a star can be estimated. The frequency apparent frequencies of the spectral lines at the opposite ends are different from actual frequency of the light emitted by the star.

The apparent frequency is given by $f = \frac{C}{(C-V)} f_0$ where c = 3 x 10^8 ms^{-1} V the speed at the edge of the star f_o natural frequency of the star light.



(i) Find F for the light emitting from A

(ii) Find F for the light emitting from B

(iii)Then find Δf where Δf = f - f^1. Show that $\frac{\Delta f}{f} = \frac{2V}{C}$ where C > > V

(iv)Find V if $\frac{\Delta f}{f} = 4 x 10^{-8}$

(v) Find the period of the star if the radius of the star is 2 x 10^6m.