CP/AL/2026/01/E-I

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மத்திய மாகாண கல்வித் திணைக்களம்
DEPARTMENT OF EDUCATION - CENTRAL PROVINCE

G. C. E. (A/L) Practice Test - 2026

Physics I | **01** | **E** | **I** | **Grade 13** | **Two Hours**

Instructions:

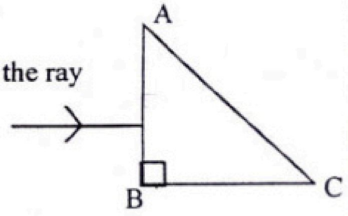
- Answer all the questions.
- Write your index number in the space provided in the answer sheet.
- Read the instructions given in the answer sheet carefully.
- In each of the questions 1 to 50, pick one of the alternatives from (1), (2), (3), (4), (5) which is correct or most appropriate and mark your response on the answer sheet with a cross (x) in accordance with the instructions in the answer sheet.

$$g = 10\,m\,s^{-2}$$

1. Among the sets of physical quantities given below, which choice below shows a vector quantity and a scalar quantity?
(1) Work, Power
(2) Electric field intensity, Electrical potential,
(3) Angular momentum, Linear momentum
(4) Tensile stress, Strain
(5) Intensity of sound, Intensity level of sound

2. What is the unnecessary characteristic property of the liquid which is used in liquid in glass thermometer?
(1) High boiling point
(2) High expansivity
(3) Low specific heat capacity
(4) Not wetting glass
(5) High density

3. The critical angle of ABC isosceles glass prism is 42°. The total deviation of the ray of light incident right angles to the face AB, is,



(1) 0°
(2) 45°
(3) 90°
(4) 135°
(5) 180°

4. The focal lengths of the lenses used in an astronomical telescope are 50 cm and 5 cm. Consider the following statements.
A. The lens of focal length 50 cm should be used as the objective.
B. When the telescope is at normal adjustment, the angular magnification is 10.
C. The final image is inverted.

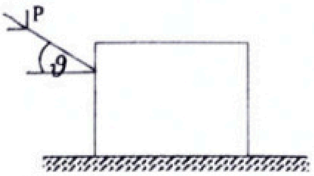
Of the above statements,
(1) only A is true.
(2) only A and B are true
(3) only A and C are true
(4) only B and C are true.
(5) all A, B and C are true

5. If the dimension of electric current, is I, the dimension of magnetic flux density is,
(1) $M\,I^{-1}T^{-2}$
(2) $M\,I^{-1}T^{-1}$
(3) $M\,L\,I^{-1}T^{-1}$
(4) $M\,L^{2}T^{-1}I^{-2}$
(5) $L\,I\,T^{-2}$

6. When a body hits the ground after vertically drops from a height *h*, 50% of kinetic energy just before the impact is lost. What is the velocity of the body with which it bounces?
(1) $\frac{\sqrt{gh}}{4}$
(2) $\sqrt{\frac{gh}{2}}$
(3) $\frac{\sqrt{gh}}{2}$
(4) $\sqrt{gh}$
(5) $\sqrt{2gh}$

7. Of a body which undergoes simple harmonic motion,
   (1) the speed is maximum when the displacement is maximum.
   (2) the magnitude of the acceleration is maximum when the speed is maximum.
   (3) the speed is directly proportional to the displacement.
   (4) the direction of the acceleration is always constant.
   (5) the magnitude of the acceleration is always directly proportional to the displacement.

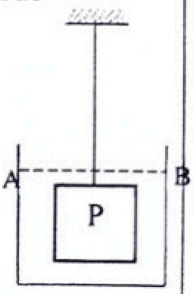
8. A body of weight W is placed on a rough horizontal surface. When a force P is applied with an angle ϑ to the horizontal as shown in the figure, the body is in equilibrium and the frictional force on the body is F. Consider the following statements.



A. $F = P\cos\vartheta$.
B. The normal reaction on the body from the horizontal surface is $(W - P\sin\vartheta)$.
C. The body is at the state of limiting equilibrium.

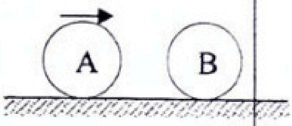
Of the above statements,
(1) only A is true. (2) only A and B are true (3) only A and C are true
(4) only B and C are true. (5) all A, B and C are true

9. An end of the thin, light, inelastic string is tied to the ceiling and the other end is attached to a 40 N weigh cube P of material of density 2500 $kg\ m^{-3}$. Keeping a beaker below the cube, when it is filled with water of density 1000 $kg\ m^{-3}$ gradually up to the level AB, the minimum tension of the string would be,



(1) 32 N (2)30 N (3)24 N
(4) 20 N (5)16 N

10. As shown in the figure, the ball A moves with velocity U and collides with the ball B which is at rest on a smooth horizontal surface. Consider the following statements.



A - If only the velocity U is along the direction of the line joining the centers of A and B, the force on B by A and the force on A by B are opposite in direction.
B - Although the velocity U is acting along any direction before collision, the reduction of momentum of A towards a certain direction is same as the momentum gained by B, towards the same direction.
C - The law of conservation of energy does not apply for the collision.

Of the above statements,
(1) only A is true. (2) only B is true (3) only C is true
(4) only A and B are true. (5) only A and C are true

11. A current 3.2 A flows along a wire of cross-sectional area 1 mm^2. The electron drift velocity is 2 $mm\ s^{-1}$. If the charge of an electron is$1.6 \times 10^{-19}C$, the number of free electrons in a unit volume of wire is,
(1) $1 \times 10^{16}\ m^{-3}$ (2) $1 \times 10^{19}\ m^{-3}$ (3) $1 \times 10^{22}\ m^{-3}$ (4) $1.024 \times 10^{23}\ m^{-3}$ (5) $1 \times 10^{28}\ m^{-3}$

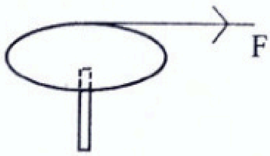
12. From a nucleus of radioactive atom,
A - the atomic number is increased by 1, when a β^-particle is emitted.
B - the atomic number is decreased by 1, when a β^+ particle is emitted.
C - the atomic number is unchanged when a γ rays are emitted.

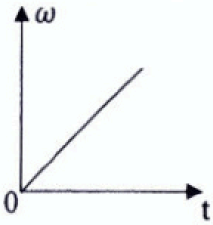
Of the above statements,
(1) only A is true. (2) only A and B are true (3) only A and C are true
(4) all A, B and C are true (5) all A, B and C are untrue

13. The cross-sectional area of a rubber hose which is used to water a lawn is 2.4 cm^2. There is a shower connected to an end of the hose and 20 holes of cross-sectional area of each 2 mm^2 are in the shower. The water flows through the hose with velocity 1.5 $m\ s^{-1}$ and enters the shower. The speed of water flows out through a single hole is,

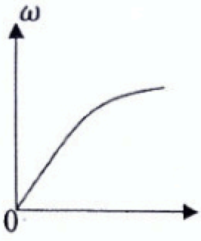
(1) 3 $m\ s^{-1}$ (2) 4.5 $m\ s^{-1}$4.5 (3) 9 $m\ s^{-1}$ (4) 18 $m\ s^{-1}$ (5) 24 $m\ s^{-1}$

14. A circular disc is set to rotate freely about a vertical axis through the center in a horizontal plane by means of a string which is wound around the circumference of the disc and a constant force F is applied tangential to the disc. The graph which best shows the variation of angular velocity ω of the disc with time t, is,





(1)



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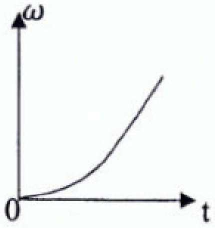

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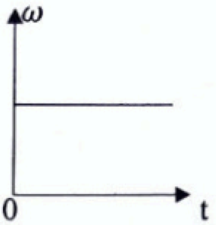

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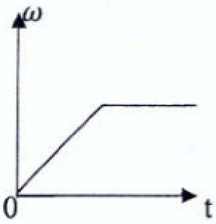
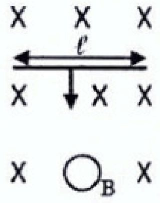
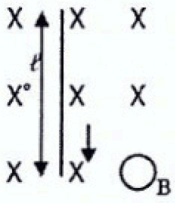


(5)

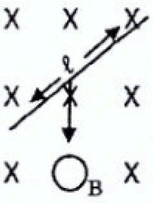
15. The figures (A), (B) and (C) show three rods of length l which moves downwards freely in a uniform horizontal magnetic field of flux density B. In the instance shown, the time is $t = 0$. When $t = T$, if the induced electromotive forces along the ends of rods in (A), (B) and (C) are $e_{a,}e_{b,}and\ e_c$, which is correct among given relationships?



(A)



(B)

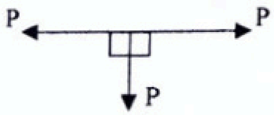


(C)

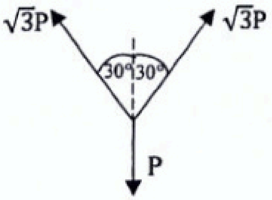
(1) $e_a = e_b = e_c$ (2) $e_a > e_b > e_c$ (3) $e_a < e_b < e_c$

(4) $e_a > e_c > e_b$ (5) $e_a = e_c > e_b$

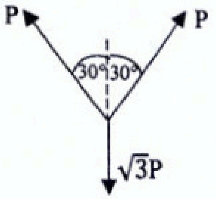
16. Consider the following co-planner systems of forces which pass through the same point.



(A)



(B)



(C)

The system/systems in equilibrium is/are,

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

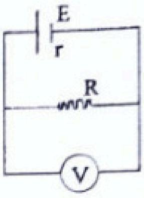
17. A body is projected with an inclination ϑ to the horizontal with a kinetic energy 100 J and the kinetic energy at the highest point of the path of this body is 25 J. The value of ϑ is,

(1) $\cos^{-1}\frac{1}{4}$ (2) $\tan^{-1}\frac{1}{4}$ (3) $\tan^{-1}\frac{1}{2}$ (4) 45° (5) 60°

18. Consider a situation that a rocket moves towards the opposite direction of the backward thrust of the exhausted gas of burning fuel.
    A) The acceleration of the rocket increases when the fuel burns with uniform rate and the velocity of exhausted gas is constant relative to the rocket.
    B) The magnitudes of the momentum of exhausted gas and the momentum of rocket are same and they are opposite in direction.
    C) The increased kinetic energy of the rocket is gained by the chemical energy of the fuel.

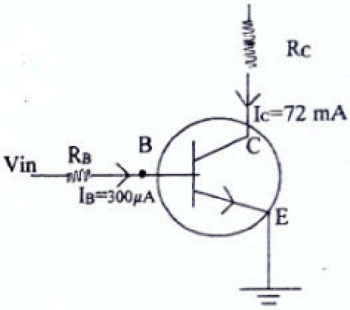
    Of the above statements,
    (1) only B is true.
    (2) only A and B are true.
    (3) only A and C are true
    (4) only B and C are true.
    (5) all A, B and C are true.

19. The cell of electromotive force E and internal resistance r is connected to an ideal voltmeter V and a resistor R, as shown in the figure. $E = 1.8\,V$ and $r = 0.6\,\Omega$. The reading of the voltmeter is $1.5\,V$. The value of R is



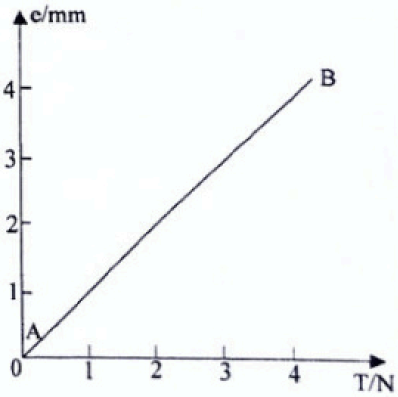
    (1) $1\,\Omega$
    (2) $2\,\Omega$
    (3) $2.5\,\Omega$
    (4) $3\,\Omega$
    (5) $4\,\Omega$

20. The figure shows a part of a circuit of transistor in common emitter configuration which is used as a signal amplifier. The currents I_B and I_C are shown in the figure. What is incorrect among the following statements?



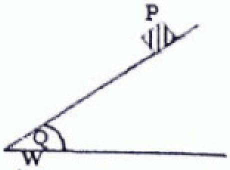
    (1) The type of the transistor is npn.
    (2) The emitter current is $75\,mA$.
    (3) The current gain is 240.
    (4) The base voltage is $V_B = V_{BE}$.
    (5) $V_{in} = R_B I_B + V_{BE}$.

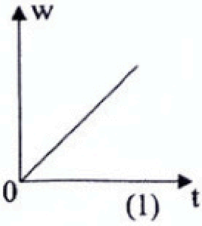
21. The graph shows the variation of tension T on a wire with the extension e of it. Consider the following statements.
    A) In the region AB, the wire obeys the Hooke's law.
    B) The young modulus of the material of wire is $7x10^8\,N\,m^{-2}$.
    C) When $T = 200\,N$, the energy stored in the wire is $\frac{2}{7}\,J$.



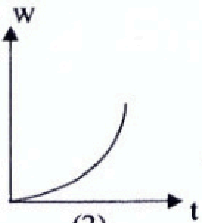
    Of the above statements,
    (1) only A is true.
    (2) only A and C are true.
    (3) only B and C are true.
    (4) all A, B and C are true.
    (5) all A, B and C are untrue.

22. Along the plane shown in the figure, the body P slips down with constant velocity. The graph which shows the variation of work done W against the friction with time t is,





(1)



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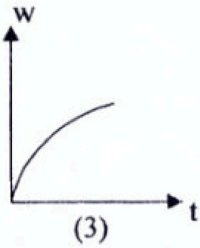

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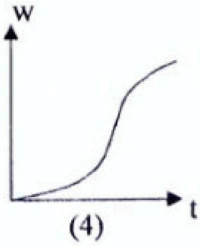

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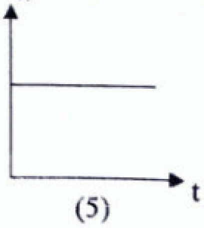
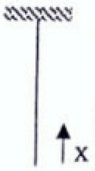
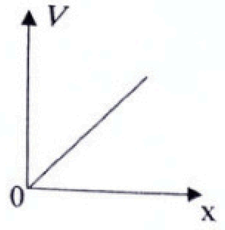


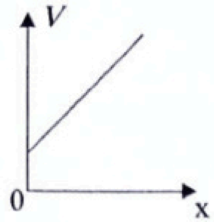
(5)

23. A wave pulse is allowed to pass up from the lower end along the heavy rope which is suspended vertically. The graph which shows the variation of the speed of wave pulse V with the distance x measured from the lower end is,





(1)



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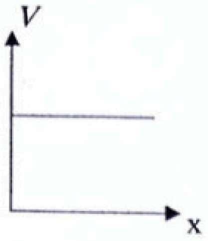

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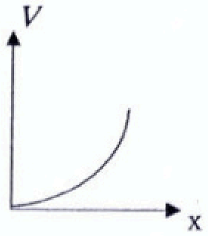

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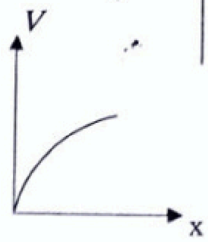


(5)

24. Consider the following statements made about the water waves produced in the ripple tank which is used in the laboratory.

A) The amplitude of the circular wave fronts made by a vibrating point source near the surface of water diminishes when they are propagating.

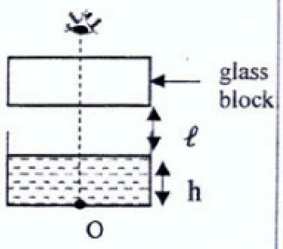
B) By moving the vibrating point source along the surface of water in the tank, the Doppler Effect can be demonstrated.

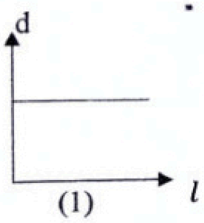
C) When the height of water in the tank is low, by making two sides of different heights, the refraction of waves can be demonstrated.

Of the above statements,

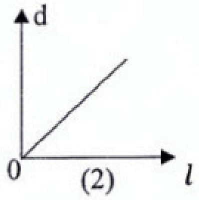
(1) only A and B are true.
(2) only A and C are true.
(3) only B and C are true.
(4) all A, B and C are true
(5) all A, B and C are untrue

25. A beaker is filled with water up to a height h. At the bottom of the beaker a bright source of light is placed at O. A height l above the surface of water, a rectangular block of glass is placed horizontally. When the eye is kept at the point E, the variation of the apparent displacement d of the image of O with l is best represented by,





(1)



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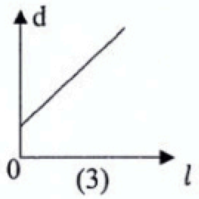

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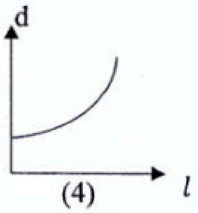

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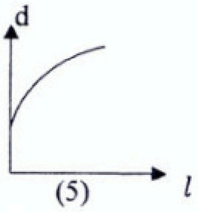


(5)

26. Consider the following statements about the production of Laser light.

A) There are more than two energy levels for the medium of Laser light.

B) The polarization of the stimulant photon and the stimulated photon are same.

C) The output of the Laser light can be obtained as continuous beam or as pulses.

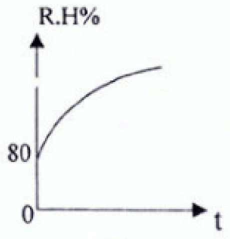
Of the above statements,

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

27. The corresponding wavelength and the electromagnetic wave of the radiation of maximum intensity from a person who can be considered as a black body at temperature $36^{o}C$ would be, (The Wien's displacement constant $=3\ x10^{-3} m\ K.$)

(1) 9.7 μm, infrared
(2) 9.7 μm, visible light
(3) 9.7 μm, ultraviolet
(4) 108 μm, infrared
(5) 108 μm, ultraviolet

28. There is a large container of water in closed room. In the beginning at time $t = 0$, the relative humidity in the room is 80%. If the temperature of the room is constant, the graph which shows the variation of relative humidity $R.H.$ of the room with time t is,



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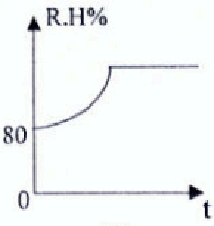

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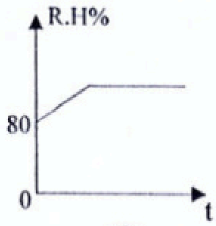

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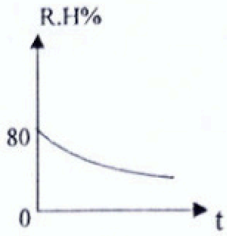

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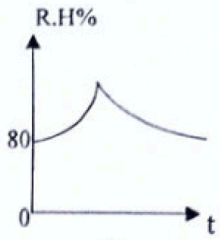


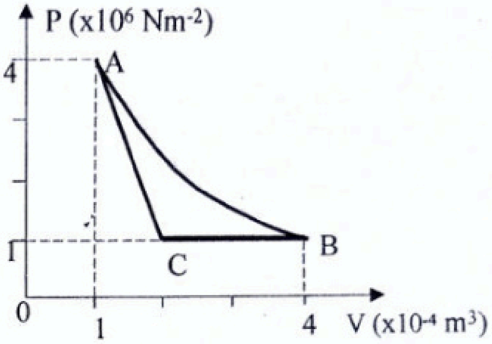
(5)

29. The figure shows the variation of the pressure (P) and volume (V) of an ideal gas. In the cyclic process ABCA, the temperatures at A, B and C are T_A, T_B and T_C. Consider the following statements.

A) $T_A = T_B > T_C$

B) In the cyclic process, the gas has absorbed heat

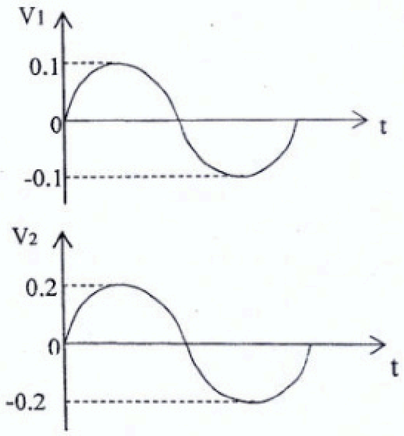
C) An adiabatic process is shown by CA.

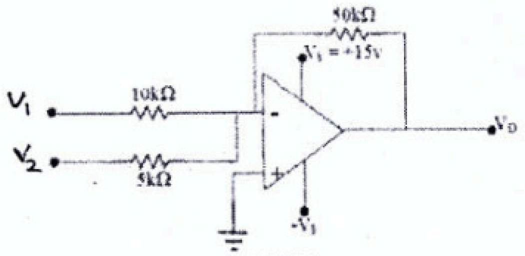


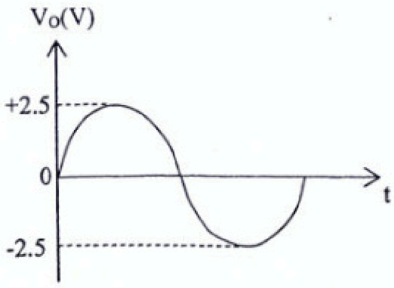
Of the above statements,

(1) only A is true.
(2) only A and B are true
(3) only A and C are true.
(4) all A, B and C are true
(5) all A, B and C are untrue

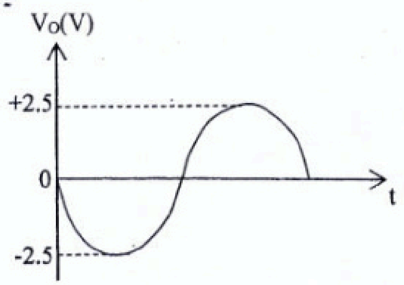
30. The figure (2) shows the inputs V_1 and V_2 which are applied to the operational amplifier shown in the figure (1). The frequencies of voltage signals of V_1 and V_2 are same. Which choice shows the output V_0 correctly?



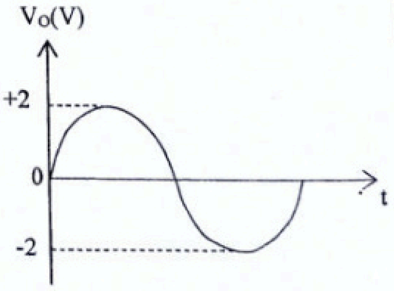




(1)



(2)



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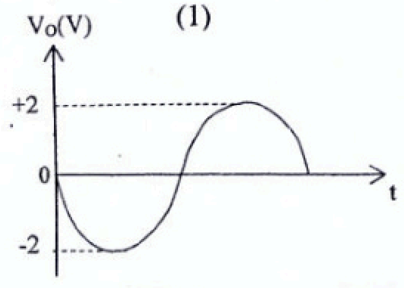

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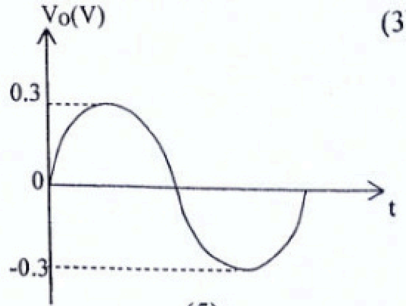
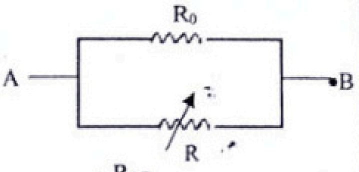
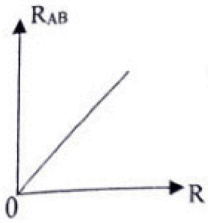


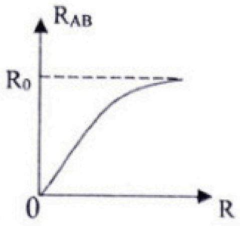
(5)

31. As shown in the figure, two resistors R_0 *and* R are connected in parallel. The graph which shows the variation of effective resistance R_{AB} with the change in variable resistor R, is

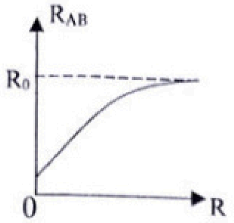




(1)



(2)



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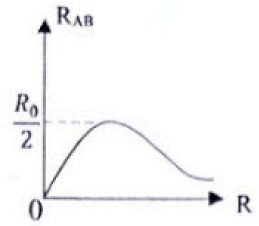

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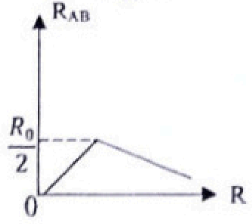
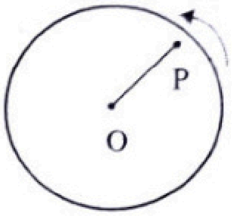


(5)

32. A body P of mass *0.2 kg* is attached to the free end of a *20 cm* long light string and the other end is connected to the axel of a smooth horizontal circular disc. The disc is able to rotate freely about the vertical axis through the center O of the disc. The disc is rotated with uniform angular acceleration 4 $rad\ s^{-2}$. If the braking tension of the string is 400 N, how long does the body P take to move away radially?



(1) 15 s (2) 20 s (3) 24 s (4) 25 s (5) 50 s

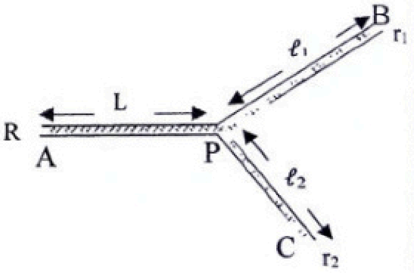
33. The column of air in a tube closed at far end vibrates with fundamental frequency 660 Hz. The temperature of air is 27 °C. What is the fundamental frequency of the air in the tube when the temperature becomes 30 °C. (Assume $\sqrt{1.01} = 1.005$)

(1) 665 Hz (2) 663 Hz (3) 662 Hz (4) 661 Hz (5) 660 Hz

34. When the graph of the image distance V against the linear magnification m is drawn for the real images formed by a converging lens, the gradient and intercept are G *and* C correspondingly. By keeping an identical converging lens in contact with the first lens, the graph of real image distance against the linear magnification is drawn. The gradient and the intercept of this graph are,

(1) G & C. (2) $\frac{G}{2}$ & C. (3) 2G & C. (4) G & 2C. (5) G & $\frac{C}{2}$.

35. The figure shows a combination of three tubes of lengths $L, l_1 and\ l_2$ which are connected at the point P. The radii of them are $R, r_1 and\ r_2$ respectively. A steady, streamlined viscous fluid flows along the tube, entering from the end A. The pressure at the points A, B and C are $2P_0$, P_0 and P_0. The pressure at the common junction P of the tubes,



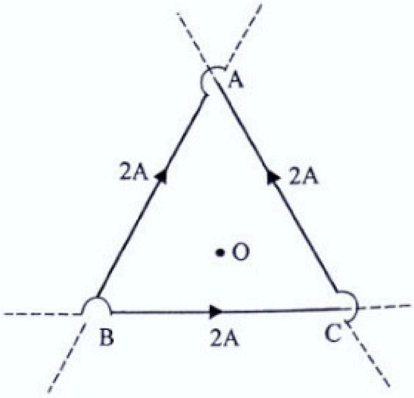
A) depends on the co-efficient of viscosity.
B) depends on the lengths of all the tubes.
C) depends on the radii of all the tubes.

Of the above statements,
(1) only A is true. (2) only A and B are true. (3) only A and C are true.
(4) only B and C are true. (5) all A, B and C are true.

36. The ratio between the radii of two planets is K_1. The ratio between the acceleration due to gravity on the surfaces of them is K_2. The ratio between the escape velocities of them is,

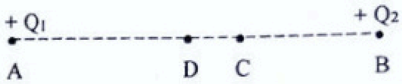
(1) $\sqrt{K_1K_2}$ (2) K_1K_2 (3) $(K_1K_2)^2$ (4) $\frac{K_1K_2}{K_1+K_2}$ (5) $\sqrt{\frac{K_1}{K_2}}$

37. Infinitely long three straight conductors are placed on the plane of the paper so as they pass through the points A, B and C without touching one another and, so as, ABC is a regular triangle. O is the center of the triangle and $AO = 20\ cm$. The conductors carry currents of $2A$ towards the directions shown in the figure. The magnetic flux density produced at O is, ($\mu_0 = 4\pi x 10^{-7} T\ m\ A^{-1}$)



(1) $2x10^{-6}\ T$ and out of the plane of the paper at right angles to the paper.
(2) $4x10^{-6}\ T$ and out of the plane of the paper at right angles to the paper.
(3) $4x10^{-6}\ T$ and in to the plane of the paper at right angles to the paper.
(4) $6x10^{-6}\ T$ and out of the plane of the paper at right angles to the paper.
(5) $6x10^{-6}\ T$ and in to the plane of the paper at right angles to the paper.

38. Two point charges $+Q_1\ and + Q_2$ are placed at the points A and B on a flat surface. The electric field intensity at the point C is zero. Consider the following statements.



A) $Q_1 > Q_2$.
B) At the mid-point D of AB, the direction of electric field intensity is towards AB.
C) The point with the maximum electric field intensity is D.

Of the above statements,
(1) only A is true.
(2) only C is true.
(3) only A and B are true.
(4) only A and C are true.
(5) all A, B and C are true.

39. In the following setup of capacitors shown in the figure (1), the area of each plate P, Q, R and S is A. The gap between each couple of plates is d. The capacitance measured in between X and Y is C.

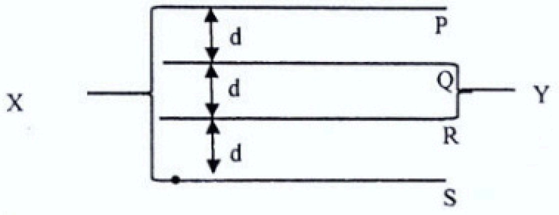


Figure 1

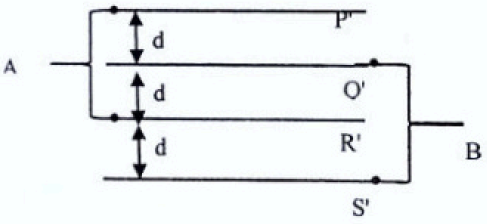


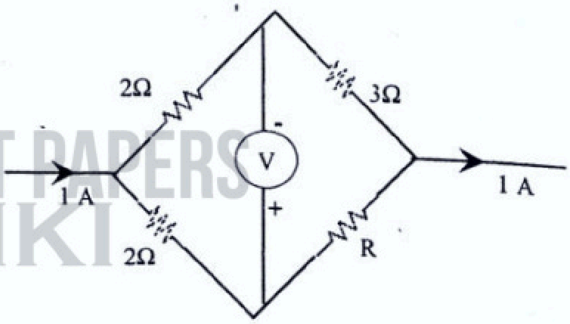
Figure 2

In the setup of capacitors shown in the figure (2), the area of each plate P′, Q', R' and S' is A. The gap between each couple of plates is d. The capacitance measured in between A and B is,

(1) 0.5 C
(2) C
(3) 1.33 C
(4) 1.5 C
(5) 2 C

40. A current of 1 A flows into the circuit shown in the figure. The reading of the ideal voltmeter is 1.2 V. The resistance of the resistor R is,

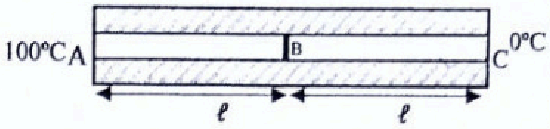
(1) 2 Ω
(2) 12 Ω
(3) 15 Ω
(4) 18 Ω
(5) 36 Ω



41. Three liquids A, B and C are at temperatures $30°C, 40°C$ *and* $50°C$ respectively. Same masses of these liquids are mixed in a container and stirred well. These liquids mix with one another and no heat loss to the surroundings. The final temperature of the mixer is 35°C. The specific heat capacities of A, B and C are S_A, S_B, *and* S_C respectively. The relationship among S_A, S_B, *and* S_C is,

(1) $S_A + S_B = S_C$
(2) $S_A + S_B = 2S_C$
(3) $S_A = S_B + S_C$
(4) $S_A = S_B + 2S_C$
(5) $S_A = S_B + 3S_C$

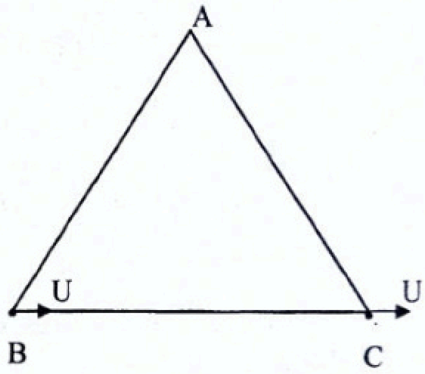
42. The length l and the cross sectional area of the rods AB and BC are same and they are connected at the end B. The curved surface of the combination is lagged to prevent heat loss. The thermal conductivity of AB is twice of that of BC. The ends A and C are maintained at $100\ °C$ *and* $0\ °C$ respectively. The distance from the end A to the point at which the temperature is 50 °C, when the combined rod becomes the thermal equilibrium, is,



(1) 0.75 ℓ
(2) 1.20ℓ
(3) 1.25 ℓ
(4) 1.50ℓ
(5) 1.60ℓ

43. As shown in the figure, two sound sources move with same velocity u towards BC, along the line BC emitting a sound of frequency f. When the sources are at B and C, a person is at the point A and ABC makes a regular triangle. If the velocity of sound in air is V, due to the sources, the person at A,

1. does not hear beats.
2. hears the beats of frequency $\frac{uvf}{u^2-v^2}$
3. hears the beats of frequency $\frac{2uvf}{2u^2-v^2}$
4. hears the beats of frequency $\frac{uvf}{4v^2-u^2}$
5. hears the beats of frequency $\frac{4uvf}{4v^2-u^2}$



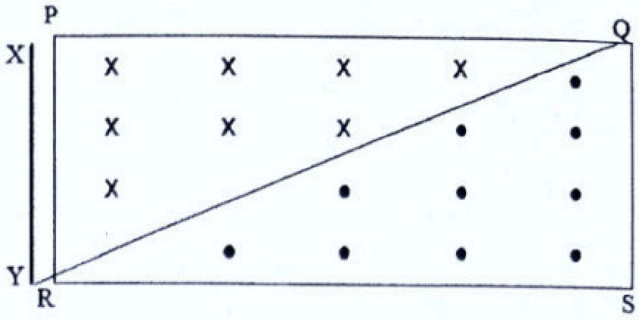
44. A beam of electrons accelerates from rest under a potential difference V. The mass and charge of an electron are m *and* e respectively. If the plank constant is h, De Broglie wavelength of the beam is,

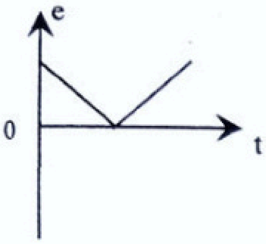
(1) $\frac{2h}{\sqrt{meV}}$
(2) $\frac{h}{\sqrt{2meV}}$
(3) $\frac{h}{2\sqrt{meV}}$
(4) $\sqrt{\frac{h}{2meV}}$
(5) $\frac{h}{2mV}$

45. A body P of mass 10^{-3} kg and charge $+1\mu C$ is kept at the point B, 1 m away from a fixed body at A of charge $+2\mu C$. The body P is allowed to move. If $\frac{1}{4\pi\varepsilon_0} = 9x10^9 m^2 N\, C^{-2}$, the speed of P gained after moving a large distance would be approximately equal to,

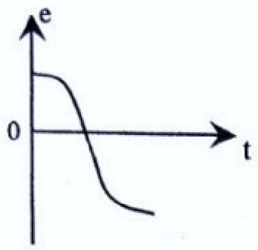
(1) $3\, m\, s^{-1}$
(2) $4\, m\, s^{-1}$
(3) $\sqrt{18}\ m\, s^{-1}$
(4) $\sqrt{30}\ m\, s^{-1}$
(5) $6\, m\, s^{-1}$

46. The figure shows a region of a uniform magnetic field of flux intensity B into the PQR horizontal plane and another uniform magnetic field of flux density B out of the QRS horizontal plane. Bothe fields are at right angles the planes. The XY conducting rod is placed very close to PR at the time $t = 0$, and is moved towards QS with constant horizontal velocity. The graph which shows the variation of electromotive force e induced in between the ends of the rod with time t is,

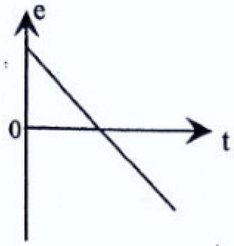




(1)



(2)



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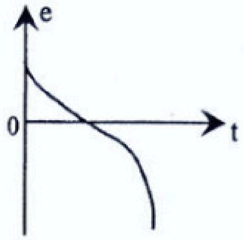

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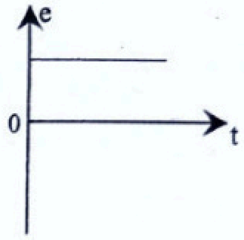


(5)

47. A meter ruler is made of a material A and it is accurate at 0 °C. When it is used to measure the length of a metal rod B at 30 °C, the reading is 50 cm. The linear expansivities of A and B are α_1°C^{-1} and α_2°C^{-1} respectively. The actual length of the rod B at 0 °C is,

(1) $\frac{50\,(1+30\alpha_1)}{1+30\alpha_2}$

(2) $\frac{50\,(1+30\alpha_2)}{1+30\alpha_1}$

(3) $50(1+30\alpha_1)(1+30\alpha_2)$

(4) $50(1+30\alpha_1)$

(5) $50(1-30\alpha_2)$

48. The capillary tube A of internal radius r and the thickness of the glass wall d is immersed vertically in a liquid of zero contact angle. Then the liquid rises to a height h. Another capillary tube B of internal radius $2r$ is immersed in the liquid so as the both tubes are co-axel as shown in the figure, the height of the liquid in the space in between the tubes is,

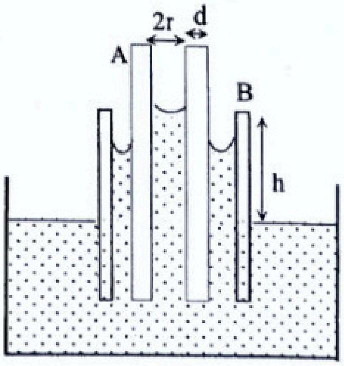
(1) h

(2) $\frac{dh}{r-d}$

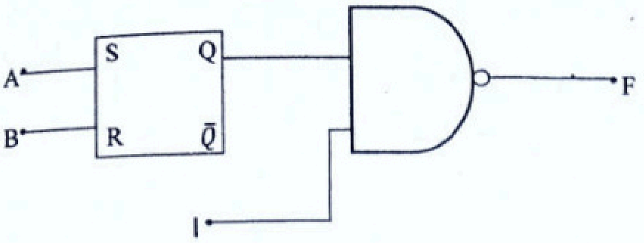
(3) $\frac{dh}{r+d}$

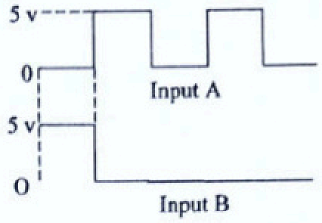
(4) $\frac{rh}{r-d}$

(5) $\frac{rh}{r+d}$

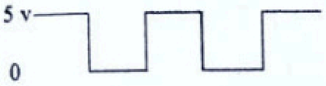


49. The voltages shown in the figure (2) are given for the A and B inputs of the S-R flip-flop shown in the figure (1). The input 1 of the NAND gate is binary 1. (voltage 5V) Which choice below gives the output F?





(1)



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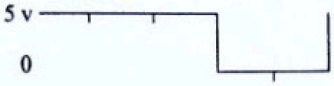

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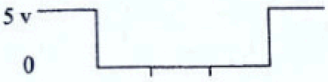

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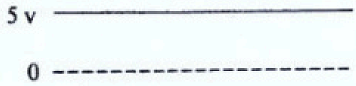
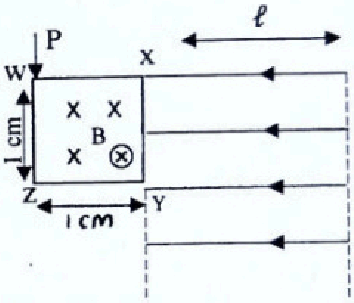


50. A uniform magnetic field of flux density $B = 1.7\,T$ acts into the plane of the paper at right angles to it. A proton P enters the magnetic field from W, right angles to WX and leaves the field from Y, right angles to XY. WXYZ is a square and the length of a side of it is 1 *cm*. An electric field of intensity $E = 1.7x10^3 N\,C^{-1}$ acts at right angles to XY along a length l. The proton P moves in the electric field within a time of 10 μs. The mass and the charge of a proton are $1.7x10^{-27}\,kg$ and $+1.6x10^{-19}C$ respectively. The length l is equal to,



(1) 2 m (2) 4 m (3) 6 m (4) 8 m (5) 12 m

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CP/AL/2026/01/E-II

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மத்திய மாகாண கல்வித் திணைக்களம்
DEPARTMENT OF EDUCATION - CENTRAL PROVINCE

G. C. E. (A/L) Practice Test - 2026

Physics II | 01 | E | II | Grade 13 | 3 Hours

Additional reading time – 10 minutes

Index number : ....

Use the extra reading time to read the paper, select questions, and organize questions to prioritize when writing answers.

- Instructions:-.
- Use of calculators is not allowed.
  Acceleration due to gravity g= 10 ms^{-2}
- Part A –Structured Essay
  Answer all the questions in this section in this paper itself.
- Part B – Essay
- Answer only four questions from Section B.
- You are allowed to take only section B of the question paper out of the examination hall.

(Examiners use only)

Part	Question No	Marks
A	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9 A/B	
	10 A/B	
Total		
Percentage		

Final Marks

(In words)	
(In Figures)	

See page 2

Part A – Structured Essay

1) A student uses a meter scale (M), a weight (B) of 100 g, a knife edge (N), a block of wood (L) and light inelastic strings to find the mass (m_0) of a metal cube (P)

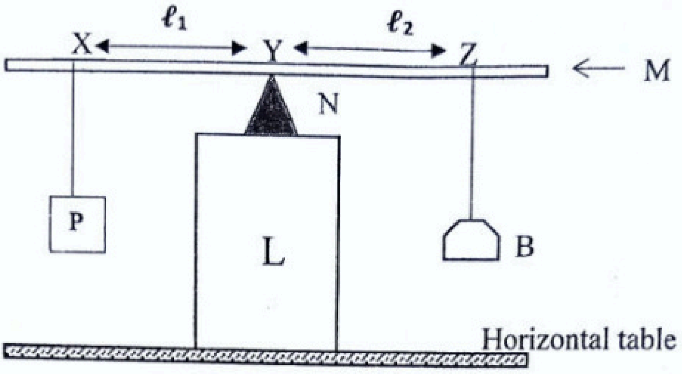


Figure 1 (1)

(a) First, the meter scale should be balanced horizontally on the knife edge (N). Write down the method to be followed to do this.

....

....

....

(b) After the step in (a), the student suspends B and P from the meter scale by the strings and again the meter scale is balanced horizontally. Look at the figure 1(1). Y is the center of gravity of the meter scale. The meter scale readings at X, Y and Z are 8.0 cm, 50.0 cm and 80.0 cm respectively.

i. Calculate the mass of P. Round off your answer to the first decimal point in grams.

....

....

ii. Find the reaction force (in Newton) on the Knife edge at Y. The mass of the meter scale is 120 g.

....

....

(c) In order to find the volume of the material of the cube P, the length (a) of a side of the cube is measured by a Vernier calliper. The appearance of the main and venire scales are shown in the figure 1(2), when the length is being measured. (Scale is enlarged)

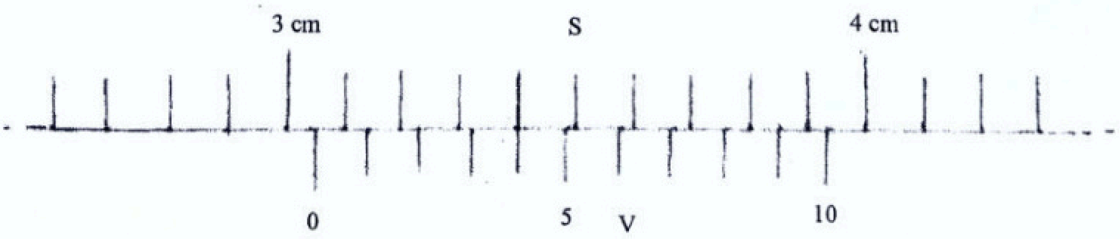


Figure 1(2)

i. What is the relevant part of the vernier callipers which is used to keep the cube in place?

....

ii. What is the least count of the vernier callipers?

....

iii. If there is no zero error, find the value of a?

....

(d) i. Give the volume of the metal cube to the nearest integer in cm^3.

....

....

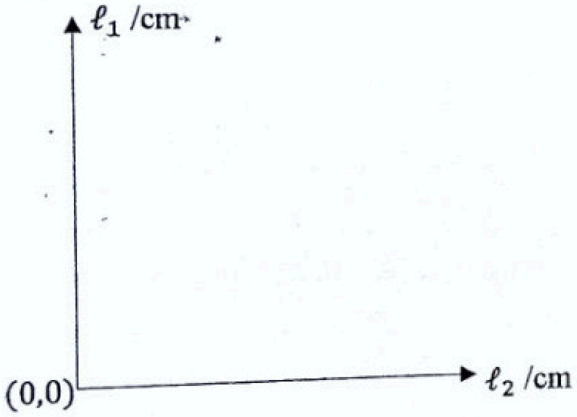
ii. Find the density of the material of the cube to the nearest integer in S. I. unit.

....

....

(e) In order to find m_0 by plotting a graph applying the method mentioned in (b), the quantities to be varied are marked as $l_1 and\ l_2$, in the figure (1).

i. Draw the expected graph of $l_1 and\ l_2$ in the following system of axes.



ii. If the minimum reading of the meter scale is 1 mm, for less than 1% of percentage error of the readings of l_2, find the minimum value of $l_2.(l_{min})$.

....

....

iii. If the value of m_0 obtained by the graph in (e)(i) is *70 g*, what is the possible maximum value of l_2? (l_{max})

....

....

....

iv. With the values of l_{min} and l_{max}, state six suitable readings for l_2 to plot the graph.

....

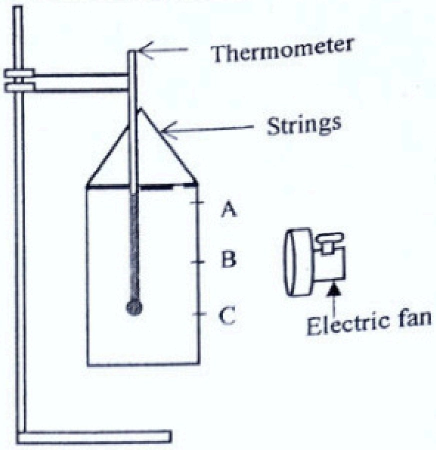


Figure 2 (1)

2) A student has been asked to find the specific heat capacity (C_0) of coconut oil using the method of cooling. For this, he uses a copper calorimeter equipped with a lid and a copper stirrer. An incomplete diagram of the experimental setup, along with other necessary items, is shown in Figure 2(1).

(a)

i. State the item that is not shown in the diagram and the measuring instrument required to take the necessary measurements.

Item ....

Measuring Instrument ....

ii. What is the use of the item you mentioned in above a (i)?

....

(b) To perform the experiment, water heated to 70°C must be poured into the calorimeter.

i. What is the mass measurement (say m_1) that the student must obtain before pouring water into the calorimeter?

....

ii. Up to which level among the three levels marked as A, B, and C in Figure 2(1) should the water be poured? Give reasons for your answer.

....

....

iii. Temperature measurements of the water must be taken after pouring it. What actions should be taken prior to taking those measurements?

....

....

iv. What is the other measurement that must be taken simultaneously with the temperature measurements?

....

v. What is the mass measurement (say m_2) that must be measured after taking the measurements mentioned in b (iv) above?

....

(c) After the activity in (b), the student removes the water and dried the calorimeter and then filled it with coconut oil at temperature 70^0 C. Then he uses the setup in 2(i) and follows the steps according to (b)(iii) and (b)(iv).

i. Up to which level that the coconut oil is poured to the calorimeter? Explain your answer.

....

....

ii. What is the measurement of mass (say m_3) to be taken after taking the readings of temperature of coconut oil?

....

(d) Based on the measurements obtained by the student, the cooling curves for both liquids were drawn on the same graph. The two resulting curves are shown in Figure 2(2).

The specific heat capacity of coconut oil is less than that of water. The specific heat capacity of water is $4200\ J\ kg^{-1}K^{-1}$. The values obtained from the experiment are given below:

$m_1 = 110$ g ; $m_2 = 290$ g: $m_3 = 254$ g:

The gradients of the tangents drawn to the curves at points P and Q are 6°C min^{-1} and 3°C min^{-1}. The specific heat capacity of copper is $400\ J\ kg^{-1}\ K^{-1}$. Calculate the specific heat capacity of coconut oil.

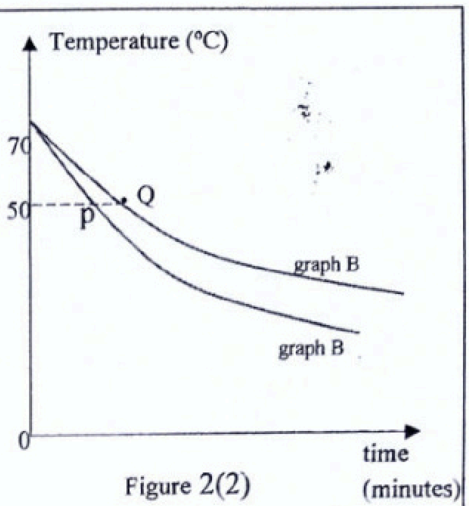


Figure 2(2)

3) You are provided with an apparatus consisting of a uniform tube containing a piston P and a piston rod, which can slide smoothly back and forth, as shown in Figure 3(1). You are asked to find the velocity of sound in air (V). The piston is in tight contact with the walls of the tube. For this experiment, tuning forks with frequencies of 512 Hz, 426 Hz, 384 Hz, 341 Hz, and 320 Hz are provided. Let the length of the resonating air column for the fundamental tone with a tuning fork be l.

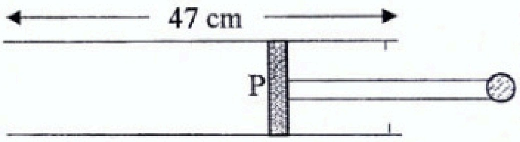


Figure 3(1)

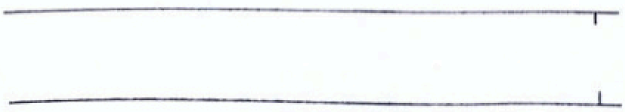
(a) An additional item is required to conduct the experiment properly. A measuring instrument is also required to take measurements. State what they are:

Item: - ....

Measuring Instrument: - ....

(b) It is appropriate to first take the tuning fork with the highest frequency, measure l and then select the remaining tuning forks in descending order of frequency to vibrate the air column and find the corresponding values of l. Give the reason for this.

(c) In the diagram provided below, draw and mark the position where the piston P should initially be placed inside the tube before obtaining the very first resonance length.



(d) After placing the piston as described in (c) above, state the experimental procedure followed to obtain the resonance length l for the tuning fork with the highest frequency.

....

....

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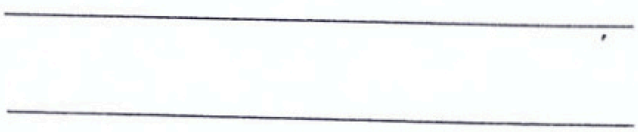
(e) Assume that the corresponding length l is obtained for all the tuning forks. Draw the wave pattern formed inside the tube during a resonance state in the space provided below. Mark the length l and the end correction e on your diagram.



(f) (i) If the frequency of the tuning fork used in the instance mentioned in (e) above is f, derive a relationship between V, f, l, and e.

....

....

....

(ii) Label the axes of a suitable graph that can be plotted to determine V.

X-axis:- .... Y-axis:- ....

(g) A student performed the experiment and plotted a graph as mentioned in f(ii) above. The gradient and the intercept of the resulting straight line expressed in their respective S.I. units were 82.5 and -0.015 respectively. Calculate V and e.

....

....

....

(h) Another student performed the experiment using the same tube and the same set of tuning forks, and plotted the graph as mentioned in f(ii). The gradient and intercept he obtained in S.I. units were 83.2 and -0.015 respectively.

(i) What is the reason for the intercept remaining unchanged?

....

(ii) What is the reason for obtaining a higher value for the gradient?

....

(i) The thickness of the piston P inside the tube mentioned in Figure 3(1) is 1 cm. The length over which P can be moved is shown in Figure 3(1). Show that the first overtone state cannot be obtained using this tube for any tuning fork in the given set.

....

....

....

....

4)

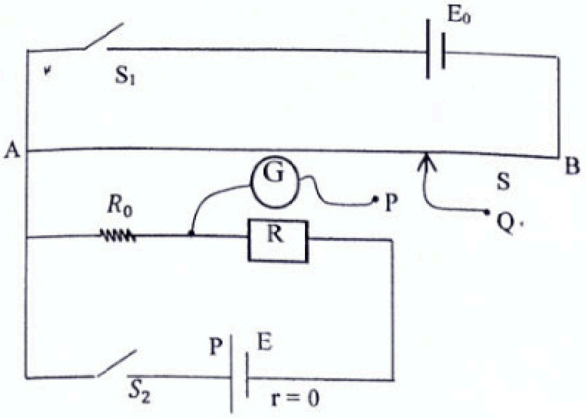


Figure 4(1)

An incomplete circuit diagram that can be used to find the value of a resistor R_0 using a potentiometer is shown in Figure 4(1). AB is the potentiometer wire of length L. R is a resistance box. S is a sliding key. (Jockey). The other components are represented by standard symbols. E_0 is an accumulator with negligible internal resistance.

(a) (i) Complete the diagram above using standard symbols to show the components that must be connected between terminals P and Q for this experiment.

(ii) State the purpose of those components and the instances in which they are used.

....

....

....

....

(b) After making the connections mentioned in (a) above, closing the switches S_1 *and* S_2, how do you test the accuracy of the circuit setup?

....

....

(c) By varying the resistance R of the resistance box, the corresponding balancing length ℓ measured from A must be obtained.

(i) Choosing values for R that result in small lengths for ℓ is avoided. Give two reasons for this.

1...

2...

(ii) Assume that the sliding key S is touching point C on wire AB when the deflection in galvanometer G is zero (not shown in the figure). Why is the potential drop per unit length k equal across both sections AC and CB? Write an expression for k in terms of E_0 and L.

k = ...

(iii) Derive a relationship among the electromotive force E of cell P, E_0, R, R_0, k, and the balancing length ℓ at equilibrium. Rearrange this relationship into the linear form y = mx + c in order to plot a graph. Take the internal resistance of cell P as zero.

....

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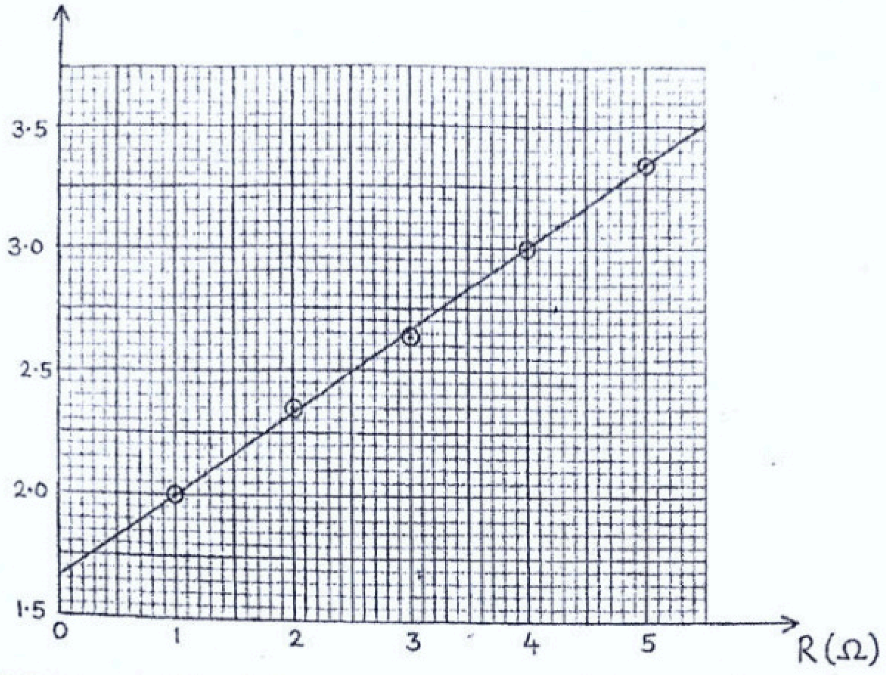
(d) A student obtained corresponding values of ℓ by varying R and plotted a graph as derived in C(iii), which is shown below. The Y-axis has been plotted using relevant S.I. units



(i) State the coordinates of the two points you would select on the straight line to calculate its gradient (m), and find m. State its units as well (Do not use data points)

....

....

....

(ii) What is the value of the intercept on the graph? ....

(iii) Calculate the value of resistance R_0.

....

....

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மத்திய மாகாண கல்வித் திணைக்களம்
DEPARTMENT OF EDUCATION - CENTRAL PROVINCE

G. C. E. (Advanced Level) Practice Test - 2026

Physics II | **01** **E** **II** | **Grade 13**

Part B - Essay

Answer only four Questions.

5) Figure 1(1) shows, the left-hand gate ABCD of a pair of gates installed on the front parapet of a land of a house. Two cylindrical rings (P and Q) are welded to the gate The weight of the gate is W=600 N and the width and height of the gate are 1.5 m and 2.0 m respectively. The center of gravity of the gate is at the mid-point G of the plane of ABCD. Rings P and Q are welded to the gate at a distance of x from the top and bottom edges, respectively. (see the figure).The horizontal (reaction) forces exerted by the wall on rings P and Q are R_1 & R_2 respectively. The vertical (reaction) forces exerted on P and Q are F_1 & F_2 respectively. R_1, R_2, F_1, F_2 & W all lie in the same vertical plane.

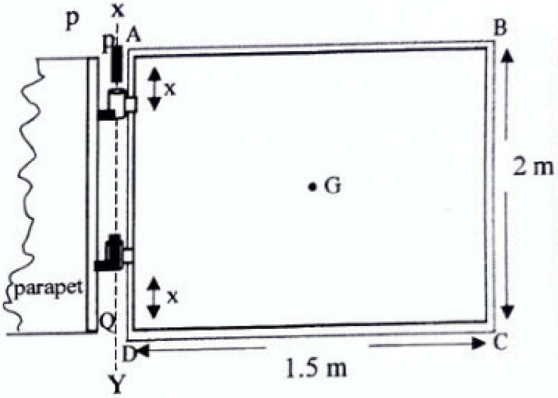


Figure 1(1)

(a)

i. Draw the free body force diagram for reaction F_p of R_1 & F_1, reaction F_Q of R_2 & F_2 and the weight W.

ii. Draw a diagram showing the positions of R_1, F_1, R_2 & F_2 and the force W instead of using the resultant reactions F_p & F_Q.

iii. Show that R_1=R_2 and find the value of R_1. (Assume $x = 25\ cm$)

iv. If F_1=F_2, find the value of F_1.

v. If F_1=F_2 find the angles that the forces F_p and F_Q make with the horizontal.

(b) The gate must be rotated 180° around the XY axis to bring the top horizontal edge AB to position AB_2. See the figure 1(2). To rotate the first 150° and bring the top edge to position AB_1, a horizontal force F_0, always at right angles to the gate must be applied at the midpoint E of edge BC. Afterward, the force F_0 is removed, and the gate is allowed to come to rest over the remaining 30° under the influence of the frictional torque acting on rings P and Q. The frictional torque opposing the rotation of the gate at P and Q is 10 $N\ m$ each. The moment of inertia of the system including the gate about the XY axis is 45 $kg\ m^2$. The effect of the weight W on the rotational motion can be neglected.

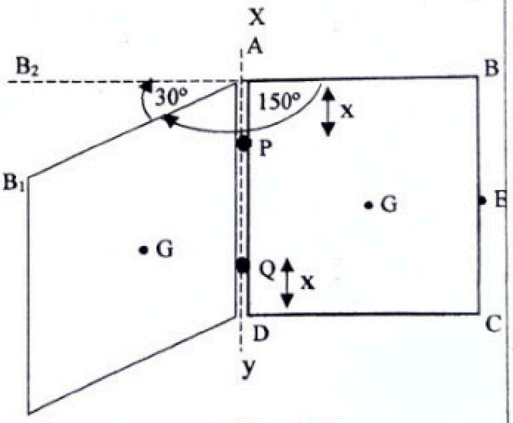


Figure 1(2)

(Round off the final mathematical answers in the following sections to two decimal places.)

i. Find the angular deceleration during the final 30° of the rotation.

ii. Find the value of the angular velocity ω^1 when the top edge reaches position AB_1 . (Take $\pi = 3$).)

iii. Calculate the force F_0.

iv. Find the total amount of work done to open both gates in this manner.

6. (a) A telescope consists of two converging (convex) lenses with focal lengths of 10 cm and 100 cm. This telescope is set in the normal adjustment position to observe a distant object.

i. Draw a ray diagram showing how a beam of light coming from the object, which is not parallel to the common axis of the lenses, travels toward the eye during the observation. Indicate the position of the final image.

ii. What is the angular magnification of the telescope? What is the distance between the two lenses?

iii. If the object observed through the telescope is a distant flag and flagpole as shown in Figure 6(1), draw diagrams to show how the image formed by the objective lens looks, and how the final image looks. Clearly label the diagrams as "Objective Image" and "Final Image". Drawing the diagrams to scale is not required.

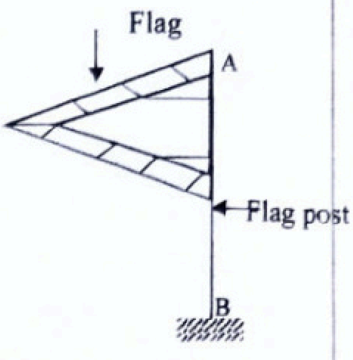


Figure 6 (1)

iv. To view the final image upright, a convex lens with a focal length of f_0 can be placed between the objective lens and the eyepiece of the telescope. Draw a diagram showing how this lens should be placed so that the angular magnification of the telescope remains equal to the value calculated in part a(ii) above. Include the positions of the objective and eyepiece lenses in your diagram. Mark the focal points of the objective and eyepiece lenses as $F_0$and F_e respectively. Now, write down an expression for the distance between the objective lens and the eyepiece in terms of f_0.

(b) Instead of viewing the image upright as shown in a(iv) above, two isosceles prisms can be used as shown in Figure 6(2) below. Here, a ray incident perpendicularly to the hypotenuse of the prisms emerges from prism Q without deviation. This prism arrangement is called "Prism Binoculars"

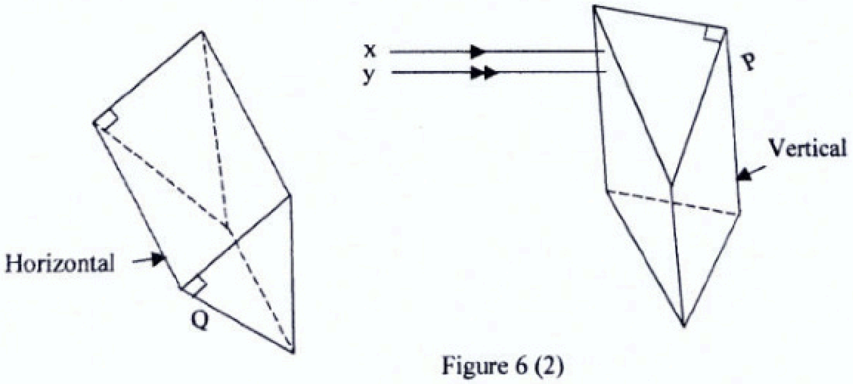


Figure 6 (2)

i. Find the minimum value of the refractive index that the prism material must have for the ray to travel as shown in Figure 6(3).
The prism binoculars are placed between the image I formed by the objective lens in a(iii) and the eyepiece, as shown in Figure 6(2) below. Does the inversion (rotating the image by 180°) of the image I by prism P occur vertically or horizontally?

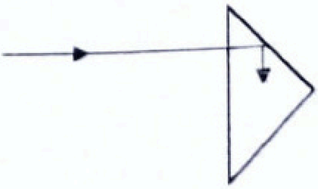


Figure 6 (3)

ii. Does the inversion of I by prism Q occur vertically or horizontally?

iii. When the prism binoculars are placed inside water, will it still provide an upright image as in b(ii)? Explain the answer. Take the refractive indices of the prism material and water to be 1.44 and 1.33, respectively.

(c) In the following Figure 6(4), a ray is incident parallel to MN onto the face LM of an isosceles right-angled prism made of glass with a refractive index of $\sqrt{2}$.

i. Find the angle of refraction r at the face LM.

ii. Show with reasons that the ray emerges from the face LN parallel to MN.

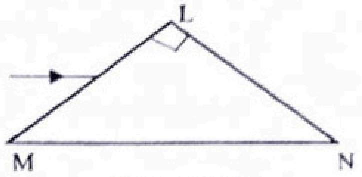


Figure 6 (4)

7)

(a) A layer of oil with a coefficient of viscosity η is spread on a horizontal table, and a cube of side length a is placed on top of it. This creates an oil layer of thickness x between the cube and the table. See Figure 7(1).

i. Write an expression for the force F_0 needed to pull the cube with constant velocity V, using the given symbols.

ii. Draw the sketch of velocity using arrows to show the variation of velocity within the oil layers between the cube and the table.

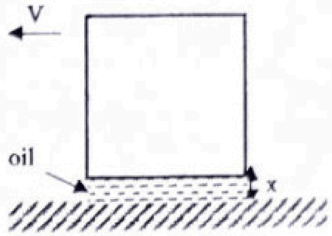


Figure 7 (1)

(b) The inner walls of a very tall vertical tube are coated with the oil mentioned in (a) above. A cylinder X made of a material with density ρ, radius r and height h is placed at position P inside the tube and allowed to fall downwards. See Figure 7(2). The thickness of the oil layer between the cylinder and the tube is d.

i. Write an expression for the viscous force F acting on X when the cylinder moves downwards with a velocity V, in terms of r, h, d, V and η.

ii. Draw the sketch of velocity using arrows to show the variation of velocity across a diameter of the tube within the oil layers when the velocity of the cylinder is V.

iii. Why does the oil not exert an upthrust on X?

iv. The upthrust exerted by the air can be neglected. Obtain an expression for the terminal velocity V_t acquired by the cylinder in terms of r, ρ, d, η and g.

v. When the cylinder moves down with the velocity V, the speed of air through a hole in the sheet Z at the bottom is V_0. Obtain an expression for the speed V_0 in terms of $n, r, V, and\ r_0$. Where n is the number of holes in the sheet Z and r_0 is the radius of a small hole in the sheet. Assume the air is incompressible.

vi. After the cylinder hits the sheet Z with velocity V_t, it bounces with $\frac{V_t}{2}$. Is the velocity of the cylinder bounces at the second collision with the same velocity as $\frac{V_t}{2}$? Explain.

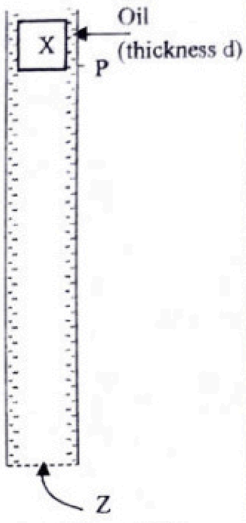


Figure 7 (2)

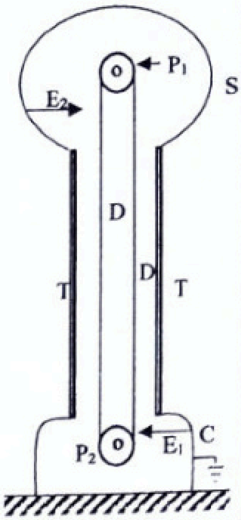
(c) In the cylinder mentioned in (b) above, r = 2 cm, d = 0.2 cm, ρ = 2600 kg m^{-3}, η = 5 x 10^{-2} Pa s.

i. Find the terminal velocity V_t.

ii. Find the maximum downward acceleration of the cylinder.

iii. Plot the variation of velocity V with time t from the moment the cylinder moves from position P until it collides with Z for the second time.

8) Read the following paragraph and answer the questions asked.



The Van de Graff generator, invented in 1929, is a high-voltage electrical generator. A simplified model of it is shown in the figure. There is a hollow metal sphere **S** mounted on top of a hollow plastic cylindrical tower **T**. There is a rubber belt **D** that runs around rollers $P_1 and P_2$. When the lower roller P_2 is rotated by a motor, friction between the roller and the rubber belt causes electrons to move from the rubber belt to the roller P_2 making the rubber belt positively charged. As the belt moves upward, electrons from the upper roller P_1 move toward the belt and then as a result, P_1 is charged. After some time, ionization of air occurs near the sharp tips of electrodes E_1 and E_2. Electrons flow from the sphere **S** to the belt through E_2. When those electrons reach the belt, they are discharged to the ground through E_1. Due to this process, **S** can be charged to a very high positive potential. When the electric field intensity on the sphere reaches the breakdown value of air, $3\times10^6\ Vm^{-1}$, corona discharges occur. The high voltage of the Van de Graff generator was used for high-speed particle accelerators, X-ray generation, the Bertozzi experiment conducted in 1962, and Rutherford's scattering experiment.

(a) What is the physical property that caused the rubber belt to become positively charged?

(b) What are the types of charges received by the rollers P_1 and P_2?

(c) What is the approximate value of the electric field intensity inside the sphere S? Give reasons for your answer.

(d) Why is chamber C earthed?

(e) Define "corona discharge".

(f) State three practical applications of a Van de Graff generator.

(g) Assuming that the charge on the rubber belt resides only on its surface and the surface charge density is $1\ \mu C\ m^{-2}$, find the electric field intensity near the rubber belt. (Take the permittivity of free space as $\varepsilon_0 = 9\times 10^{-12}\ C^2 m^{-2} N^{-1}$. Will a corona discharge occur from the rubber belt? Explain your answer

(h) The radius of sphere S is 12 cm. Calculate the maximum charge that the sphere can acquire. And find the electric potential of the sphere at this instance. (Take $\pi = 3$)

(i) The effective resistance between the end of the hand and the feet of the human body is about $1000\,\Omega$. If a current greater than 50 mA passes through this path, it may damage the organs. Show that touching the above charged sphere by hand is not safe.

(j) Consider, after the charge of the sphere becomes the maximum value calculated in (h), it discharges with a rate of $4\ x\ 10^{-8} C\ s^{-1}$. Find the speed of the belt with which it should be moved in order to supply the charge to the sphere with the same rate of discharge. The width of the belt is 5 cm.

9) Answer either Part (A) or Part (B) only.

(A) (a) Alternating voltage is used for long-distance power transmission. The electrical power supplied to households in Sri Lanka is 230 V, 50 Hz. The variation of voltage (V) with time (t) is sinusoidal, as shown in Figure 9 (A) (1) below. 230 V is the root-mean-square (rms) value of the voltage.

i. Find the value of peak voltage V_p and the period T for this voltage. ($\sqrt{2} = 1.41$).

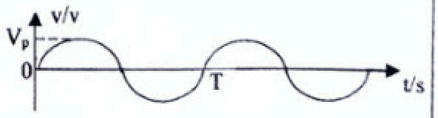


Figure 9A (1)

ii. Figure 9A (2) shows a section of a household circuit containing a 5 A fuse. Consider an instance where the switch S is closed and a rice cooker with a power consumption of 1 kW is connected to the plug socket. Calculate the maximum power that the bulb can have such that the fuse does not blow in this situation.

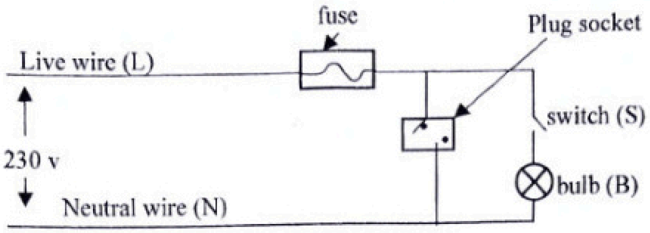


Figure 9A (2)

(b) Consider an instance where a filament bulb marked 230 V, 100 W is connected as bulb B in the circuit shown in Figure 9A(2) above. (take this bulb as C.) When the bulb glows at its rated power of 100 W, the temperature of the filament is 1000 °C.

i. Find the resistance of the bulb filament when it glows at its rated power.

ii. At the room temperature 30° C, the resistance of the filament is 115 Ω. Calculate the mean temperature coefficient of resistance of the filament material. (Give the answer in scientific notation correct to two decimal places.)

iii. If the cross-sectional area of the filament material of bulb C is 5×10^{-4} mm^2, and the resistivity of the filament material at 30°C is 5×10^{-8} Ω m, calculate the length of the filament.

iv. At the instant the switch is closed, is the electrical power drawn by bulb C equal to, greater than, or less than 100 W? Explain your answer.

v. Consider an instance where no other electrical appliance is connected to the plug socket in the circuit shown in Figure 9A(2) above, and only bulb C is connected. Find the electric current flowing through the fuse when the bulb glows at its rated power.

vi. When the current calculated under b(v) above flows through the fuse, the power generated by the fuse is entirely dissipated into the environment. If the resistance of the fuse in this state is 9×10^{-2} Ω, find the rate of heat loss from the fuse under steady-state conditions.

(c) In long-distance transmission of alternating voltage, the voltage is first stepped up to a high voltage such as 66,000 V at the power station using the T_1 transformer and transmitted through transmission lines. It is then reduced to a voltage of 11,000 V and finally stepped down to 230 V using the T_2 transformer to be distributed to houses. See Figure 9A(3).

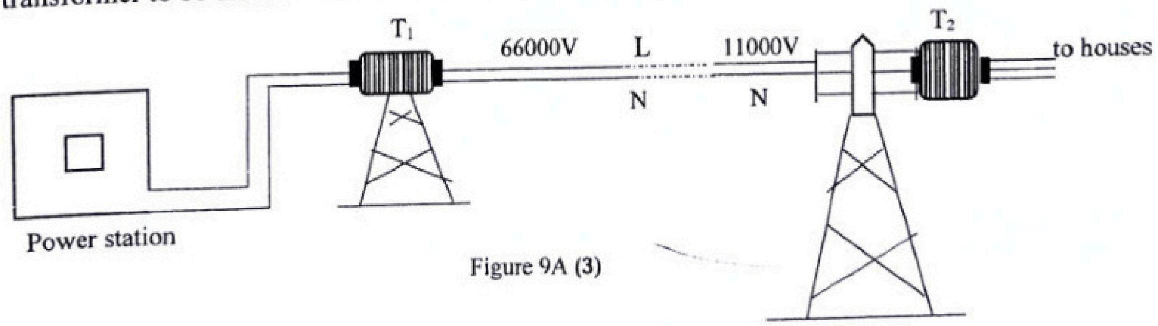


Figure 9A (3)

i. Identify the type of transformers T_1 and T_2 as step-down, step-up, or isolation transformers.

ii. State three heat-generating processes that cause the efficiency of these transformers to decrease.

iii. Oil circulation is utilized around transformers like T_2. State the reason for this. Give two physical properties that this oil should possess.

(B) (a) Figure 9B (1) shows a circuit using a silicon transistor T that can be used to light up a Light Emitting Diode (LED), when the water level of an overhead water tank in a house reaches the level XY. The transistor is used such that it reaches its saturation state when the LED lights up. When the LED lights up, the voltage across it is 2V. Consider a case where the water is filled above the level XY. Assume water is an ideal electrical conductor.

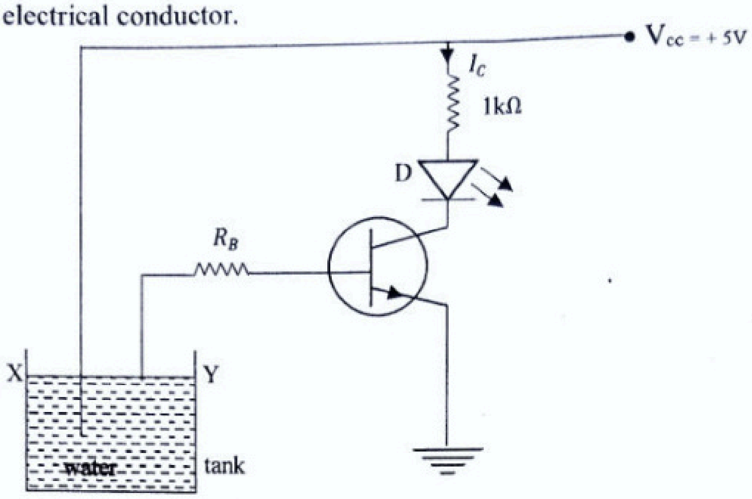


Figure 9B (1)

1. What is the maximum possible value for the collector current, I_C?
2. If the direct current gain of the transistor is 150, what should be the minimum value of the base current R_B?

(b) Figure 9(B) 2 shows a circuit that can be used to light up LEDs, $D_1 and\ D_2$, corresponding to two different water levels in the tank. The diodes $D_1\ and\ D_2$are identical to the diode D mentioned in part (a) above.

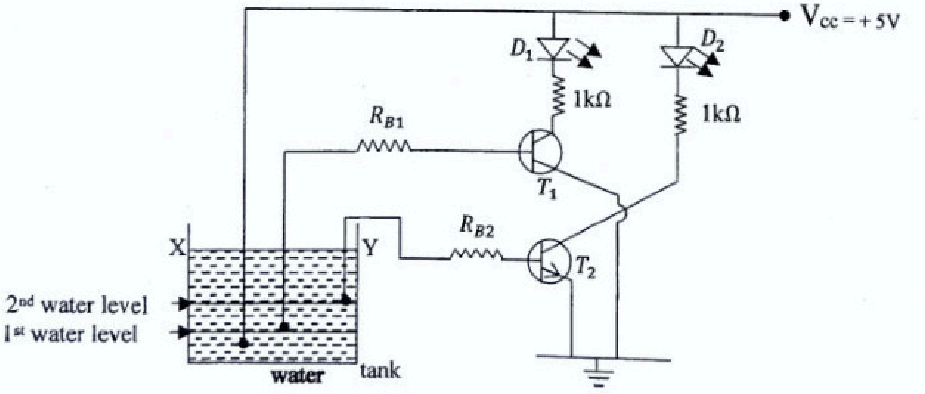


Figure 9B (2)

1. Which LED / LEDs will light up when the water level is at level 1?
2. Which LED / LEDs will light up when the water level is at level 2?
3. Which LED / LEDs will light up when the water level is below level 1?
4. If transistors T_1 and T_2 are identical to the transistor T shown in (a), what will the resistances of RB_1 and RB_2 be?

(c) Instead of detecting the water level using transistors as shown in (b) above, the water level can also be detected using operational amplifiers (op-amps).

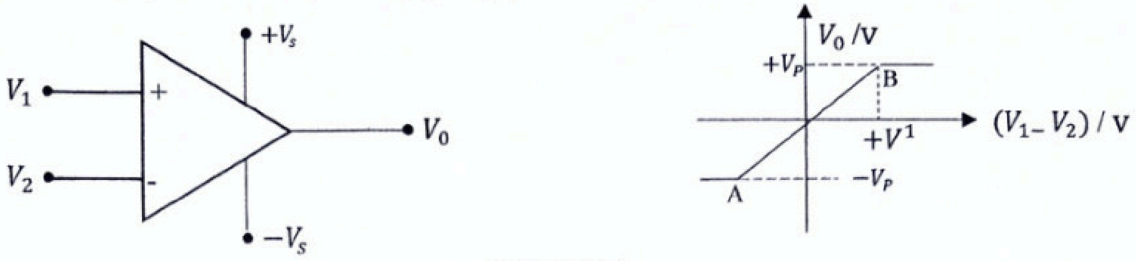


Figure 9B (3)

i. The open-loop transfer characteristic curve of the op-amp shown in Figure 9B (3) is given alongside. The supply voltage $+V_S$ is +5V and the saturation value V_0 is equal to V_S. The open-loop voltage gain is 10^5.

1. What is the gradient of the section AB?
2. Find the value of V^1.

ii. 9B(4) shows a circuit that can be used to indicate the water level using two vertically aligned LEDs; the lower LED lights up when the water level reaches Level 1, and both LEDs light up when it reaches Level 2. This is an incomplete circuit. The positive saturation voltage of 5V provided by the operational amplifiers is used to light up the LEDs.

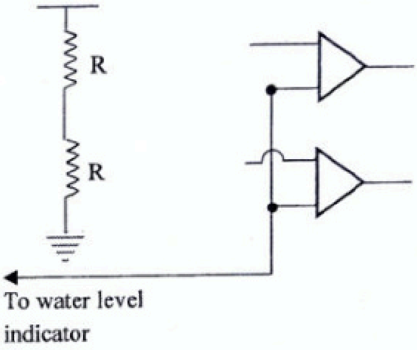


Figure 9B (4)

1. Copy Figure 9B(4) onto your answer sheet and complete the circuit by connecting the other terminals to the appropriate locations. Mark the inverting terminal of the operational amplifiers as - and the non-inverting terminal as +.
2. If the current passing through the resistors R is 1 mA, find the value of R. (Neglect the current flowing into the inputs of the operational amplifiers).

(d) Figure 9B(5) shows a circuit used to light up an LED bulb. The rated operating conditions of the LED are 2.5 mA and 3V. The forward bias voltage of diode D is 0.7 V. The current gain of the transistor is 150.

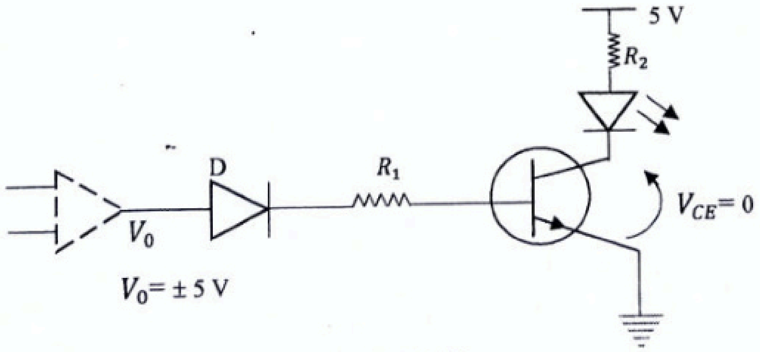


Figure 9B (5)

i. *Find a suitable value for* R_2.

ii. If $V_{BE} = 0.7$ V and $V_0 = 5$V, calculate a suitable value for R_1.

10) Answer either Part (A) or Part (B) only.

(A) (a) To study the thermal conduction of a metal rod, a student arranged the apparatus as shown in Figure 10A(1). Here, AB is a metal rod of length *5 m* and radius 3.5 cm. The end A is in contact with Mercury. A thermometer T_1 and an immersion heater H are immersed in the mercury bath. End B is in contact with water in the metal container C. The initial temperature of water in C is 30°C. (room temperature). A thermometer T_2 is immersed in water in the container C. The entire setup is covered with thermal insulation as shown in the figure.

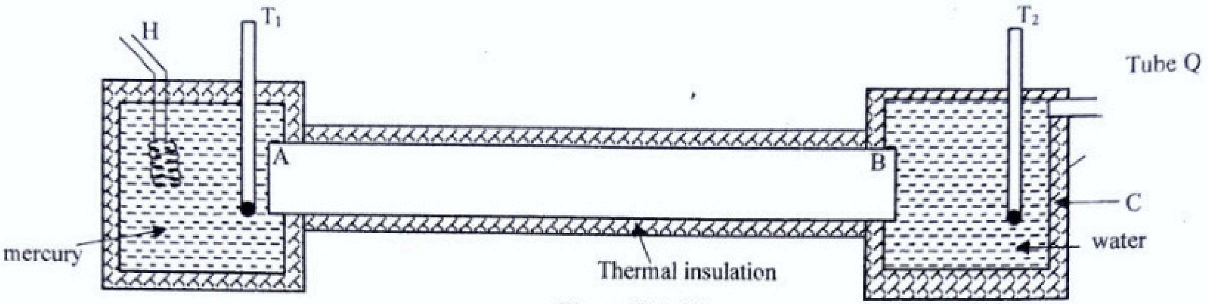


Figure 10 A (1)

When the switch of the immersion heater was closed, the readings of thermometers T_1 and T_2 rose and became steady (constant) after a few minutes. The steady temperatures of T_1 and T_2 were 150°C and 100°C respectively. In the steady state, steam was continuously emitted from the tube Q, and the mass of steam collected in 5 minutes was 20 g. The latent heat of vaporization of water is $2.25 \ x \ 10^{6} J \ kg^{-1}$. Assume there is good thermal contact between heater H and end A.

i. Find the rate of heat conduction along the rod AB in the steady state.

ii. What is the power of the heating coil?

iii. 1). Sketch a graph showing the variation of the temperature θ with the distance l measured from end A of the rod in the steady state.

2). Sketch a graph showing the variation of temperature θ with distance l a few minutes *before* reaching the steady state.

3). Sketch a graph showing the variation of the reading $\theta^1$of thermometer T_2 with *time t*.

iv. Calculate the thermal conductivity of the material that the rod AB is made of. Give your answer to the nearest whole number.

v. If the end of tube Q is closed what changes would be observed in the reading of the thermometer T_2? Explain the reasons for your answer.

vi. When the end of tube Q is not closed, calculate the mean speed at which steam was emitted from the end of tube Q. The cross-sectional area of the end of tube Q is 3.73 cm², atmospheric pressure is 1×10^5 Pa, the molar mass of steam is 18 g moℓ^{-1}, and the universal gas constant R=8.3J mo$\ell^{-1} K^{-1}$. Assume that steam behaves as an ideal gas. (Take $\frac{1}{8.3} = 0.12$)

(b) Consider a case where, instead of the metal rod AB, another metal rod is used which has ½ of thermal conductivity of that AB, but is equal to AB in length and cross-sectional area. In the steady state, the reading of the thermometer T_2 was 100° C. Find the rate of heat conduction along this rod in the steady state, and find the steady-state temperature of the thermometer T_1.

(c) Show that in this study, the percentage increase in the volume of container C is less than 0.5%. The initial temperature of C is 30°C. The linear expansivity of the metal material of C is 1.9×10^{-5} K^{-1}.

(B) (a) State the Stefan-Boltzmann law regarding black body radiation.

(b) i) 100 W filament bulb has a filament with a diameter of 0.4 mm and a length of 30 cm. When the bulb is lit at its rated power, its surface emissivity is 0.21. Calculate the temperature of the filament surface. (The Stefan-Boltzmann constant = 6×10^{-8} W m^{-2} k^{-4} Give your answer to the nearest whole number.

ii) Find the wavelength of the electromagnetic wave emitted by the bulb at its maximum intensity. The Wien's constant = 2.9×10^{-3} *m K.*

iii) To which region of the electromagnetic spectrum does the wavelength calculated in part **b (ii)** above belongs?

iv) What is the reason for the low efficiency of a filament bulb when producing light?

(c) i. Find the energy, in electron-volts (eV), of a photon with a wavelength of 500 nm emitted by the bulb mentioned in part (b) above.

Planck's constant h = 6.4×10^{-34} J s
Speed of light in a vacuum = 3×10^{8} m s^{-1}
1 eV = 1.6×10^{-19} J

The photons mentioned in C(i) above are incident on three metals, A, B, and C, which have work functions of 1.90 eV, 2.25 eV and 4.60 eV respectively. Which metal(s) will exhibit the photoelectric effect? Explain your answer.

ii. Assume the bulb only emits photons of wavelength 500 nm. It falls normally on a photosensitive surface of area 1 cm^2 placed at a distance of 1 m from the bulb. If 1% of the incident photons emit electrons, calculate the resulting photoelectric current. (the charge of an electron is 1.6×10^{-19} C.)

(d) The minimum power required for visual perception in a normal human eye is 3.6×10^{-17} W. Calculate the rate at which photons of wavelength 500 nm must fall on the eye to produce this visual sensation.

***

P1

මධ්‍යම පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව

මෙහෙයුම් පරීක්ෂණය – 13 ශ්‍රේණිය – භෞතික විද්‍යාව – 2026

පිළිතුරු සහ ලකුණු දීමේ පටිපාටිය

භෞතික විද්‍යාව I පත්‍රයේ පිළිතුරු

ප්‍රශ්න අංකය	පිළිතුර	ප්‍රශ්න අංකය	පිළිතුර	ප්‍රශ්න අංකය	පිළිතුර
1	2	18	5	35	4
2	5	19	4	36	1
3	3	20	2	37	2
4	5	21	2	38	3
5	1	22	1	39	4
6	4	23	5	40	4
7	5	24	4	41	5
8	1	25	1	42	3
9	3	26	5	43	5
10	2	27	1	44	2
11	5	28	1	45	5
12	4	29	2	46	3
13	3	30	2	47	1
14	1	31	2	48	4
15	4	32	4	49	3
16	2	33	2	50	4
17	5	34	3		

භෞතික විද්‍යාව - 2

① (a) මීටර් කෝදුව තියුණු දාරය මත තිරස්ව සංතුලනය වනසේ මීටර් කෝදුවේ පිහිටි ස්ථානය තියුණු දාරය මත තැබීම → ⓪①

(b) i) $m_0 g(50-8) = 100g(80-50)$ (g ඉවත්කොට) → ⓪①

$m_0 = 71.4\text{ g}$ - - - - → ⓪①

ii) ප්‍රතික්‍රියාව $= (100+71.4+120)\times 10^{-3}\times 10$ - - → ⓪①

$= 2.91\text{ N}$ - - - - - → ⓪①

(c) i) බාහිර හනුව (පිට හනු) - - - → ⓪①

ii) 0.01 cm (හෝ 0.1 mm) - - → ⓪①

iii) $(3 + 4\times 0.01)\text{ cm}$ - - - - → ⓪①

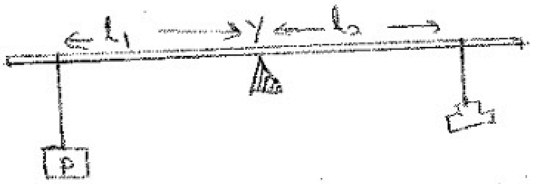
$= 3.04\text{ cm}$ - - - - → ⓪①

(d) i) පරිමාව $= (3.04)^3\text{ cm}^3 = 28\text{ cm}^3$ - - → ⓪②

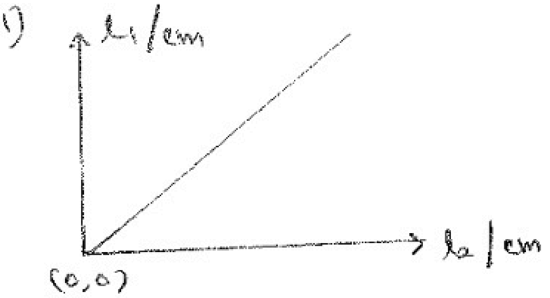
ii) ඝනත්වය $= \dfrac{71.4\times 10^{-3}\text{ kg}}{28\times 10^{-6}\text{ m}^3}$ - - → ⓪①

$= 2550\text{ kgm}^{-3}$ → ⓪①

(e)



i)



→ ⓪①

ii) $\dfrac{1\text{ mm}}{l_2} = \dfrac{1}{100}$ $l_{2\,(\text{min})} = 100\text{ mm (10 cm)}$ → ⓪①

iii) $70\times 50 = 100\, l_{max}$ - - - → ⓪①

$l_{max} = 35\text{ cm}$ - - - → ⓪①

iv) 10 cm, 15 cm, 20 cm, 25 cm, 30 cm, 35 cm → ⓪③

$\underline{\underline{20}}$

② (a) i) ද්‍රාවණය :- [illegible] - - - - → ⓪①

මිනුම් උපකරණ :- විරාම ඝඩිකාව, [illegible] හෝ ත්‍රිදණ්ඩ තුලාව ඉලෙක්ට්‍රොනික තුලාව } ⓪②

P3

ii) කැලරිමීටරය තුළ ඇති ද්‍රවයේ උෂ්ණත්වය ද්‍රවය පුරා ඒකාකාර ලෙස පවත්වා ගැනීම / ද්‍රවය කැලතීම → (01)

(b) i) මන්ථය සහිත කැලරිමීටරයේ ස්කන්ධය (m_1) → (01)

ii) A → (01)

කැලරිමීටර සංසර්ගය පුරා උෂ්ණත්වය, ද්‍රවයේ උෂ්ණත්වයට ළඟා කර ගැනීම සඳහා → (01)

iii) ජලය කැලතීම (මන්ථනය කිරීම) → (01)

iv) (සිසිලන) කාලය → (01)

v) මන්ථය + ජලය + කැලරිමීටරයේ ස්කන්ධය (m_2) → (01)

(c) i) ජලය ඉවත් කර වියළා (හෝ A) → (01)

තාපය හානිවන සමාන සංසර්ගය මන්දගාමී ලෙස සමාන කර ගැනීම සඳහා (02)

ii) මන්ථය + පොල්තෙල් + කැලරිමීටරයේ ස්කන්ධය (m_3) → (01)

$$(d)\ \left\{(290-110)10^{-3}\times 4200 + 110\times 10^{-3}\times 400\right\}\times 3$$

$$=\left\{(254-110)10^{-3}\,C_0 + 110\times 10^{-3}\times 400\right\}\times 6$$

(10^{-3} අනවශ්‍යයි) (04)

$$\frac{180\times 2100 + 110\times 200 - 110\times 400}{144} = C_0$$

$C_0 = 2472\ \mathrm{J\,kg^{-1}\,K^{-1}}$ (2470 – 2475 පිළිගන්න.) → (02)

20

(3)

(a) ප්‍රභවය : සරසුල කට්ටලය. → (01)

මිනුම් උපකරණය : මීටර් කෝදුව → (01)

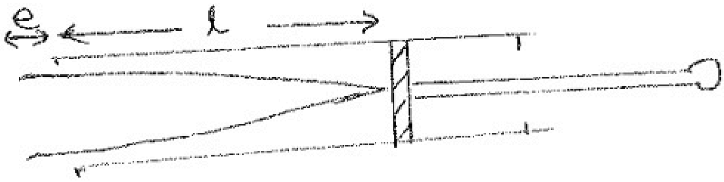
(b) සිහින්ම සරසුල සඳහා වැඩ ගොනුවේ මූලික තාන අනුනාද දිග ලබාගැනීම පිණිස → (01)

(c)

l දිග ලෙස වන සංදීප ස්ථානය ඇඳීමට → (01)

(d) සරසුල කම්පනය කර නලයේ විවෘත කෙළවරට අල්ල තබන්න. l දිග ක්‍රමයෙන් වැඩිකරගෙන යන්න. නලය තුළින් ඇසෙන ශබ්දයේ තීව්‍රතාව උපරිම වන පළමු අවස්ථාව ලබාගන්න. මෙම අවස්ථාව මූලික තානයේ අනුනාදය වන අවස්ථාවයි. → (03)

(e).



තරංග රටාව → (01)
l, e ට → (01)

(f) i). $\lambda/4 = l + e$ එවිට $\lambda = 4(l+e)$ → (01)

$V = f\lambda \Rightarrow V = f.4(l+e)$ → (01)

ii). $l + e = \frac{V}{4f}$ $l = \left(\frac{V}{4}\right)\frac{1}{f} - e$

X අක්ෂයේ :- $\frac{1}{f}$ Y අක්ෂයේ :- l → (01)

(g). $\frac{V}{4} = 82.5$ $V = 330\ \text{m s}^{-1}$ → (01)

$e = 0.015\ \text{m}\ (1.5\ \text{cm})$ → (01)

(h). i) නලය සිරස් නොවීම (නලයේ සිරස්භාවය නොවීම) → (01)

ii). නලය තුළ වාතයේ උෂ්ණත්වය වැඩිවීම හෝ } → (01)
නලය තුළ ආර්ද්‍රතාව වැඩිවීම

(i). නලයට ලබාගත හැකි උපරිම දිග = (47 − 1) cm = 46 cm → (01)
සංඛ්‍යාතය වැඩිවීම සඳහා ලට අඩුම පළමු උපරිතාන දිගක් ලැබේ. එම දිග L නම්

$L + e = \frac{3}{4}\lambda$

$\lambda = \frac{V}{f} = \frac{33000}{512}$ cm → (01)

→ (01)

$\therefore L + 1.5 = \frac{3}{4} \times \frac{33000}{512} = 48.3$ → (01)

$L = 46.8$ cm

∴ පළමු උපරිතානය අනුනාදය ලබාගත නොහැක.

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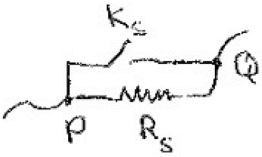
④. (a) i).



→ (02)

ii). Rs අධික ප්‍රතිරෝධයක් යොදා ගන්නේ ගැල්වනෝමීටරය තුළින් අධික ධාරා ගැලීමෙන් සිදුවිය හැකි හානිය වළක්වා ගැනීමට → (01)

Ks යතුර වසනුයේ G හි උත්ක්‍රමණය ශුන්‍යයට ආසන්න වන විට (ආසන්න [illegible] වන විට) → (01)

(b). S සංවෘත කොට A හා B දෙකෙළවර වෙන වෙනම තබා ස්පර්ශ කරද්දී G තුල උත්ක්‍රමණය ප්‍රතිවිරුද්ධ අපගමනයන් දෙපසට සිදුවීම බැලීම. → (02)

(c). i). 1. A කෙළවර ශුන්‍යාංක දෝෂය නොසලකා හැරීම සඳහා → (01)

2. l දිගෙහි මිනුමෙහි භාගික දෝෂය (ප්‍රතිශත දෝෂය) අවම කර ගැනීම සඳහා → (01)

ii). AC සහ CB තුළින් එකම විද්‍යුත් ධාරාව ගැලීම → (01)

$k = E_0 / L$ - - - → (01)

iii). දැක්වෙන පරිපථයේ ධාරාව $I = \frac{E}{R_0+R}$ - - - → (01)

$I R_0 = kl$ - - - → (01)

$\therefore \frac{E}{R_0+R} R_0 = kl = \frac{E_0}{L} l$

$$\therefore \underset{\downarrow \atop y}{\frac{1}{l}} = \underset{\downarrow \atop c}{\frac{E_0}{EL}} + \underset{\downarrow \atop m}{\frac{E_0}{ELR_0}} \underset{\downarrow \atop x}{R}$$ - - - → (01)

(d). i) Y අක්ෂය :- S.I. ඒකකය m^{-1}

දත්ත ලක්ෂ්‍ය :- (0.7, 1.9) ; (2.5, 2.5) ; (4.9, 3.3) දෙකක් → (02)

අනුක්‍රමණය (m) $= \frac{(3.3 - 1.9)\,m^{-1}}{(4.9 - 0.7)\,\Omega} = \frac{1}{3}(\Omega m)^{-1}$ → (01)

$= 0.333\ \Omega^{-1} m^{-1}$

ii) අන්තඃඛණ්ඩය $c = 1.65\ m^{-1}$ - - - → (01)

iii) $m = \frac{c}{R_0}$ - - - → (01)

- - - → (01)

$R_0 = \frac{1.65\ m^{-1}}{\frac{1}{3}\ \Omega^{-1} m^{-1}} = 4.95\ \Omega$ - - - → (01)

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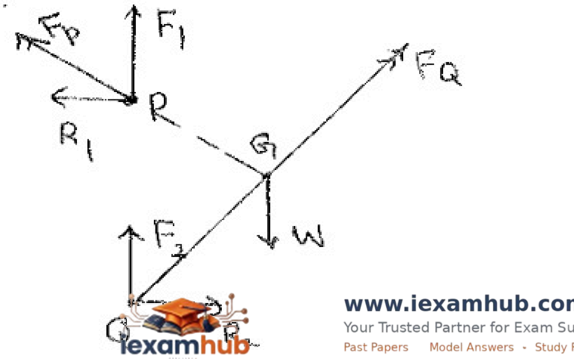
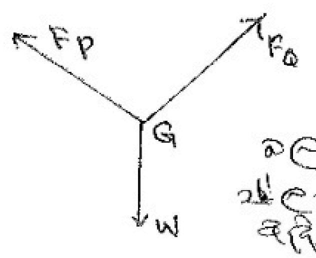
B කොටස

(5). a(1).

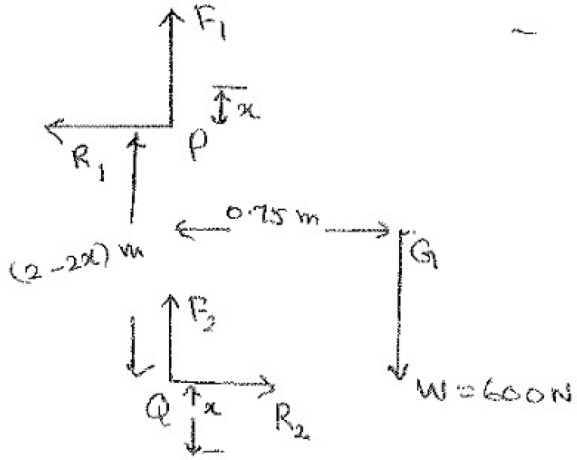


හෝ



බල තුන ඒක ලක්ෂ්‍ය වීම ඇඳීම (03)

ii).



— — — — — — — → (02)

iii) තිරස් බල සමතුලිතතාව සැලකීමෙන් → (01)

$R_1 = R_2$

P වටා සූර්ණයෙන්

$W \times 0.75 = R_2(2 - 2 \times 0.25)$ → (03)

$R_2 = \frac{600 \times 0.75}{1.5}$

$= 300$ N — — → (01)

iv) $F_1 + F_2 = 600$ — — — — → (01)

$\therefore F_1 = F_2 = 300$ N — — — → (01)

v) F_P තිරස සමඟ සාදන කෝණය $= 45°$
F_Q තිරස සමඟ සාදන කෝණය $= 45°$ } → (02)

b). i) $\theta = 30° = \frac{\pi}{6}$ rad

$\tau = I\alpha$ මගින්

$-10 \times 2 = 45\alpha$ — — — → (02)

$\alpha = -0.44$ rad s^{-2} — — — → (01)

ii). $\omega = 0$, $\omega_0 = \omega' = ?$ $\alpha = -4/9\,(0.44)$ rad s^{-2}, $\theta = \frac{\pi}{6}$ rad

$\omega^2 = \omega_0^2 + 2\alpha\theta$

$0 = (\omega')^2 - \frac{4}{9} \times \frac{\pi}{6} \times 2$ → (03)

$\omega' = 2/3$ rad s^{-1} } → (01)

$\omega' = 0.67$ rad s^{-1}

iii) $\tau = I\alpha$ මගින් $F_0 \times 1.5 - 20 = 45\alpha'$ → (02)

(α' = කෝණික ත්වරණය)

$\omega^2 = \omega_0^2 + 2\alpha\theta$ මගින් $(\omega')^2 = 2\alpha' \cdot \frac{5\pi}{6}$ → (02)

$(2/3)^2 = 2\alpha' \times 5/2$ $\alpha' = 4/45$ rad s^{-2} → (01)

$\therefore F_0 = \frac{20 + 45 \times 4/45}{1.5} = 16$ N → (01)

iv) කාර්යය $= \tau\theta = 16 \times 1.5 \times 5/2 \times 2$ → (02)

$= 120$ Nm → (01)

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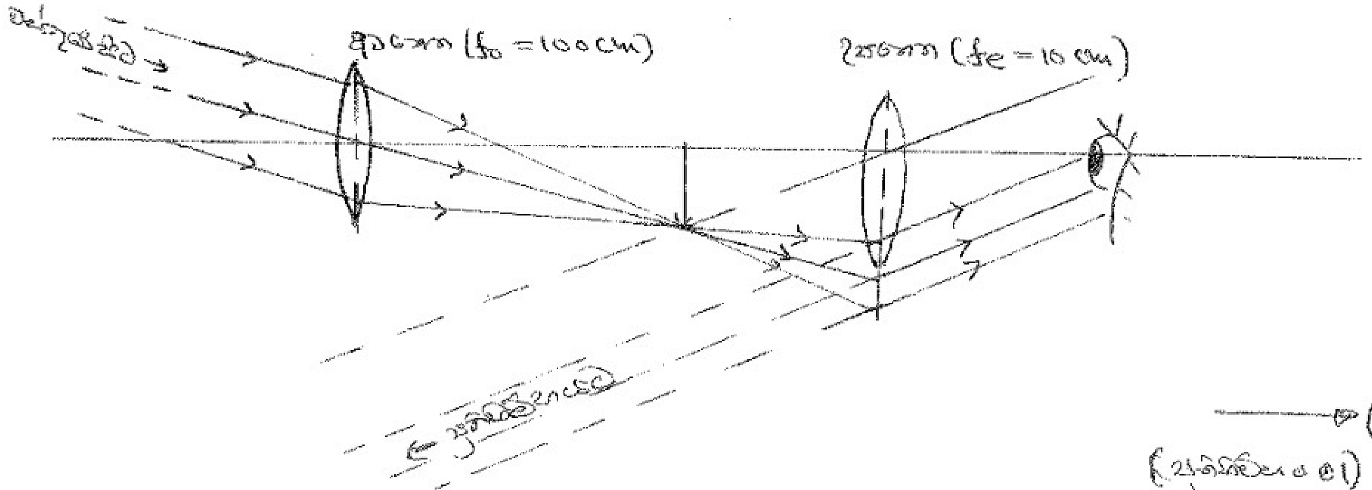
(6). i)



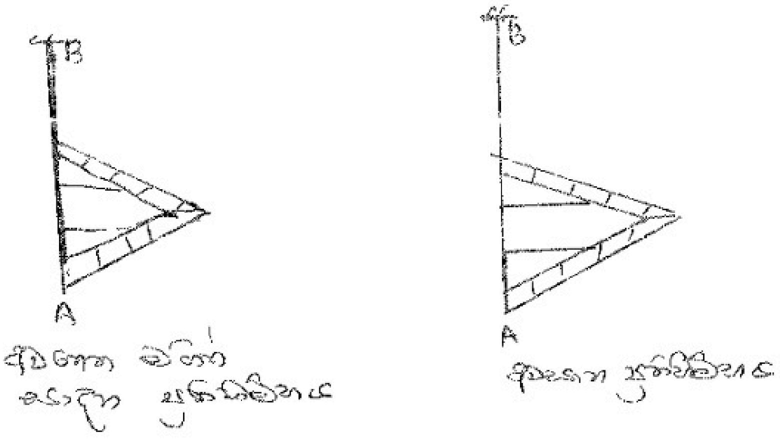
→ (03)

(ප්‍රතිබිම්බයට 01)

ii). කෝණික විශාලනය $= \frac{100}{10} = 10$ → (01)

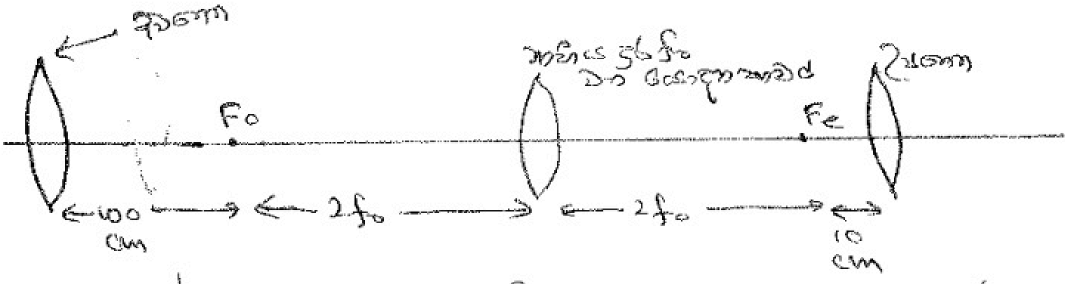
කාච අතර පරතරය = 110 cm → (01)

iii).



නිසි ලෙස ඇඳීමට → (03)

iv).

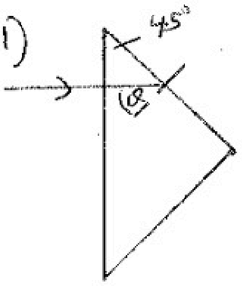


පිහිටීම → (01)

Fo, Fe ලකුණු කිරීම → (01)

අවනෙත් කාචය සහ උපනෙත අතර දුර = (110 + 4fo) cm → (01)

(b). i)



θ ≥ අවධි කෝණය (C) θ = 45° → (01)

$\sin\theta \geq \sin C$

$\frac{1}{\sin\theta} \leq \frac{1}{\sin C} = n$ → (01)

$n \geq \frac{1}{\sin 45^\circ}$ $n \geq \sqrt{2}$

$n_{අවම} = 1.41$ → (01)

ii) බරින් අඩුව → (01)

iii) මිලෙන් අඩුව → (01)

→ (01)

iv). හර - ආවරණ අතුරු මුහුණත සඳහා අවධි කෝණය C_0 නම්,

$1.44 \sin C_0 = 1.33$ → (01)

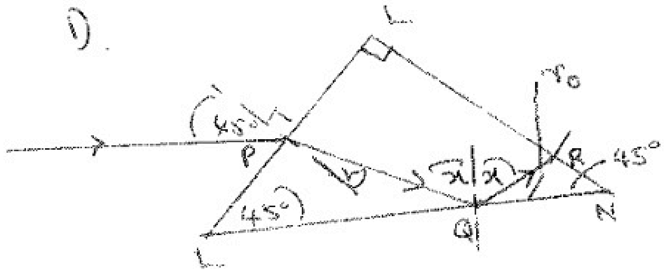
$\sin C_0 = 0.9236$

$C_0 = 67°28'$ → (01)

පතන ∢ $(45°) < C_0$ නිසා පූර්ණ අභ්‍යන්තර → (01)

පරාවර්තනය සිදු නොවේ.

v). 1).



පතන ∢ $= 45°$ → (01)

$1 \times \sin 45° = \sqrt{2} \sin r$ → (01)

$\sin r = \frac{1}{2}$

$r = 30°$ → (01)

2). Q හි පතන ∢ x නම්

$90° - x + 90° + r + 45° = 180°$ → (01)

$x = 45° + r = 75°$

$x >$ අවධි ∢ නිසා කිරණය Q වලින්

පූර්ණ අභ්‍යන්තර පරාවර්තනය වේ. → (01)

r_0 සෙවීමට $90° + r_0 + 45° + 90° - x = 180°$ → (01)

$r_0 = x - 45° = 75° - 45°$

$= 30°$ → (01)

QP පතන කෝණය 30° නිසා පතනය වූ මුහුණත් තලයට 45° ක කෝණයකින් වර්තනය වේ. එලෙස QR කෝණය 45° ක කෝණයකින් වර්තනය වේ. එම නිර්ගත කෝණය LN ට සමාන්තරයි. → (02)

∴ ප්‍රකාශය සත්‍යයි.

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(7). (a) i). $F_0 = \eta a^2 \frac{v}{x}$ → (02)

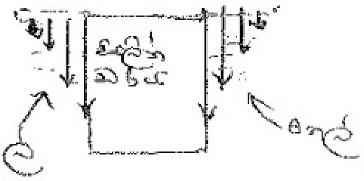
ii)

→ (02)

(b) i) $F = \eta \cdot \frac{2\pi r h v}{d}$ — — — → (03)

(ඒකකවලට 01)

ii)



— — — → (02)

iii) සිලින්ඩරය තෙල් තුළ ගිලී නොපාවේ. / සිලින්ඩරයේ සකල පෘෂ්ඨයට යටින් තෙල් නොමැත. — — → (02)

iv). ආන්ත ප්‍රවේගයෙන් පහළට ගමන් කරන විට

$F =$ සිලින්ඩරයේ බර — — — → (01)

$$\frac{\eta \cdot 2\pi r h V_t}{d} = \pi r^2 h \rho g$$ — — — → (02)

$$V_t = \frac{r d \rho g}{2\eta}$$ — — — → (01)

v). $A_1 V_1 = A_2 V_2 \Longrightarrow \pi r^2 V = (\pi r_0^2 n) V_0$ — — → (02)

$$V_0 = \frac{r^2 V}{r_0^2 n}$$ — — → (01)

vi). නැත. සෑම විටම සිලින්ඩරය මත දුස්ස්‍රාවී බලය ක්‍රියා කරන නිසා නැවත Z සිට ඉහළ ගමනේදී ශක්තිය හානි වේ. — — → (02)

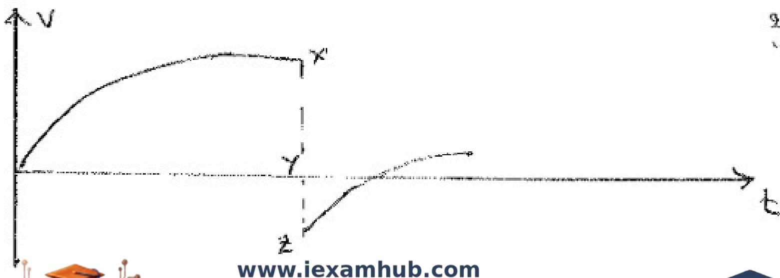
(c) i) $V_t = \frac{2\times10^{-2} \times 0.2\times10^{-2} \times 2600 \times 10}{2\times5\times10^{-2}}$ — ආදේශයට → (02)

$= 5.2 \text{ m s}^{-1}$ — — — → (01)

ii). උපරිම ත්වරණය ලැබෙන්නේ ආරම්භයේදීය. එවිට දුස්. බලය $= 0$

∴ උපරිම ත්වරණය $= 10 \text{ m s}^{-2}$ — — — → (02)

iii).



ප්‍රස්තාරය සඳහා

දෙපැත්ත ඇඳීමට → (02)

XY > YZ වීමට → (01)

ආන්ත ප්‍රවේග → (04)

උඩ < YZ වීමට → (02)

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P10

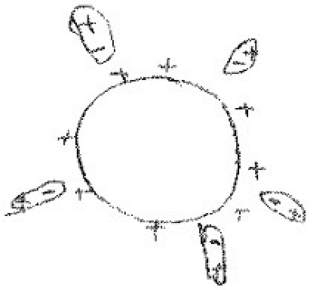
(8) (a) ප්‍රේරණය → (01)

(b) $P_1 \rightarrow$ ධන
$P_2 \rightarrow$ සෘණ } → (02)

(c) ශූන්‍යයයි → (01)
ගෝලය සන්නායකයක් බැවින් ආරෝපණය බාහිර පෘෂ්ඨයේ පමණක් රැඳේ. → (02)

(d) E_1 තරම ඉතා අධික විද්‍යුත් ක්ෂේත්‍රයක් ඇතිවීම සඳහා → (01)

(e) විද්‍යුත් ක්ෂේත්‍ර තීව්‍රතාව ඉහළ අගයක් පවතින විට අවට වායු / ජල අණු ධ්‍රැවීකරණය වේ. සන්නායකයේ ආරෝපණයට ප්‍රතිවිරුද්ධ ආරෝපණ ඇති කෙළවර සන්නායකයට ආකර්ෂණය වේ. එම ප්‍රතිවිරුද්ධ ආරෝපණ උදාසීන වේ. සන්නායකයේ ආරෝපණ ඇති වායු / ජල අණු විකර්ෂණය වේ. → (03)



(f) අරයෙන් අඩු ගෝලයක් ගත් විට, x-කිරණ නිකුත් වීමට, විභවය වැඩි කිරීමට, ගෝලය වටා ... වැඩි කිරීමට, ... 3 කට → (03)

(g) $E = \dfrac{\sigma}{\varepsilon_0}$ → (01)

ආදේශයට → (01)

$= \dfrac{1\times10^{-6}}{9\times10^{-12}} = \dfrac{1}{9}\times10^{6} = 1.11\times10^{5}\ \mathrm{Vm^{-1}}$ → (01)

ලෙස නිසා විසර්ජනයක් සිදු නොවේ. → (01)

වන්නේ $E <$ වාතයේ බිඳ වැටීම් වි. ක්ෂේ. ත. → (01)

(h) $E = \dfrac{Q}{4\pi\varepsilon_0 r^2}$ → (01)

$Q = 3\times10^{6}\times4\times3\times9\times10^{-12}\times(12\times10^{-2})^{2}$ ආදේශය (01)

$= 3\times12\times9\times144\times10^{-10} = 4.67\times10^{-6}\ \mathrm{C}$ → (01)

→ (01)

$V = \dfrac{Q}{4\pi\varepsilon_0 r} = \dfrac{4\pi\varepsilon_0 r^2 E}{4\pi\varepsilon_0 r} = E.r$ ආදේශය (01)

$= 3\times10^{6}\times12\times10^{-2} = 36\times10^{4} = 3.6\times10^{5}\ \mathrm{V}$ → (01)

(i) ධාරාව $= \dfrac{3.6\times10^{5}}{1000} = 3.6\times10^{2}\ \mathrm{A}$ → (01)

මෙම ධාරාව 50 mA ට වඩා අඩු බැවින් ගෝලය අල්ලන ප්‍රාණඝාතක ~~[illegible]~~ නොවේ. → (01)

(j). ජලයේ වේගය V නම්, ජලය තත්:1ට ගලා
යන පරිමාව $= 5\times10^{-2}V$

එම පරිමාවේ ආරෝපණය $= 10^{-6}\times5\times10^{-2}V \longrightarrow$ (01)

$5\times10^{-2}V\times10^{-6} = 4\times10^{-8} \longrightarrow$ (02)

$V = 0.8\ ms^{-1} \longrightarrow$ (01)

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(9A) (a).i). $V_p = \sqrt{2}\,V_{rms} \longrightarrow$ (01)

$= 1.41\times230 = 324.3V \longrightarrow$ (01)

$T = \frac{1}{f} = \frac{1}{50} = 0.02\,S \longrightarrow$ (01)

ii). උදුන හරහා ගලායන ධාරාව $= \frac{1000}{230}A \longrightarrow$ (01)

බල්බය හරහා ගලායන ධාරාව $= \left(5 - \frac{1000}{230}\right)A \longrightarrow$ (01)

$= 0.65\,A$

බල්බයේ උපරිම ක්ෂමතාව $= 230\times0.65$

$= 149.5\,W$ (149−150) අ $\longrightarrow$ (01)

(b). i) බල්බය ක්‍රියාකාරී ප්‍රතිරෝධය $= \frac{V^2}{P} = \frac{(230)^2}{100} \longrightarrow$ (02)

$= 529\,\Omega \longrightarrow$ (01)

ii). $R_\theta = R_0(1+\alpha\,.\,\theta)$
$529 = R_0(1+\alpha\,.\,1000)$
$115 = R_0(1+\alpha\,.\,30)$ } (03)

$\frac{529}{115} = \frac{1+1000\alpha}{1+30\alpha}$

$\alpha = 414/99130 = 4.18\times10^{-3}\ {}^\circ C^{-1}$ (හෝ K^{-1}) $\longrightarrow$ (07)

iii). $R = \rho l/A \longrightarrow$ (01)

ආදේශයට $\longrightarrow$ (01)

$115 = \frac{5\times10^{-8}\,l}{5\times10^{-6}}$ $\quad l = 1.15\,m \longrightarrow$ (01)

iv). ස්විචය වසා සිට උෂ්ණත්වය අඩු නිසා ප්‍රතිරෝධය අඩුයි. (529 Ω නොවේ.) එබැවින් ලබාගන්නා ක්ෂමතාව වැඩියි. $\longrightarrow$ (07)

$\longrightarrow$ (01)

v). ධාරාව $= \frac{230}{529}A = 0.43\,A \longrightarrow$ (01)

vi) තාප හානි ශීඝ්‍රතාව $= (0.43)^2 \times 9\times10^{-2}$ ---→ (01)

$= 1.66\times10^{-2}\ W$ ---→ (01)

(c). i) T_1 → ආරෝහක
T_2 → අවරෝහක } (02)

ii). ජූල් තාපනය, චුම්බක කාන්දුවීම, සුළි ධාරා → (03)

iii) විභවය සහ ධාරාව වෙනස්ව අඩු කිරීම සඳහා → (01)

ඉහළ තාපජනනය, වැඩි ප්‍රතිරෝධ තාප හානිය
විද්‍යුත් ආරක්ෂාකාරී වීම, වැඩි දුරක්‍ෂමතාව } (02)

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(9B) (a) i) $I_C = \frac{5-2}{1}$ mA $= 3$ mA ---→ (01) ---→ (01)

ii). $I_B = \frac{3}{150}$ mA ---→ (01)

$5 = I_B R_B + V_{BE}$ ---→ (02)

$5 = \frac{3}{150} R_B + 0.7$

$R_B = 215\ k\Omega$ ---→ (01)

(b) i) D_1 දැල්වෙයි ---→ (01)

ii) D_1 සහ D_2 දෙකම දැල්වෙයි ---→ (02)

iii) කිසිවක් නොදැල්වේ ---→ (02)

iv) $R_{B1} = R_{B2} = 215\ k\Omega$ ---→ (02)

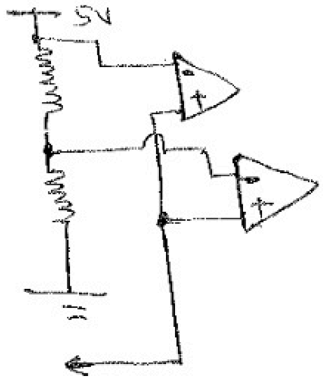
(c). i) 1) 10^5 ---→ (01)

2) $V_0 = A_V(V_+ - V_-)$ ---→ (01)

$5 = 10^5\ V'$ ---→ (01)

$V' = 5\times10^{-5}\ V$ ---→ (01)

ii). 1)



පරිපථය සම්පූර්ණ කිරීම ---→ (02)
+ සහ − ලකුණු කිරීම ---→ (02)

2) $5 = 10^{-3}\times 2R$ ---→ (01)

$R = 2.5\times10^{3}\ \Omega$

$= 2.5\ k\Omega$ ---→ (01)

(iii). i) $5 - 3 = 2.5 R_2 \quad (R_2 - k\Omega)$ → (02)

$R_2 = \frac{2}{2.5} k\Omega = 800\,\Omega$ → (01)

ii) $I_B = \frac{2.5}{150}\ mA$ → (01)

$5 = 0.7 + \frac{2.5}{150} R_1 + 0.7$ → (02)

$R_1 = 216\ k\Omega$ → (01)

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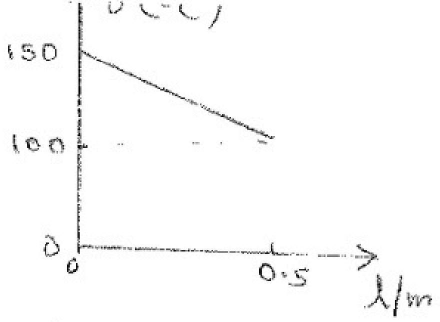
10 A

(a) i) තාප සන්නයන ශීඝ්‍රතාව $= mL/t$

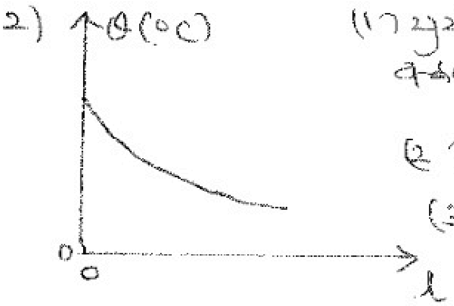
$$= \frac{20\times10^{-3} \times 2.25\times10^{6}}{5\times60} = 150\ W$$ → (02) → (01)

ii) තාපය ඉවත්වීමේ ශීඝ්‍රතාව – 150 W → (01)

iii). 1)

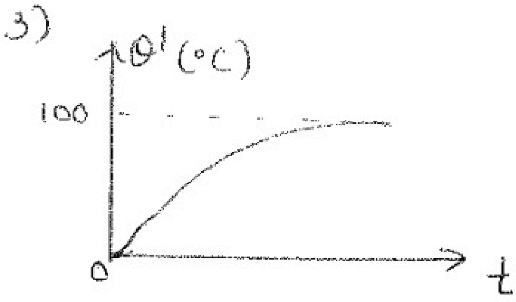


2)



(1) ප්‍රස්ථාරයට (01)
අක්ෂ ලකුණු කිරීමට (01)
(2) → (02)
(3) → (02)

3)



→ (01)

iv) $\frac{Q}{t} = \dot{Q} = kA\left(\frac{\theta_1 - \theta_2}{l}\right)$

$$\therefore 150 = k \times \frac{22}{7} \times \frac{(3.5\times10^{-2})^2 (150-100)}{0.5}$$

ආදේශයට → (02)

$k = 389.6\ Wm^{-1}K^{-1}$ $(\underline{390\ Wm^{-1}K^{-1}})$

පිළිතුරට → (01)

ඒකකයට (01)

v) T_2 උෂ්ණත්වමානයේ අගය 100°C හි ස්ථාවර නොවී ඉහළ යයි. → (01)

Q වැඩි වේ (වතුර නල සිසිලනය නැවතේ). → (01)

vi). තත්:1ට පිටවන හුමාල ස්කන්ධය $(\dot{m}) = A\rho V$ → (01)

$$PV = nRT \Rightarrow PV = \frac{\text{ස්කන්ධය}(m)}{\text{මවුලික ස්කන්ධය}(M)} RT$$

$P = \frac{\rho RT}{M}$ (ρ = ඝනත්වය) → (01)

$$\therefore \dot{m} = A\left(\frac{PM}{RT}\right)V$$

$$\frac{20\times10^{-3}}{300} = \frac{3.73\times10^{-4}\times1\times10^{5}\times18\times10^{-3}}{8.3\times373}V \rightarrow (02)$$

$V = 0.31\ ms^{-1}$ (0.30 − 0.32) → (01)

(b). තාප සන්නයන සීඝ්‍රතාව = 150 W → (01)

$$\frac{\frac{k}{2}A(\theta_0-100)}{0.5} = 150 = \frac{kA(150-100)}{0.5} \rightarrow (02)$$

$\theta_0 - 100 = 100 \quad \theta_0 = 200^\circ C$ → (01)

(c). පරිමා ප්‍රසාරණයේ ප්‍රතිශතය $= \frac{\Delta V}{V}\times100\%$ → (01)

$= \frac{V\gamma\theta}{V}\times100\%$ $= 3\times1.9\times10^{-5}\times70\times100\%$ → (01)

$= 0.399\%$ → (01) → (01)

එය 0.5% වඩා අඩු අගයකි.

$\underline{\underline{30}}$

10B.

(a) කෘෂ්ණ වස්තුවක පෘෂ්ඨයේ ඒකක වර්ගඵලයකින් තාපය විකිරණය වන ශීඝ්‍රතාව (ක්ෂමතාව), පෘෂ්ඨයේ නිරපේක්ෂ උෂ්ණත්වයේ හතරවැනි බලයට අනුලෝමව සමානුපාතික වේ. → (03)

(b). i) $\frac{Q}{t} = \dot{Q} = eA\sigma T^4$ → (02)

$$100 = 0.21\times2\times\frac{22}{7}\times0.2\times10^{-3}\times30\times10^{-2}\times6\times10^{-8}T^4 \rightarrow (02)$$

$$T^4 = \frac{10^{17}}{108\times44} = 21\times10^{12}$$

$T = 2141\ K$ (OR 2142 K) → (02)

ii). $\lambda_p T = 2.9\times10^{-3}$ ⟶ (02)

$\lambda_p = \dfrac{2.9\times10^{-3}}{2141} = 1.35\times10^{-6}\,m$ ⟶ (01)

iii). අධෝරක්ත කලාපයට ⟶ (01)

iv). තාරකා දෙක එකම ශක්තියක් නිකුත් කිරීම
නමුත්
දෘශ්‍ය තරංග ආයාම කලාපයද අධෝරක්ත කොටසට විහිදීම } (01)

(c). i). $E = \dfrac{hc}{\lambda}$ ⟶ (01)

$= \dfrac{6.4\times10^{-34}\times3\times10^{8}}{500\times10^{-9}}\,J$ ආදේශය ⟶ (01)

eV බවට ⟶ (01)

$= \dfrac{6.4\times10^{-34}\times3\times10^{8}}{500\times10^{-9}\times1.6\times10^{-19}}\,eV = 2.4\,eV$ ⟶ (01)

ii) කාර්ය ශ්‍රිතය 1.90 eV සහ 2.25 eV වූ ලෝහ
ප්‍රකාශ විද්‍යුත් ආචරණය පෙන්නුම් කරයි. } (02)
හේතුව කාර්ය ශ්‍රිතය $< 2.4\,eV$ ⟶ (01)

iii). ප්‍රභවයට 1m දුරින් වූ ඒකක වර්ගඵලය මත
ශක්තිය පතන සීඝ්‍රතාව $= \dfrac{100}{4\pi\times1^2}\times10^{-4}\,J\,S^{-1}$ ⟶ (01)

ඒකක වර්ගඵලය මත පතිත ෆෝටෝනයක
ශක්තිය $= 2.4\times1.6\times10^{-19}\,J$ ⟶ (01)

ඒකක වර්ගඵලය මත තත්.1ට පතිත ෆෝටෝන ගණන
$= \dfrac{100\times10^{-4}}{4\pi\times2.4\times1.6\times10^{-19}}\,S^{-1}$ ⟶ (01)

∴ ඒකක ධාරාව $= \left(\dfrac{100\times10^{-4}}{4\pi\times2.4\times1.6\times10^{-19}}\right)\dfrac{1}{100}\times1.6\times10^{-19}\,A$ ⟶ (02)

$= 3.31\times10^{-6}\,A\ (3.3\,\mu A)$ ⟶ (01)

(d). ඇස මත ෆෝටෝන පතිත විය යුතු සීඝ්‍රතාව ⟶ (02)

$= \dfrac{3.6\times10^{-17}\,J\,S^{-1}}{2.4\times1.6\times10^{-19}\,J} = 93.75\,S^{-1}$ // ⟶ (01)

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