ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2026
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2026
General Certificate of Education (Adv. Level) Examination, 2026

භෞතික විද්‍යාව I
பௌதிகவியல் I
Physics I

01 E I

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Instructions:

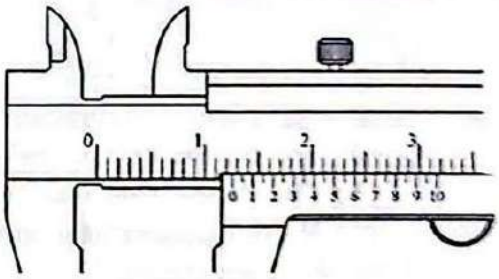
- *This question paper consists of* **50** *questions in* **10** *pages.*
- *Answer* ***all the questions.***
- *Write your* ***Index Number*** *in the space provided in the answer sheet.*
- *Read the instructions given on the back of the answer sheet carefully.*
- *In each of the questions* **1** *to* **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*** (×) ***in accordance with the instructions given on the back of the answer sheet.***

Use of calculators is not allowed.

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

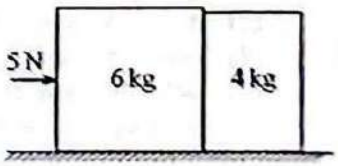
1. Which of the following pairs does **not** have similar dimensions?
   (1) stress and pressure
   (2) momentum and impulse
   (3) force and surface tension
   (4) speed and velocity
   (5) work and energy

2. The diagram shows a reading of a certain length taken using a Vernier caliper. What are the measured length and the least count of the instrument, respectively? The Vernier caliper has no zero error.



   (1) 1·206 cm and 0·001 cm
   (2) 1·206 cm and 0·005 cm
   (3) 1·260 cm and 0·001 cm
   (4) 1·260 cm and 0·005 cm
   (5) 1·260 cm and 0·010 cm

3. As shown in the figure, two blocks of mass 4 kg and 6 kg are placed in contact with each other on a frictionless horizontal surface. If a horizontal force of 5 N is applied on the heavier mass so that the system moves together, what is the magnitude of the force acting on the lighter mass?



   (1) 1 N
   (2) 2 N
   (3) 3 N
   (4) 4 N
   (5) 5 N

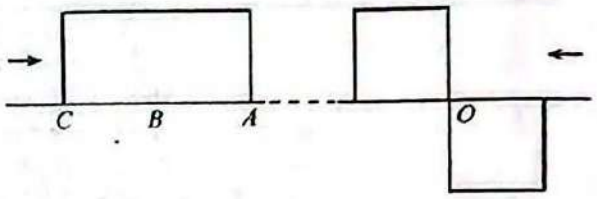
4. Speed of sound in air
   (1) is independent of temperature.
   (2) increases with increasing pressure.
   (3) decreases with increasing pressure.
   (4) decreases with increasing humidity.
   (5) increases with increasing humidity.

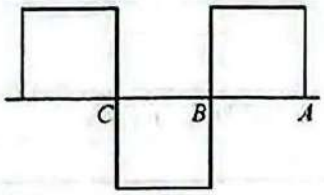
5. The total energy of a particle undergoing simple harmonic motion is directly proportional to its
   (1) velocity.
   (2) square of the velocity.
   (3) amplitude.
   (4) square of the amplitude.
   (5) frequency.

6. How many types of quarks exist?
   (1) 2
   (2) 3
   (3) 4
   (4) 5
   (5) 6

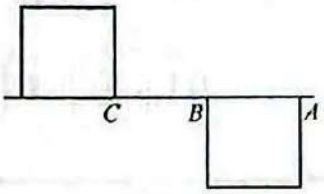
[See page two

7. The two waveforms shown in the figure are travelling in opposite directions in a medium along the same plane. What is the shape of the resultant waveform when point O reaches point C?





(1)



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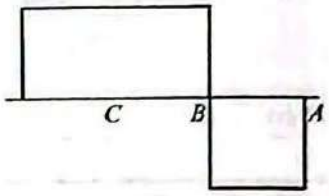

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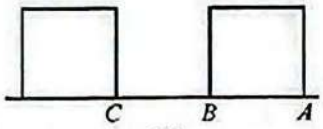

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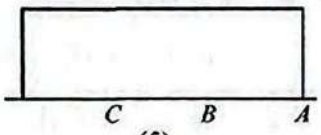


(5)

8. Which of the following is the suitable device for most accurate measurement of an e.m.f. of a cell?
   (1) Meter Bridge (2) Non-ideal voltmeter
   (3) Galvanometer (4) Ammeter
   (5) Potentiometer

9. A uniform solid sphere starts from rest and rolls along an inclined plane without slipping. The moment of inertia I of a uniform solid sphere of mass M and radius R rotating about an axis through the centre is $I = \frac{2}{5}MR^2$. What is the ratio $\frac{\text{translational kinetic energy of the sphere}}{\text{rotational kinetic energy of the sphere}}$?
   (1) $\frac{2}{5}$ (2) $\frac{1}{2}$ (3) 1 (4) $\frac{5}{2}$ (5) 4

10. Consider the following statements about electric equipotential surfaces.
   (A) The electric field intensity is always constant over an equipotential surface.
   (B) The electric field lines and equipotential surfaces are always mutually perpendicular.
   (C) No two equipotential surfaces intersect with each other.
   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.

11. A monochromatic ray of light is incident on a glass block at an incident angle of 60°. If the partially reflected and refracted rays are perpendicular to each other, what is the refractive index of glass?
   (1) 1·3 (2) 1·4 (3) 1·5 (4) $\sqrt{3}$ (5) 1·8

12. How much water should be filled in a cylindrical container 21 cm in height so that it appears half filled when viewed from the top of the container? The refractive index of water is $\frac{4}{3}$.
   (1) 16·0 cm (2) 14·0 cm (3) 12·0 cm (4) 10·0 cm (5) 8·0 cm

13. If the mass of a radioactive sample is increased, the activity and the decay constant of the sample are respectively
   (1) increases, remains the same. (2) decreases, increases.
   (3) decreases, remains the same. (4) increases, decreases.
   (5) increases, increases.

[See page three

14. A child holding two weights in his hands is sitting on a chair with folded hands on a platform rotating about its central axis. The rotational kinetic energy of the system is K. If the child stretches his arms so that the moment of inertia of the system doubles, what is the rotational kinetic energy of the system?

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

15. An electric generator in a construction site produces a sound intensity level of 50 dB at a certain point. Due to the operation of another equipment, the sound intensity at that point becomes 100 times of the original value. What is the new sound intensity level at that point?

(1) 50 dB (2) 60 dB (3) 70 dB (4) 80 dB (5) 150 dB

16. A compound microscope and an astronomical telescope are in normal adjustment positions. If the focal length of both objective lenses is increased, what will happen to the magnifying power of the microscope and the telescope, respectively?

(1) Increases, decreases
(2) Decreases, increases
(3) Remains the same, increases
(4) Increases, increases
(5) Decreases, decreases

17. An inflated helium air balloon has a volume of 500 m^3. What is the largest mass that can be raised upwards by the balloon? Neglect the mass of the material of the balloon. The densities of air and helium are 1·28 $kg\,m^{-3}$ and 0·18 $kg\,m^{-3}$, respectively.

(1) 400 kg (2) 550 kg (3) 600 kg (4) 700 kg (5) 750 kg

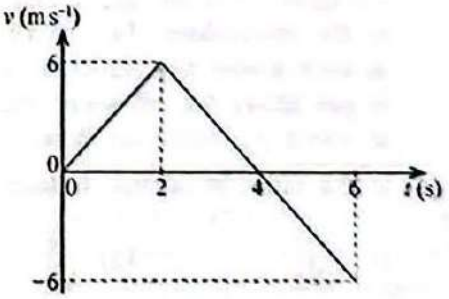
18. An ideal gas expands from a lower volume to a higher volume by different thermodynamic processes. Consider the following statements.

(A) The amount of work done by the gas is maximum when the expansion is isobaric.
(B) The heat absorbed by the gas is maximum when the expansion is adiabatic.
(C) The change in internal energy of the gas is maximum when the expansion is isothermal.

Of the above statements,

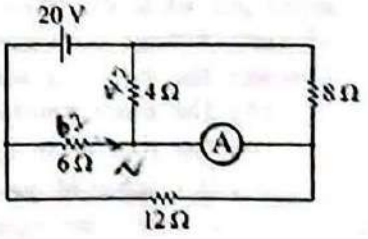
(1) only (A) is true.
(2) only (A) and (B) are true.
(3) only (A) and (C) are true.
(4) only (B) and (C) are true.
(5) all (A), (B) and (C) are true.

19. The velocity (v) - time (t) graph of a particle is shown in the figure. What is the net displacement of the particle?



(1) 18 m
(2) 12 m
(3) 6 m
(4) 3 m
(5) 0

20. What is the reading of the ammeter shown in the circuit?



(1) 0
(2) 1 A
(3) 2 A
(4) 3 A
(5) 4 A

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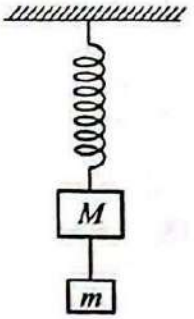
21. A mass M is suspended from a rigid support by a light vertical spring, as shown in the figure. A second mass m is attached to M by a light string ($M > m$). When the system is in equilibrium, the string is instantly cut.



Consider the following statements.

(A) Immediately after the string is cut, the tension in the spring becomes Mg.

(B) Immediately after the string is cut, the mass M accelerates upwards with a magnitude of less than g.

(C) Finally the mass M will begin to perform a simple harmonic motion about its new equilibrium position.

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.

22. A toy boat floats in a cylindrical water container. The boat carries two blocks A and B of equal mass. The densities of the materials of A and B are $600\,kg\,m^{-3}$ and $1200\,kg\,m^{-3}$, respectively. The height of the water level in the container is h.

Consider the following two cases.

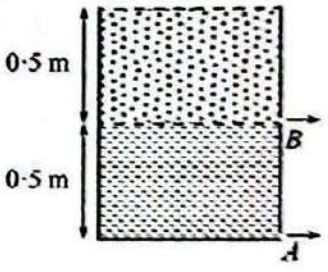
Case I : Block A is removed from the boat and when it is placed on the water surface, it floats, while B remains in the boat.

Case II: Block B is removed from the boat and when it is placed on the water surface, it sinks, while A remains in the boat.

Which of the following statements is true regarding the height of the water level in the container?

(1) It becomes higher than h in case I and lower than h in case II.
(2) It becomes higher than h in both cases I and II.
(3) It remains at h in case I and lower than h in case II.
(4) It remains at h in both cases I and II.
(5) It remains at h in case I and higher than h in case II.

23. A tank having a large cross-sectional area contains two immiscible liquids as shown in the figure. Water of density $1000\,kg\,m^{-3}$ fills the lower half of the tank to a height of 0·5 m, while an oil of density $500\,kg\,m^{-3}$ fills the upper half to a height of 0·5 m. The tank is open to the atmosphere. Two small outlets A and B are fitted to the tank in such a way that outlet A is at the bottom of the tank and outlet B is just above the oil–water interface. Water flows out through outlet A at speed v_A, while oil flows out through outlet B at speed v_B. What is the ratio $\frac{v_A}{v_B}$ at this instant? Assume that liquids are non-viscous.



(1) $\sqrt{\frac{7}{2}}$ (2) $\sqrt{\frac{5}{2}}$ (3) $\sqrt{\frac{3}{2}}$ (4) $\sqrt{\frac{2}{3}}$ (5) $\sqrt{\frac{1}{2}}$

24. Two sealed cylinders of equal volume are kept at the same temperature. One cylinder contains argon gas while the other contains neon gas. Relative atomic mass of argon is higher than that of neon. Assume both gases behave ideally.

Consider the following statements.

(A) The mean translational kinetic energy of the gas atoms in both cylinders is the same.

(B) The root mean square speed of argon atoms is greater than that of neon atoms.

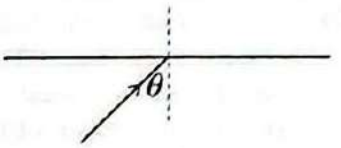
(C) If number of gas atoms in both cylinders are the same, the gas pressures inside the cylinders are equal.

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.

[See page five

25. A monochromatic ray of light is incident on the interface of two transparent media with an incident angle θ as shown in the figure. When θ is slightly increased the ray undergoes total internal reflection. What is the angle between the two outgoing rays in the above two situations?



(1) $90° - 2\theta$ (2) $90° - \theta$ (3) $180° - 2\theta$ (4) $180° - \theta$ (5) 2θ

26. Consider the following statements.

(A) A body can be accelerating while travelling at constant speed.

(B) A body can have acceleration even at an instant when its velocity is zero.

(C) A body can be accelerating in the direction opposite to its velocity.

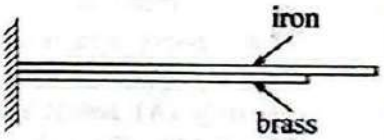
Of the above statements,

(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. Starting from rest a small spherical ball of radius r falls freely under gravity through a height h in air before entering a tank of water. Neglect air resistance. The ball enters water with a velocity v without any energy loss. After entering the water, if the velocity of the ball remains constant at v until it reaches the bottom of the tank, h is proportional to

(1) r (2) r^2 (3) r^3 (4) r^4 (5) r^5

28. The figure shows a bimetallic strip made of iron and brass. Left ends of the each strip are fixed together and the other ends are free. The difference between their lengths is 10 cm. If this difference is to remain constant with increase in temperature, what should be the length of the brass strip? Linear expansivities of iron and brass are $1{\cdot}2 \times 10^{-5}\,K^{-1}$ and $1{\cdot}8 \times 10^{-5}\,K^{-1}$, respectively.

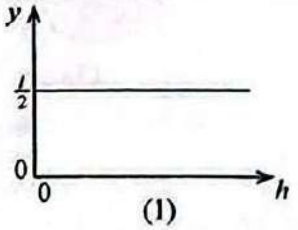


(1) 5 cm (2) 10 cm (3) 15 cm (4) 20 cm (5) 25 cm

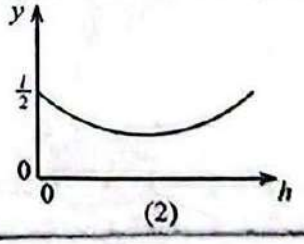
29. The output of an S – R flip-flop is at $Q = 1$. After setting inputs simultaneously to $S = 1$, $R = 1$ briefly, both inputs are set to 0. Which of the following conclusions is true about the output state of the flip-flop now?

(1) It certainly sets to $Q = 1$.
(2) It certainly sets to $Q = 0$.
(3) Its output state is unpredictable.
(4) Q certainly follows the sequence $Q = 1 \rightarrow Q = 0 \rightarrow Q = 0$.
(5) Q certainly follows the sequence $Q = 1 \rightarrow Q = 1 \rightarrow Q = 1$.

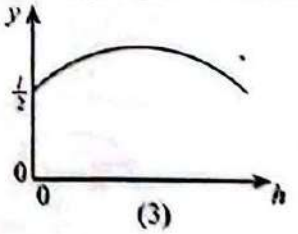
30. A uniform vertical cylindrical container of height l has a base only which is of negligible mass. Initially the cylinder is empty and water is poured into the cylinder gradually at a constant rate. Which of the following graphs best represents the variation of the height (y) of the centre of gravity of the system measured from the base of the cylinder with the height (h) of water?



(1)



(2)



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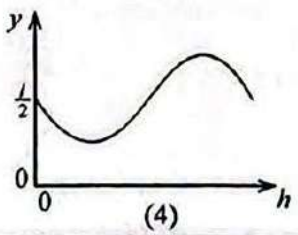
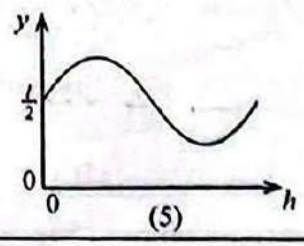


(4)



(5)

[See page six

31. A calorimeter of heat capacity $50\,J\,K^{-1}$ contains a liquid of mass 0·25 kg. A 10 W immersion heater is placed in the liquid. The immersion heater is switched on and after some time the temperature of the liquid reaches a steady value. The heater is now switched off and it is observed that the initial rate of fall of temperature of the liquid is $1{\cdot}0 \times 10^{-2}\,K\,s^{-1}$. What is the specific heat capacity of the liquid?

(1) $3000\,J\,kg^{-1}\,K^{-1}$ (2) $3500\,J\,kg^{-1}\,K^{-1}$ (3) $3800\,J\,kg^{-1}\,K^{-1}$
(4) $4000\,J\,kg^{-1}\,K^{-1}$ (5) $4500\,J\,kg^{-1}\,K^{-1}$

32. Figure (1) shows a child pulling himself up at a constant speed while standing on a movable platform hung on a frictionless pulley. Figure (2) shows the child on the platform pulled at a constant speed by another child standing on the ground. Assume that the ropes are massless and inextensible.

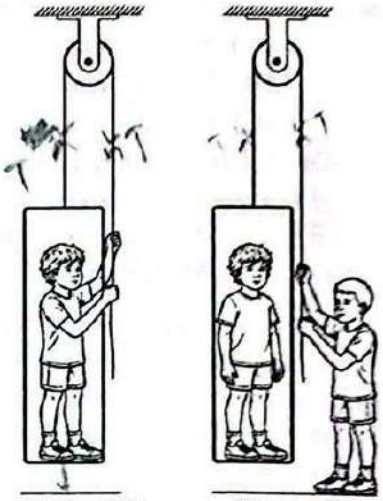


Figure (1) Figure (2)

Consider the following statements.

(A) The force applied by the child in figure (1) is half of the force applied by the child on the ground in figure (2).

(B) To move up by the same height, the work done by the child in figure (1) is less than the work done by the child on the ground in figure (2).

(C) The reaction forces from the platform acting on the child standing on the platform are equal in both situations.

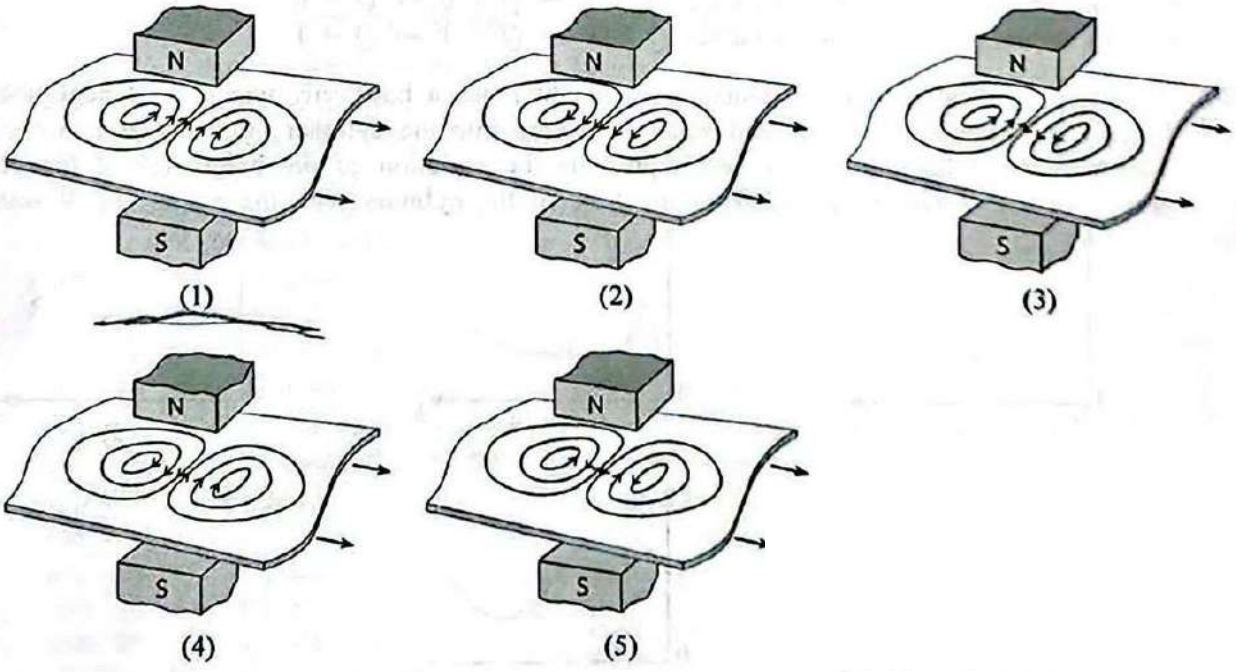
Of the above statements,

(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.

33. A star system consists of three collinear stars of equal mass M. The two companion stars move around the central star in a circular orbit of radius R. What is the linear speed of a companion star relative to the central star?

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

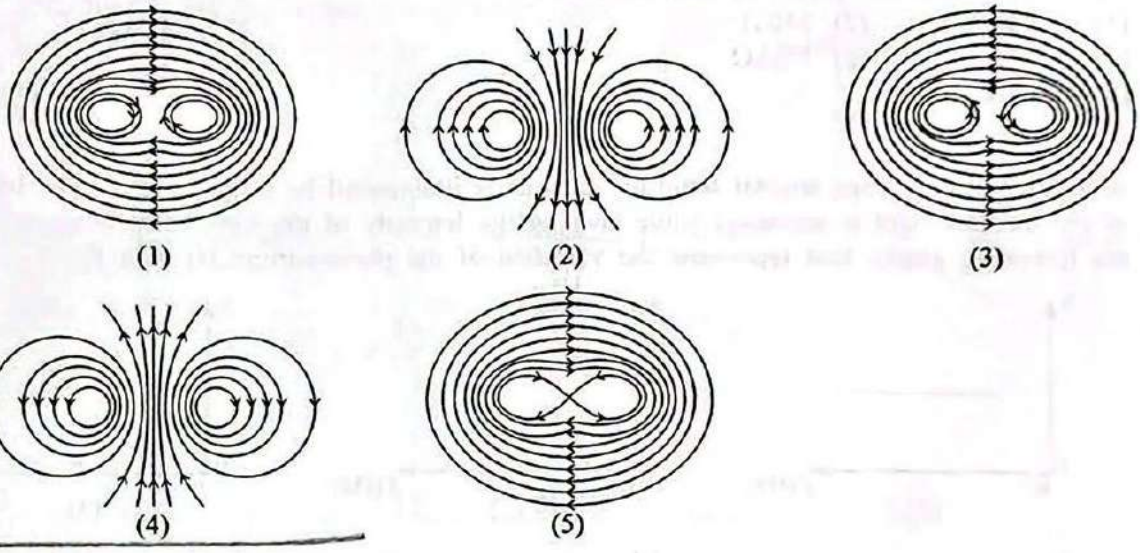
34. A thin conducting plate is pulled out horizontally across a uniform magnetic field acting vertically downwards as shown in the figure. Which of the following diagrams accurately represents the direction of the eddy currents induced in the plate?



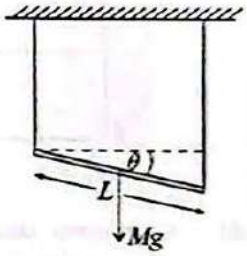
(1) (2) (3) (4) (5)

[See page seven

35. Two parallel wires of infinite length carry equal currents along same direction into the plane of the page. Which of the following diagrams best represents the pattern of the resulting magnetic field lines?



36. A heavy uniform rod of mass M and length L is suspended from a rigid ceiling by two vertical wires attached to each end of the rod. The un-stretched length and the cross-sectional area of the wires are l and A, respectively. One wire is made of copper and the other is made of brass. The Young's moduli of copper and brass are E_C and E_B, $(E_C > E_B)$ respectively. What is the angle θ, (in radians) shown in the figure that the rod makes with the horizontal? (Hint: For a small angle θ measured in radians $\sin\theta = \theta$)



(1) $\frac{Mgl}{4AL}\left(\frac{1}{E_B}-\frac{1}{E_C}\right)$ (2) $\frac{Mgl}{2AL}\left(\frac{1}{E_B}-\frac{1}{E_C}\right)$ (3) $\frac{Mgl}{AL}\left(\frac{1}{E_B}-\frac{1}{E_C}\right)$

(4) $\frac{MgL}{2Al}\left(\frac{1}{E_B}-\frac{1}{E_C}\right)$ (5) $\frac{MgL}{Al}\left(\frac{1}{E_B}-\frac{1}{E_C}\right)$

37. A circuit with an ideal diode in series with a resistance R is shown in figure (1). A supply voltage in the form of a square wave with amplitude V_0 is applied between the terminals A and B as shown in figure (2). What is the value of average power dissipated across the resistance R over one cycle?

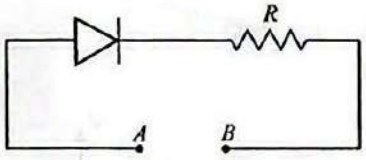


Figure (1)

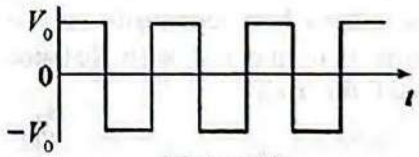
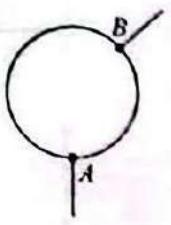


Figure (2)

(1) 0 (2) $\frac{V_0^2}{4R}$ (3) $\frac{V_0^2}{2R}$ (4) $\frac{V_0^2}{R}$ (5) $\frac{2V_0^2}{R}$

38. A uniform wire of diameter 1·0 mm is bent to form a circular loop, as shown in the figure. The radius of the circular loop is 10 cm. The resistivity of the material of the wire is $3{\cdot}0 \times 10^{-4}\,\Omega$m. Two conducting wires are connected at points A and B to the loop, such that the point B can slide around the loop. What is the maximum resistance that can exist between points A and B?



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

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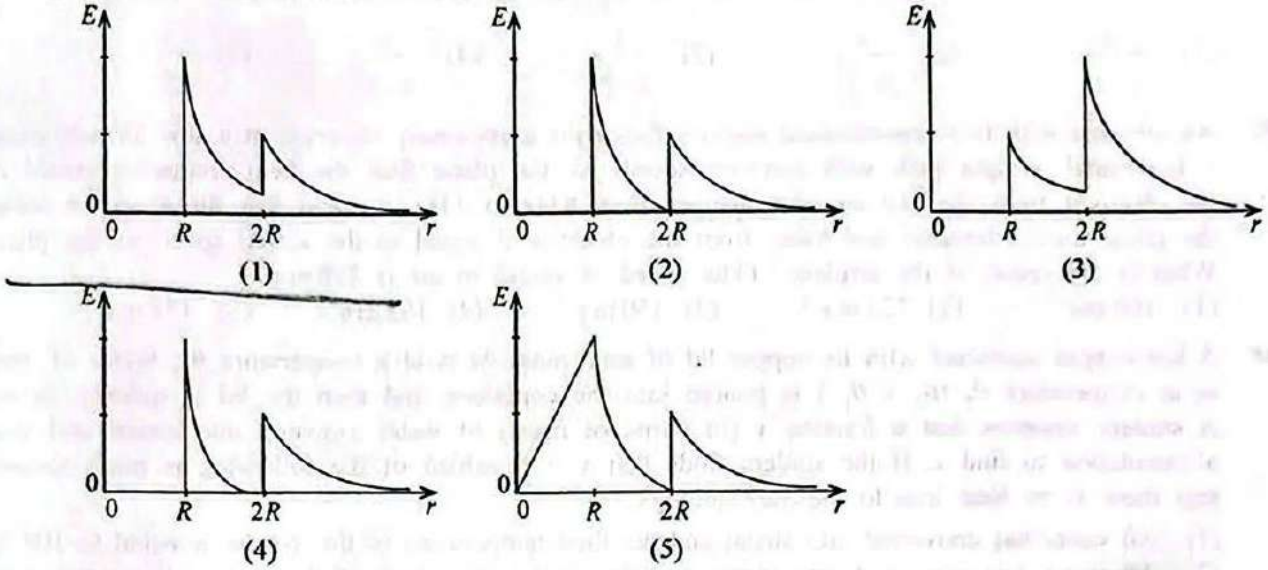
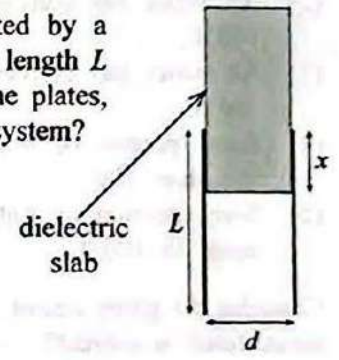
43. A solid conducting sphere with radius R carrying a charge $+Q$ is concentric with a very thin insulating shell of radius $2R$ carrying charge $+Q$. The charge is distributed uniformly over the insulating shell. Which of the following graphs best represents the variation of electric field intensity E with the radial distance r from the common center?



(1) (2) (3) (4) (5)

44. Two square conducting plates with sides of length L are separated by a distance d. A dielectric slab with dielectric constant k with sides of length L and thickness d is inserted a distance x into the space between the plates, as shown in the figure. What is the effective capacitance of the system?



(1) $\frac{\varepsilon_0 L}{d}\left[L+(k-1)x\right]$

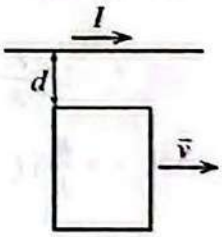
(2) $\frac{\varepsilon_0 L}{d}\left[L+kx\right]$

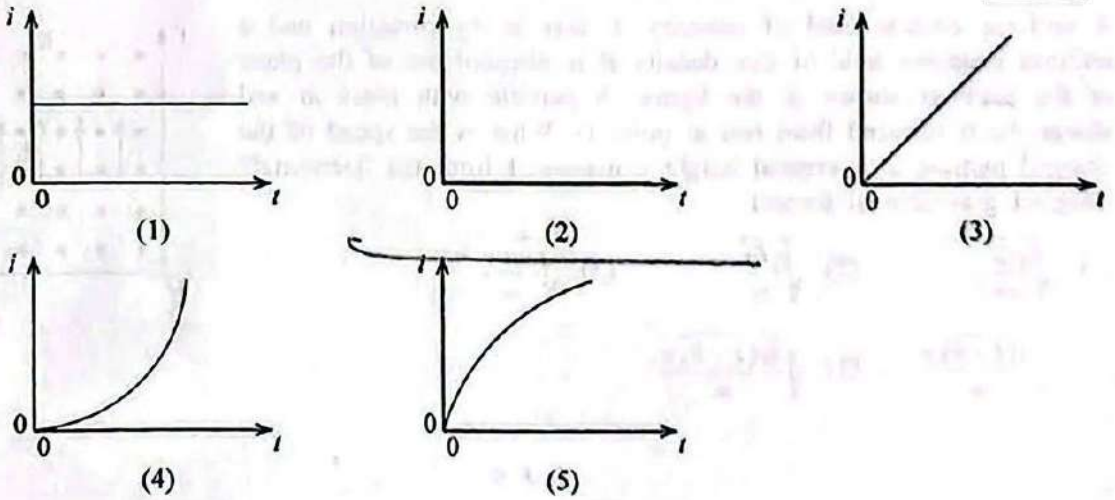
(3) $\frac{\varepsilon_0 k(L-x)x}{d}$

(4) $\frac{\varepsilon_0 kLx}{d}$

(5) $\frac{2\varepsilon_0 L}{d}\left[L+(k-1)x\right]$

45. An infinitely long straight wire carries a constant current I. A rectangular conducting loop starts moving at constant velocity v as shown in the figure at time $t = 0$, keeping separation d constant. The wire and the loop lie on the same plane. Which of the following graphs best represents the variation of the current (i) induced in the loop with time t?





(1) (2) (3) (4) (5)

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46. When the radius of a soap bubble is increased from r to $2r$ isothermally by blowing air, the surface energy of the bubble increases by E_1. When two identical soap bubbles each of radius r made from the same soap solution coalesce to form a single bubble, the surface energy decreases by E_2. What is the magnitude of the ratio of $\frac{E_1}{E_2}$?

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

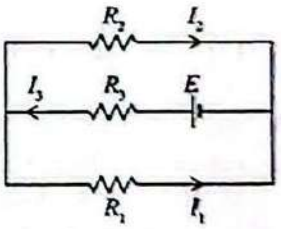
47. An airplane with two non-identical engines flies over a stationary observer at a low altitude along a horizontal straight path with constant speed. As the plane flies the beat frequency heard by the observer from the two engines changes from 8 Hz to 2 Hz. Assume that the speed at which the plane moves towards and away from the observer is equal to the actual speed of the plane. What is the speed of the airplane? (The speed of sound in air is $330\,m\,s^{-1}$)

(1) $100\,m\,s^{-1}$ (2) $125\,m\,s^{-1}$ (3) $150\,m\,s^{-1}$ (4) $195\,m\,s^{-1}$ (5) $198\,m\,s^{-1}$

48. A hot copper container with its copper lid of total mass M is at a temperature θ_1. Water of mass m at temperature θ_2 ($\theta_2 < \theta_1$) is poured into the container, and then the lid is quickly closed. A student assumes that a fraction x (in terms of mass) of water converts into steam and does a calculation to find x. If the student finds that $x > 1$, which of the following is true? Assume that there is no heat loss to the surroundings.

(1) All water has converted into steam and the final temperature of the system is equal to 100 °C.
(2) All water has converted into steam and the final temperature of the system is greater than 100 °C.
(3) All water has converted into steam and the final temperature of the system is less than 100 °C.
(4) Some portion of water has converted into steam and the final temperature of the system is less than 100 °C.
(5) Some portion of water has converted into steam and the final temperature of the system is equal to 100 °C.

49. Consider the given circuit. Here $R_2 > R_1 >> R_3$. Which of the following inequalities is correct?

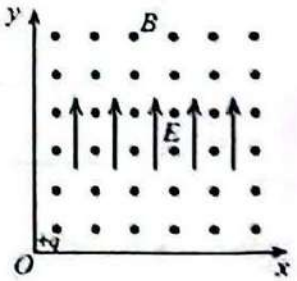


(1) $I_3 > 2I_1$ (2) $I_3 < 2I_2$

(3) $I_3 > 2I_2\frac{R_2}{R_1}$ (4) $I_3 > \frac{R_3(I_1+I_2)}{R_3+R_1}$

(5) $I_3 > \frac{R_2}{R_1}(I_1+I_2)$

50. A uniform electric field of intensity E acts in +y direction and a uniform magnetic field of flux density B is directed out of the plane of the page as shown in the figure. A particle with mass m and charge $+q$ is released from rest at point O. What is the speed of the charged particle at a vertical height y measured from the horizontal? (Neglect gravitational forces)



(1) $\sqrt{\frac{qEy}{2m}}$ (2) $\sqrt{\frac{qEy}{m}}$ (3) $\sqrt{\frac{2qEy}{m}}$

(4) $\sqrt{\frac{q(E+B)y}{m}}$ (5) $\sqrt{\frac{2q(E+B)y}{m}}$

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