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இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

01 E I

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2006 අප්‍රේල්
கல்விப் பொதுத் தராதரப் பத்திர(உயர் தர)ப் பரீட்சை, 2006 ஏப்பிரல்
General Certificate of Education (Adv. Level) Examination, April 2006

භෞතික විද්‍යාව I
பௌதிகவியல் I
Physics II

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Important :

- ✻ *This question paper consists of* **60** *questions in* **12** *pages.*
- ✻ *Answer all the questions.*
- ✻ *Write your* ***Index Number*** *in the space provided in the answer sheet.*
- ✻ *Instructions are given on the back of the answer sheet. Follow those carefully.*
- ✻ *In each of the questions* **1** *to* **60**, *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* (×) *on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*

Use of calculators is not allowed.

(g = 10 N kg^{-1})

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1. Which of the following is **not** an SI unit?
   (1) kg (2) m (3) s (4) A (5) k

2. If $(n-1)$ number of main scale divisions of a certain measuring instrument is divided into n vernier scale divisions, then the least count of the instrument in main scale divisions is
   (1) 1 (2) $\frac{1}{n}$ (3) $\frac{n}{n-1}$ (4) $\frac{n-1}{n}$ (5) $\frac{1}{n-1}$

3. The refractive indices of water and glass are $\frac{4}{3}$ and $\frac{3}{2}$ respectively.

   The refractive index of water relative to glass is
   (1) $\frac{1}{4}$ (2) $\frac{1}{2}$ (3) $\frac{8}{9}$ (4) $\frac{9}{8}$ (5) 2

4. For an object undergoing simple harmonic motion
   (1) the magnitude of the acceleration is maximum when the displacement is maximum.
   (2) the displacement is maximum when the speed is maximum.
   (3) the magnitude of the acceleration is maximum when the speed is maximum.
   (4) the maximum potential energy is greater than the maximum kinetic energy.
   (5) the acceleration is always constant.

5. A black body of temperature T K radiates energy at a rate of 10 mW. At temperature $2T$ K it will radiate energy at a rate of
   (1) 10 mW (2) 20 mW (3) 40 mW (4) 80 mW (5) 160 mW

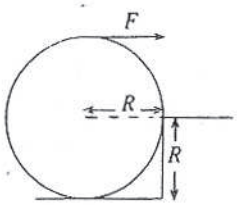
6. A radioactive nucleus ${}^{A}_{Z}X$ decays to a nucleus ${}^{A-4}_{Z-1}Y$ in two stages. The radiations emitted in the two stages would most likely be

	First stage	Second stage
(1)	α	β^-
(2)	β^-	γ
(3)	β^+	α
(4)	α	γ
(5)	β^+	γ

7. Light of wavelength 5000 Å is incident on a sodium surface whose work function is 2.28 eV. The maximum kinetic energy of the emitted photoelectrons is ($hc = 12.4 \times 10^3$ eV Å)

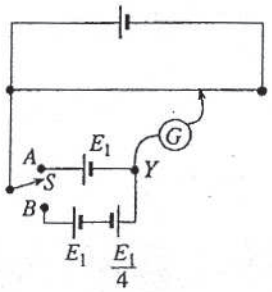
(1) 0.03 eV (2) 0.20 eV (3) 0.60 eV (4) 1.30 eV (5) 2.00 eV

8. A circular coin of radius R and mass M is placed so that it touches a step of height R as shown in the figure. The minimum value of the horizontal force F required to pull the coin over the step is



(1) $\frac{Mg}{2}$ (2) $\frac{Mg}{\sqrt{2}}$ (3) Mg

(4) $\sqrt{2}\,Mg$ (5) $2\,Mg$

9. 

In the potentiometer circuit shown when switch S is connected to A the balance length is l. When S is connected to B the balance length will be

(1) $\frac{l}{4}$ (2) $\frac{l}{2}$ (3) $\frac{3l}{4}$

(4) $\frac{4l}{3}$ (5) $\frac{5l}{4}$

10. An astronomical telescope consists of two convex lenses of focal lengths 50 mm and 650 mm. The moon subtends an angle of 0.5° on an unaided eye. If the telescope is used in normal adjustment to view the moon, the angle subtended by the final image of the moon on the eye is

(1) 6.5° (2) 5.5° (3) 4.5° (4) 3.5° (5) 2.5°

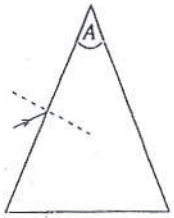
11. A ray of light incident on a glass prism is shown in the figure.

Consider the following statements.

(A) Irrespective of the value of angle A the incident ray always emerges from the opposite face.

(B) For a certain value of the angle of incidence the deviation of the emergent ray is minimum.

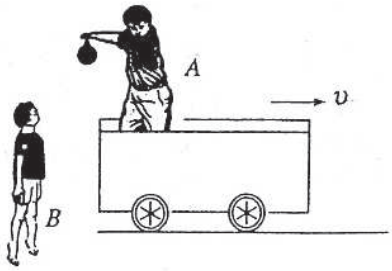
(C) There is an angle of incidence for the ray for which the angle of emergence is equal to the angle of incidence.

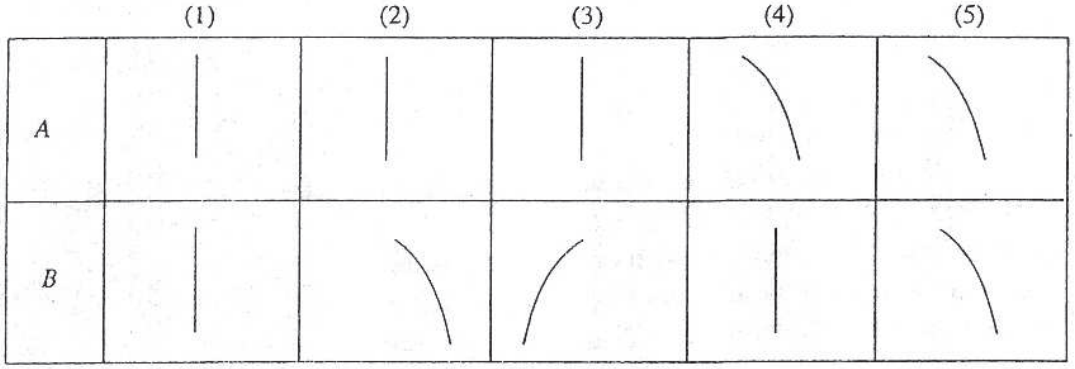


Of the above statements,

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

12. A person A standing on a trolley moving with a constant speed v on a straight horizontal track drops an object as shown in the figure. B is an observer standing on the ground. If the air resistance is negligible, the paths of the object as observed by A and B are represented by





13. Refractive indices for red light and blue light in crown glass are 1.51 and 1.53 respectively. Consider the following statements.

(A) The speeds of red light and blue light in vacuum are the same.

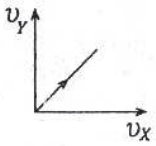
(B) The speed of red light is greater than that of blue light in crown glass.

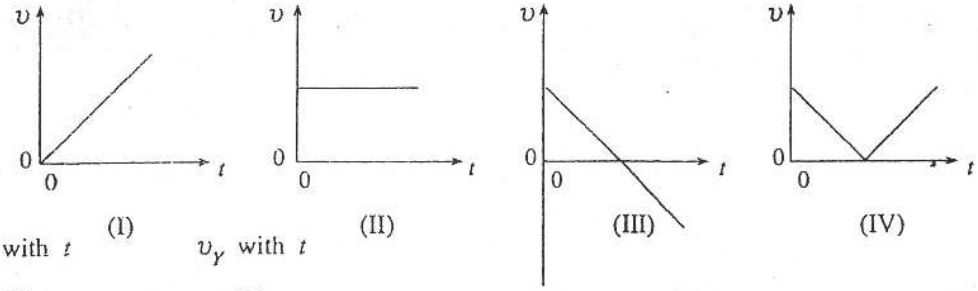
(C) Critical angle of red light is greater than that of blue light for crown glass.

Of the above statements,

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

14. A stone is thrown at a certain angle with the horizontal in the direction shown by the arrow. If air resistance is ignored, which of the following velocity (v) - time (t) graphs best represent the variations of v_X with t, and v_Y with t?





	v_X with t	v_Y with t
(1)	II	III
(2)	II	I
(3)	I	IV
(4)	II	IV
(5)	II	II

15. Consider the following statements made regarding a transformer.

(A) The core of a transformer is usually made of soft iron in order to maintain a better flux linkage.

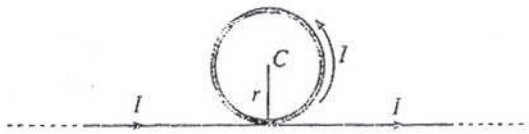
(B) The wire diameter of the secondary coil of a step-down transformer is usually larger than that of the primary coil.

(C) When winding transformers, wires without insulated coating must be used.

Of the above statements,

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

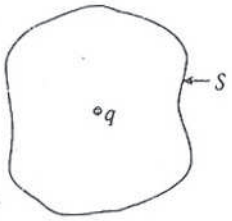
16. A long insulated wire carrying a current I is bent to form a flat circular coil of N turns and radius r. The two straight ends of the wire extend to a large distance as shown. The magnitude of the magnetic flux density at the centre C of the coil is



(1) 0 (2) $\frac{N\mu_0 I}{2\pi r}+\frac{\mu_0 I}{2r}$ (3) $\frac{N\mu_0 I}{2r}-\frac{\mu_0 I}{2\pi r}$ (4) $\frac{N\mu_0 I}{2r}+\frac{\mu_0 I}{2\pi r}$ (5) $\frac{N\mu_0 I}{2r}-\frac{\mu_0 I}{2r}$

17. As a mechanical wave propagates in a medium, the energy of the wave dissipates gradually. This will gradually
(1) decrease the speed of the wave. (2) decrease the amplitude of the wave.
(3) decrease the frequency of the wave. (4) decrease the wavelength of the wave.
(5) increase the wavelength of the wave.

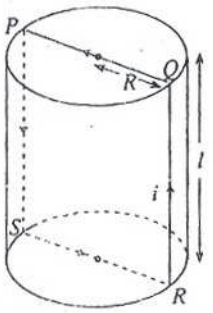
18. S is a Gaussian surface and q is a charge inside it. Consider the following statements made about the net electric flux Φ through the surface S.



(A) If the volume enclosed by the surface S increases, then Φ increases.
(B) If the charge q is moved close to the surface S, then Φ increases.
(C) Even if the shape of the surface S is changed, Φ remains the same.

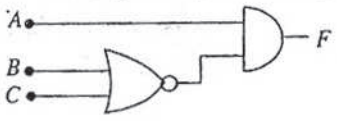
Of the above statements,
(1) only (A) is true. (2) only (B) is true. (3) only (C) is true.
(4) only (A) and (B) are true. (5) only (B) and (C) are true.

19. The figure shows a cylindrical satellite with radius R and length l and a wire $PQRS$ wrapped around it in a rectangular shape. If a current i is made to flow through $PQRS$ at an instant when the direction of the earth's magnetic field of flux density B is along PQ,

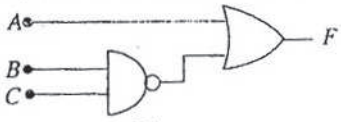


(1) a net force of $2RiB$ and a torque of $2RliB$ will act on the satellite.
(2) a net force of $2liB$ and a torque of $2RliB$ will act on the satellite.
(3) there will be no net force but a torque of $RliB$ will act on the satellite.
(4) there will be no net force but a torque of $2RliB$ will act on the satellite.
(5) neither a net force nor a net torque will act on the satellite.

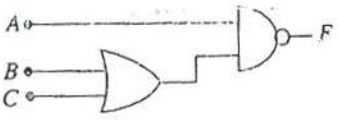
20. The circuit corresponding to the logic expression $F = A \cdot \overline{B+C}$ is



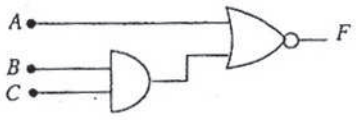
(1)



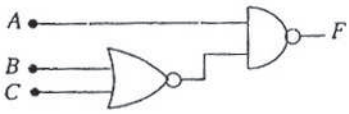
(2)



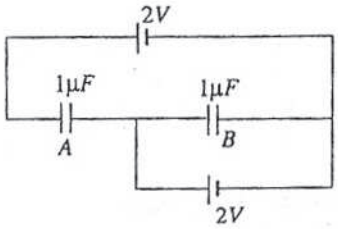
(3)



(4)

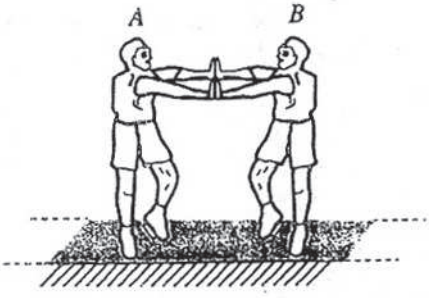


(5)

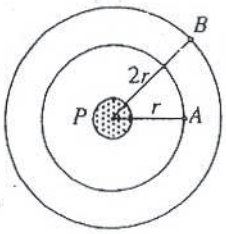
21. 

In the circuit shown, charges of the capacitors A and B respectively are
(1) 2 μC, 2 μC (2) 1 μC, 2 μC
(3) 1 μC, 3 μC (4) 0, 2 μC
(5) 0, 4 μC

22. Two boys, A and B, standing on a horizontal ice surface move apart by pushing each other. The weight of A is twice that of B. By the time A has moved 4 m the distance moved by B is



(1) 0 (2) 2 m
(3) 4 m (4) 8 m
(5) 12 m

23. 

As shown in the figure, two satellites A and B of masses m_A and m_B move around a planet P in circular orbits with speeds V_A and V_B respectively. The radii of the orbits are r and $2r$ respectively. The ratio $\frac{V_A}{V_B}$ is

(1) $2\frac{m_A}{m_B}$ (2) $\frac{m_A}{m_B}$ (3) $\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$ (5) 2

24. Suppose the times taken for a large airplane to accelerate uniformly from 500 km hr^{-1} to 505 km hr^{-1}, a car from 50 km hr^{-1} to 55 km hr^{-1} and a bicycle from 5 km hr^{-1} to 10 km hr^{-1} are the same. Consider the following statements.

(A) All have the same acceleration.

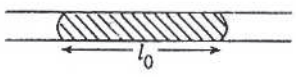
(B) All travel the same distance during the above time period.

(C) The accelerating force on each is the same.

Of the above statements,

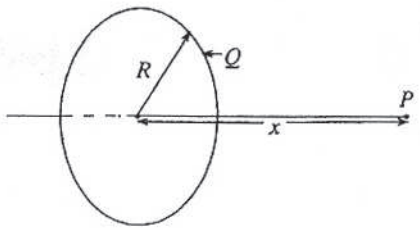
(1) only (A) is true. (2) only (B) is true.
(3) only (A) and (B) are true. (4) only (A) and (C) are true.
(5) all (A), (B) and (C) are true.

25. A liquid of volume expansivity γ forms a liquid thread of length l_0 inside a tube made of a material of linear expansivity α as shown in the figure. If the temperature is increased by an amount θ, the length of the liquid thread will become



(1) l_0 (2) $l_0\frac{(1+\gamma\theta)}{(1+\alpha\theta)}$ (3) $l_0(1+\gamma\theta)(1+2\alpha\theta)$ (4) $\frac{l_0(1+\gamma\theta)}{(1+2\alpha\theta)}$ (5) $\frac{l_0(1+\gamma\theta)}{(1+3\alpha\theta)}$

26. A thin conducting ring of radius R has a charge Q uniformly distributed over it. P is a point on the axis passing perpendicular to the plane of the ring and through its centre. The electric potential at the point P is given by

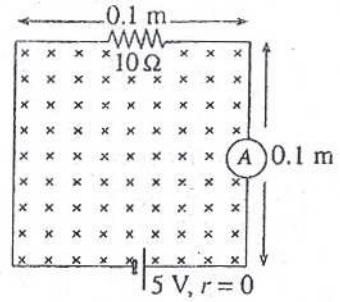


(1) $\frac{Q}{4\pi\varepsilon_0 x}$ (2) $\frac{Q}{4\pi\varepsilon_0\left(R^2+x^2\right)^{\frac{1}{2}}}$

(3) $\frac{Qx}{4\pi\varepsilon_0\left(R^2+x^2\right)}$ (4) $\frac{Qx}{4\pi\varepsilon_0\left(R^2+x^2\right)^{\frac{3}{2}}}$ (5) $\frac{QR}{4\pi\varepsilon_0\left(R^2+x^2\right)}$

27. If two cylinders one containing argon gas and the other containing neon gas are kept at the same temperature, then

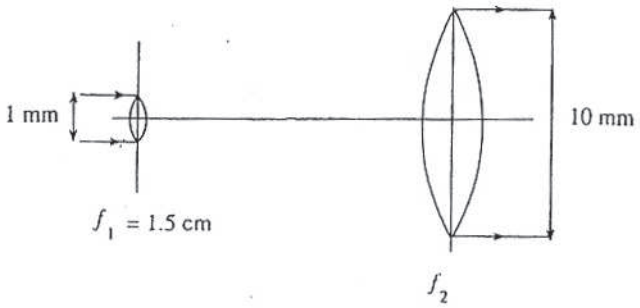
(1) the pressures of the gases must be equal.
(2) the mean speeds of the gas atoms of the two gases must be equal.
(3) the gas atoms of the two gases must have the same root mean square speed.
(4) the masses of the gases must be equal.
(5) the gas atoms of the two gases must have the same mean translational kinetic energy.

28. 

The circuit shown is placed in a uniform magnetic field that is acting into the page. This magnetic field is decreasing in magnitude at a rate of 150 T s^{-1}. The reading of the ammeter is

(1) 0.15 A (2) 0.35 A
(3) 0.50 A (4) 0.65 A
(5) 0.80 A

29. A laser beam of 1 mm diameter has to be converted into a beam of 10 mm diameter using two convex lenses as shown. What is the value of the focal length f_2 of the second lens and the distance d at which it should be placed from the first lens?

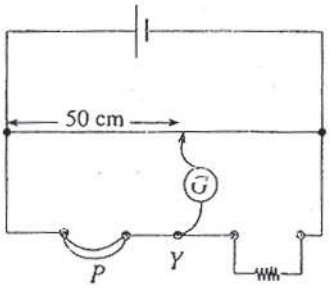


	f_2	d
(1)	4.5 cm	6.0 cm
(2)	10.0 cm	10.0 cm
(3)	10.0 cm	11.5 cm
(4)	15.0 cm	15.0 cm
(5)	15.0 cm	16.5 cm

30. The near point of a defective eye is 50 cm. The lens that should be worn to correct the near point to 25 cm is
(1) a converging lens of focal length 50 cm.
(2) a diverging lens of focal length 50 cm.
(3) a converging lens of focal length 25 cm.
(4) a diverging lens of focal length 25 cm.
(5) a converging lens of focal length 75 cm.

31. An earthquake which occurred at a certain location generates a transverse wave (S-wave) and a longitudinal wave (P-wave). Both waves travel through the earth, and the P-wave arrives 3 minutes before the S-wave at a certain point on the earth. The average speeds of the S and P waves between the point and the location of the earthquake are 4 km s^{-1} and 8 km s^{-1} respectively. How far away from the point did the earthquake occur?
(1) 40 km (2) 540 km (3) 720 km (4) 1 440 km (5) 2 400 km

32. The diagram shows a balanced metre bridge. P indicates a pair of identical resistive wires connected in parallel. When one resistive wire is removed, the new balance length is approximately equal to
(1) 22 cm
(2) 44 cm
(3) 55 cm
(4) 67 cm
(5) 92 cm



33. Two small plastic spheres, A and B of which A is hollow and B is solid, made of the same material and having the same external radii are released from rest from a tall building. Both spheres reach their terminal velocities before hitting the ground. When the spheres reach the ground
(1) the speed of A is greater than the speed of B.
(2) the viscous force on A is less than that on B.
(3) the viscous force on B is less than that on A.
(4) A has taken a shorter time than B.
(5) both spheres gain the same speed.

34.

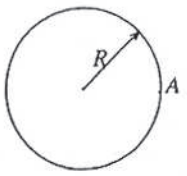


Figure I

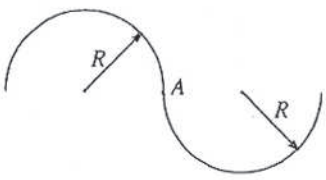
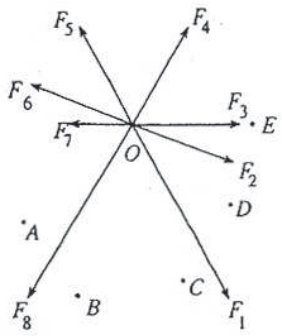


Figure II

The moment of inertia of a ring of mass M made of a uniform thin wire about an axis through the point A (figure I) perpendicular to the plane of the ring is $2MR^2$. When the ring is bent to a S shape as shown in figure II, the moment of inertia about the same axis is

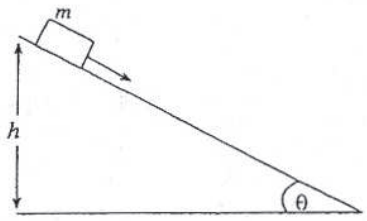
(1) 0 (2) $\frac{1}{2}MR^2$ (3) MR^2 (4) $\frac{3}{2}MR^2$ (5) $2MR^2$

35. A system of coplanar forces F_1 to F_8 drawn to scale act on a point object O as shown.



The resultant force will most probably be a vector represented by

(1) $\overrightarrow{OA}$
(2) $\overrightarrow{OB}$
(3) $\overrightarrow{OC}$
(4) $\overrightarrow{OD}$
(5) $\overrightarrow{OE}$

36. 

A wooden block of mass m is sliding down an inclined plane at **constant speed** from a height h above the ground as shown in the figure. The total energy dissipated due to friction by the time the block reaches the bottom of the plane is

(1) $\frac{mgh}{\cos\theta}$ (2) $\frac{mgh}{\sin\theta}$ (3) $mgh\tan\theta$
(4) mgh (5) 0

37. Two identical conducting spheres A and B carry equal charges. The spheres are separated by a distance which is much larger than their diameters. The electrostatic force acting between them is F. Now a third identical uncharged conducting sphere is first made to touch A and secondly B, and then removed. The new value of the force acting between A and B is

(1) 0 (2) $\frac{F}{16}$ (3) $\frac{F}{4}$ (4) $\frac{3F}{8}$ (5) $\frac{F}{2}$

38. The standard length of the filament of a 60 W, 230 V electric bulb has shortened due to a certain defect. When this bulb is glowing,

(A) it will glow brighter and consume more power than a standard 60 W bulb.
(B) the wavelength corresponding to the maximum intensity of the light emitted will be lower than that due to a standard 60 W bulb.
(C) surface temperature of the glass envelope of the bulb will be at a higher temperature than that of a standard 60 W bulb.

Of the above statements,

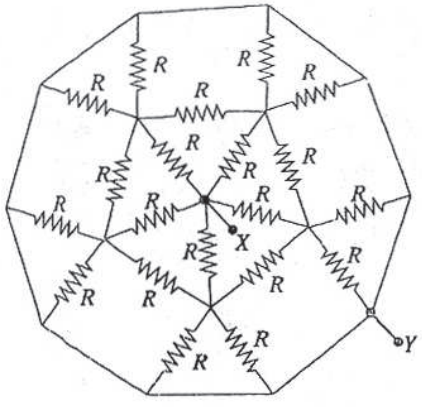
(1) only (A) is true.
(2) only (A) and (B) are true.
(3) only (B) and (C) are true.
(4) only (A) and (C) are true.
(5) all (A), (B) and (C) are true.

39. A long uniform wire of resistance R is cut into n number of pieces of equal length. These pieces are bundled together to make a composite wire of length that is equal to the length of a piece. The resistance of the composite wire is

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

40. Resistance across XY of the network shown is

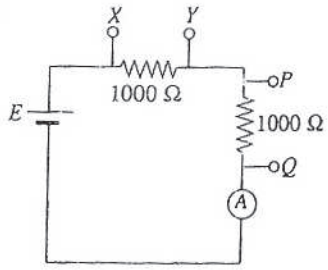
(1) $2R$
(2) $\frac{3}{2}R$
(3) R
(4) $\frac{2}{5}R$
(5) $\frac{3}{10}R$



41. A point source of sound emits sound equally in all directions. For such a situation the sound intensity at a point is inversely proportional to the square of its distance from the source. If the intensity level at a distance of 5 m from the source is 70 dB then the intensity level at a distance of 50 m from the source is

(1) 30 dB (2) 40 dB (3) 50 dB (4) 60 dB (5) 80 dB

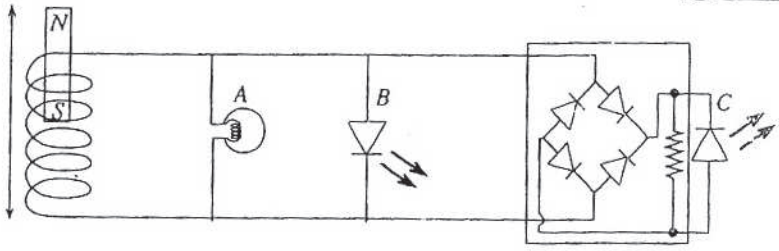
42. In the circuit shown the cell E and the ammeter A have negligible internal resistances.



When a voltmeter having internal resistance of 2000 Ω is connected across XY,

(1) the voltage across XY drops and the ammeter reading decreases.
(2) voltage across PQ increases and the ammeter reading drops.
(3) voltages across XY and PQ remain the same.
(4) both the voltage across PQ and the ammeter reading increase.
(5) voltage across PQ remains the same and the ammeter reading increases.

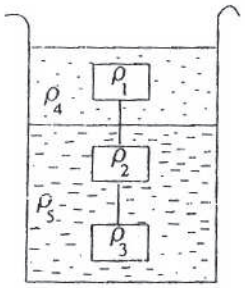
43.



In the figure shown, A is a torch bulb, B and C are light emitting diodes. If a strong bar magnet is moved up and down continuously at a high rate through the coil and generates an ac voltage of peak amplitude 4 V,

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

44. Three masses made of materials having densities ρ_1, ρ_2 and ρ_3, and of equal volumes are connected together with light strings. The system floats in a vessel containing two immiscible liquids of densities ρ_4 and ρ_5 with strings taut as shown in the figure.



Consider the following conclusions made about the system.

(A) $\rho_1 < \rho_5$

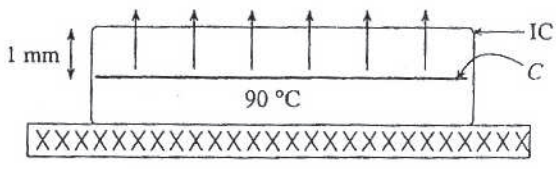
(B) $\rho_1 < \rho_3$

(C) If the tensions of the strings are equal, then $\rho_2 = \rho_5$.

Of the above conclusions,

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

45.



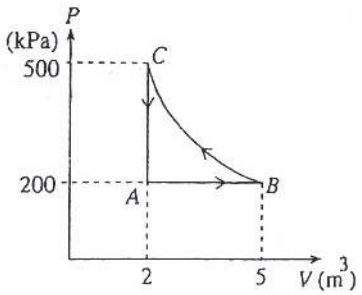
The figure shows a cross section of an integrated circuit (IC) mounted on a circuit board. The core (C) of the IC (the electronic circuit) dissipates 60 W of power as heat. The core is covered with a material of thermal conductivity 6 $W m^{-1} K^{-1}$. The direction of heat flow is shown by the arrows. The top surface of the IC is cooled by forced convection. The top surface has an area of 10 cm^2 and the distance from the core to the top surface is 1 mm.

At what temperature the top surface be kept in order to maintain the core at 90 °C? (Assume that no heat flows through the bottom surface and the sides.)

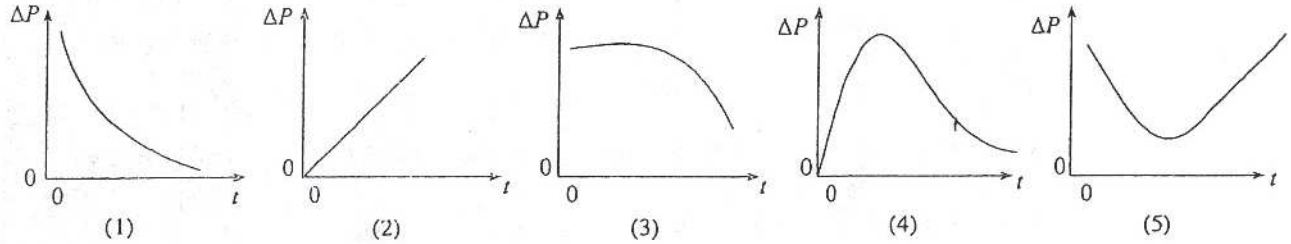
(1) 70 °C (2) 80 °C (3) 89.9 °C (4) 91 °C (5) 100 °C

46. An ideal gas undergoes the cyclic process $ABCA$ in the PV diagram shown. BC is an isothermal path. The work done by the gas during one cycle is nearly equal to

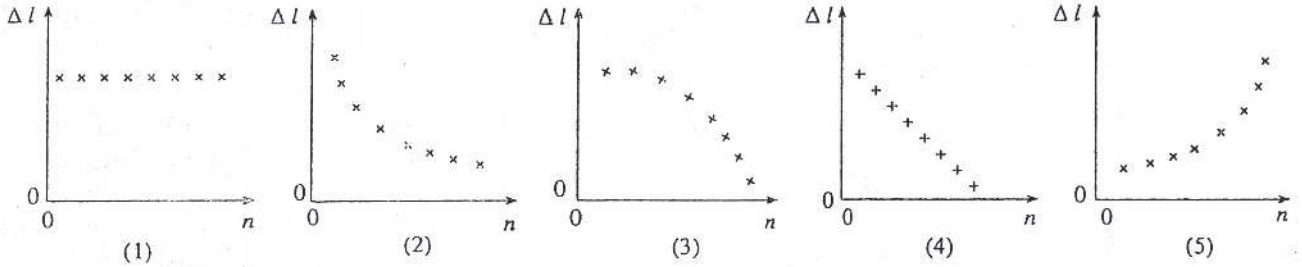
(1) 600 kJ
(2) 300 kJ
(3) 0
(4) −300 kJ
(5) −600 kJ

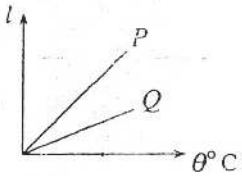


47. A soap bubble is formed gradually at one end of a glass tube from time $t = 0$ by slowly blowing air from the other end. The variation of excess pressure (ΔP) inside the bubble with time (t) is best represented by



48. A heavy metal box is to be supported by n number of uniform identical legs of the same material in such a way that the entire weight of the box is equally distributed among all legs. In this situation, the variation of the contraction Δl of each leg with the number of legs n, due to the weight of the box, is best represented by



49. 

Graph shows the variation of the length (l) of the liquid columns of a certain mercury-in-glass thermometer (P) and an alcohol-in-glass thermometer (Q) with temperature (θ).

A student draws the following **general** conclusions solely based **only** on the graph.

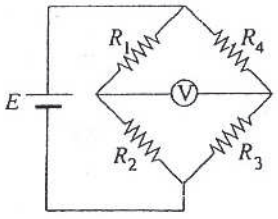
(A) Mercury thermometers are more sensitive than alcohol thermometers.
(B) Mercury thermometers are longer than alcohol thermometers.
(C) Volume expansivity of mercury is greater than that of alcohol.

He can truly conclude

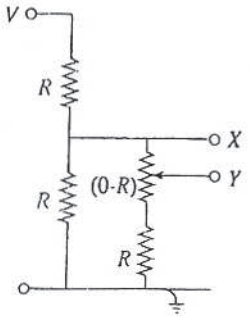
(1) only (C).
(2) only (A) and (B).
(3) only (A) and (C).
(4) all (A), (B) and (C).
(5) **none** of (A), (B) and (C).

50. The following table indicates five different sets of resistance values that can be allocated for R_1, R_2, R_3 and R_4 of the bridge circuit shown. Which of the following sets produces the **largest** deflection in the voltmeter (V)?

	Set	$R_1\ \Omega$	$R_2\ \Omega$	$R_3\ \Omega$	$R_4\ \Omega$
(1)	1	30	5	30	5
(2)	2	20	15	10	25
(3)	3	25	10	10	25
(4)	4	10	25	25	10
(5)	5	30	5	5	30



51. The circuit shown consists of three fixed resistors and variable resistor which can be varied from 0 to R. The maximum voltage that can be obtained across XY is



(1) $\frac{1}{5}V$ (2) $\frac{1}{3}V$ (3) $\frac{2}{5}V$

(4) $\frac{2}{3}V$ (5) $\frac{4}{5}V$

52. A particle is moving in a circular orbit of radius 10 m. At one instant, the speed of the particle is $10\,m\,s^{-1}$ and is increasing at a rate of $10\,m\,s^{-2}$. The angle between the velocity vector and the resultant acceleration vector of the particle at that instant is

(1) 0° (2) 30° (3) 45° (4) 60° (5) 90°

53. Consider the following statements made regarding the weightlessness experienced inside a satellite orbiting around the earth?

(A) Weightlessness is due to the negligibly small gravity at such an altitude.

(B) Due to weightlessness, the momentum of a person moving inside the satellite is zero.

(C) Due to weightlessness, natural thermal convection currents cannot occur inside the satellite.

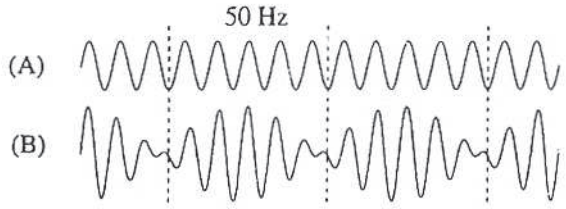
Of the above statements,

(1) only (A) is true. (2) only (C) is true.

(3) only (A) and (C) are true. (4) all (A), (B) and (C) are true.

(5) all (A), (B) and (C) are **false**.

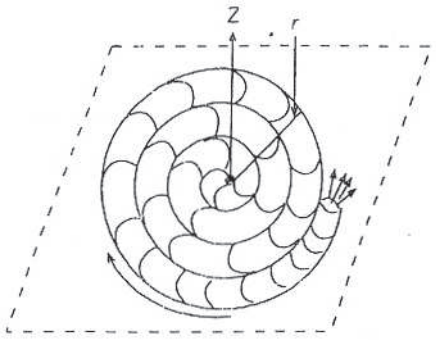
54. An oscilloscope is connected to a microphone which receives simultaneously a 50 Hz signal and another signal of frequency $f (f > 50\,Hz)$. The figure A shows the trace with the 50 Hz signal alone while the figure B shows the trace due to the combined signal.



The value of f is

(1) 50 Hz (2) 55 Hz (3) 60 Hz (4) 65 Hz (5) 70 Hz

55. A circular disc shaped pin wheel type firework shown in the figure performs a rotational motion about the Z-axis on a horizontal smooth floor due to a constant reaction force generated by its burning. Assume that the pin wheel retains the shape of a uniform circular disc throughout and its moment of intertia $I = \frac{1}{2}mr^2$ about the Z-axis. If m, r, ω and α are the values of mass, radius, angular velocity and angular acceleration respectively of the burning pin wheel at a certain instant, then

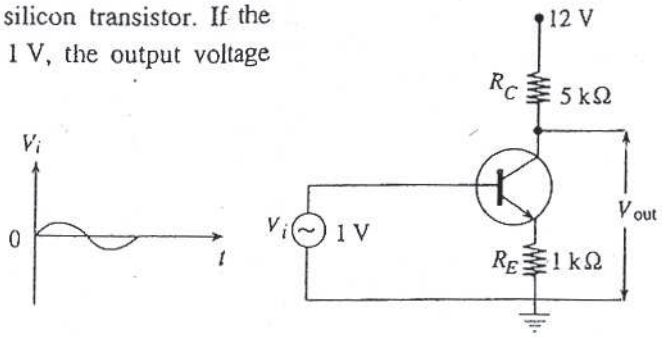


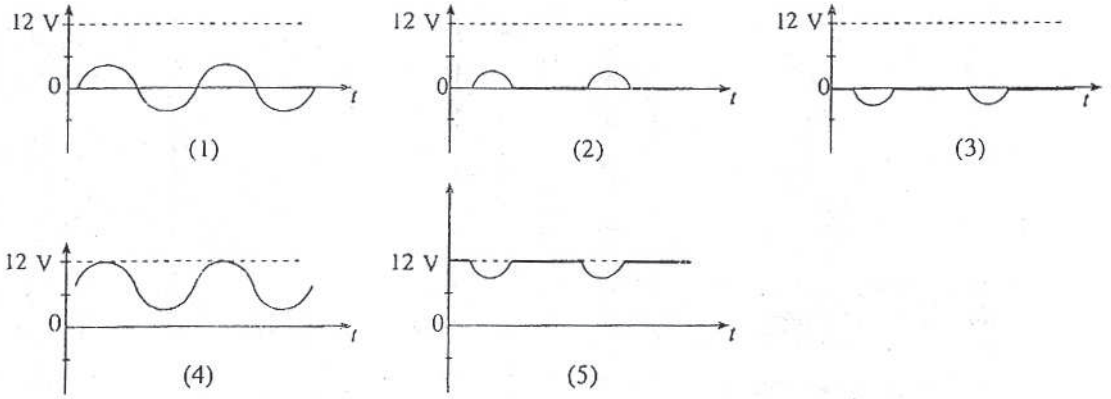
(1) $mr\alpha$ is constant. (2) $mr^2\alpha$ is constant.

(3) $r\omega$ is constant. (4) $mr^2\omega$ is constant.

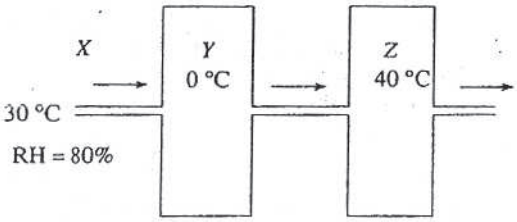
(5) $mr^2\omega^2$ is constant.

56. The figure shows a circuit constructed using a silicon transistor. If the peak value V_i of the input alternating voltage is 1 V, the output voltage V_{out} is best represented by





57. Atmospheric air at 30 °C and having 80% relative humidity is made to flow slowly through two large chambers, Y and Z, maintained at 0 °C and at 40 °C, as shown in figure. Densities of saturated water vapour in the atmosphere at 0 °C, 30 °C and 40 °C are 4.8×10^{-3} kg m^{-3}, 30×10^{-3} kg m^{-3} and 48×10^{-3} kg m^{-3} respectively. Which of the following tables correctly represents the relative humidities (RH), and the absolute humidities (AH) of air in the atmosphere (X), and in the chambers Y and Z?



(1)

	X	Y	Z
RH	80	10	90
AH (kg m^{-3})	30×10^{-3}	4.8×10^{-3}	35×10^{-3}

(2)

	X	Y	Z
RH	80	100	10
AH (kg m^{-3})	24×10^{-3}	4.8×10^{-3}	4.8×10^{-3}

(3)

	X	Y	Z
RH	80	0	40
AH (kg m^{-3})	24×10^{-3}	4.8×10^{-3}	4.8×10^{-3}

(4)

	X	Y	Z
RH	80	100	100
AH (kg m^{-3})	24×10^{-3}	4.8×10^{-3}	4.8×10^{-3}

(5)

	X	Y	Z
RH	80	100	100
AH (kg m^{-3})	24×10^{-3}	4.8×10^{-3}	48×10^{-3}

58. In the circuit shown in figure (a), the supply voltage (E) increases linearly with time (t) as shown in figure (b).

At time $t = t_0$, supply voltage surpasses the breakdown voltage of the Zener diode. The variation of the voltage (V_R) across 100 Ω resistor, and the voltage (V_Z) across the Zener diode with time (t) is best represented in

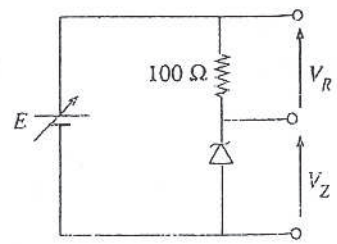


Figure (a)

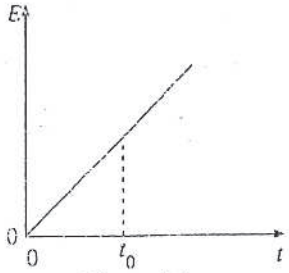
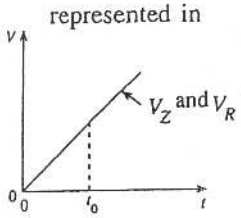
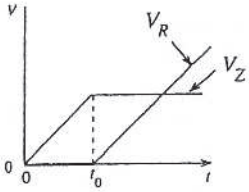


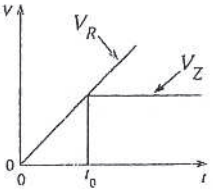
Figure (b)



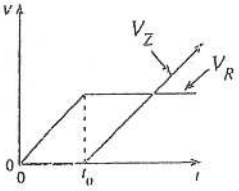
(1)



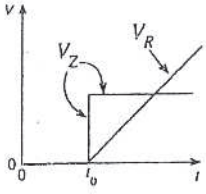
(2)



(3)



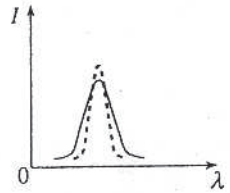
(4)



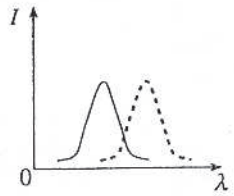
(5)

59. A star (S) rotates about its own axis as shown in the figure. Which of the following graphs best represents the observed distribution of intensity (I) as a function of wavelength (λ) of a spectral line emitted by a certain gas in the star, when viewed from the earth (E)? The broken lines represent the expected intensity distribution of the spectral line if the star does not rotate about its axis.

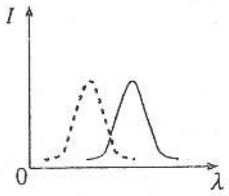




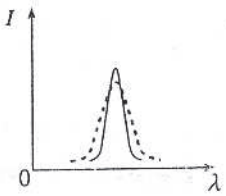
(1)



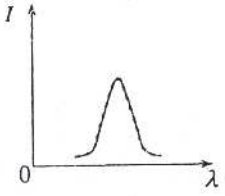
(2)



(3)

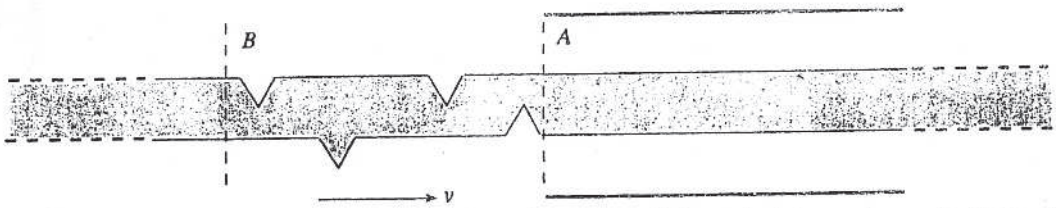


(4)

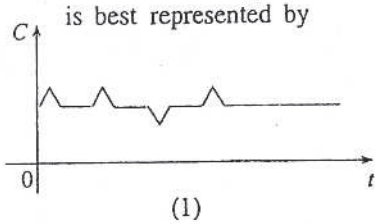


(5)

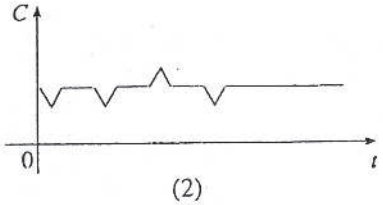
60.



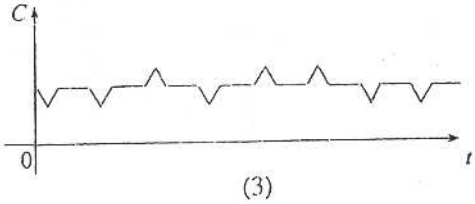
A uniform sheet of dielectric material is sent through two parallel metal plates as shown in figure at a constant velocity (v) to check for manufacturing defects. Some of such defects are shown in the figure. As the section AB of the sheet passes through the metal plates, variation of the capacitance (C) of the system with time (t) is best represented by



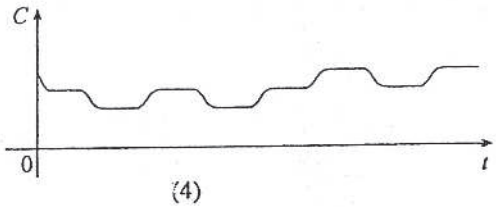
(1)



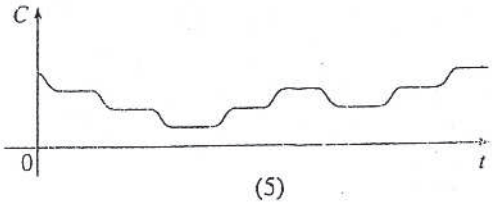
(2)



(3)



(4)



(5)