# G.C.E. (Advanced Level) Examination - August 2007

## PHYSICS - I

## Two hours

**Important :**

- This question paper includes **60** questions in **7** 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 them 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 sith instructions given on the back of the answer sheet.

**Use of calculators is not allowed.**

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

01. SI unit of surface tension is
(1) N (2) $Nm^{-1}$ (3) Nm (4) $Nm^{-2}$ (5) $Nm^2$

02. Dimensions of a certain physical quantity when multiplied by $[L]^3$ yield the dimensions of work. The physical quantity would be
(1) force. (2) momentum (3) pressure
(4) mass (5) velocity

03. If the absolute temperature of a body is doubled, the rate at which the energy is radiated will
(1) remain the same (2) increase two times
(3) increase four times (4) increase eight times
(5) increase sixteen times

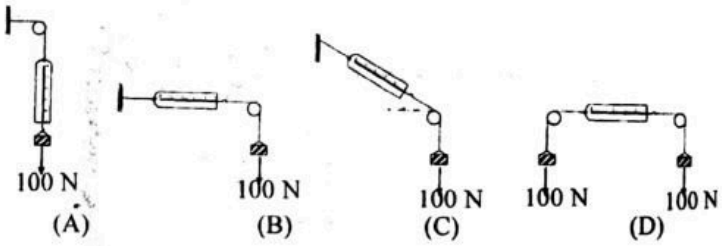
04. An e. m. f. is induced across the length of a wire when it is moving in a uniform magnetic field. This e.m.f. **does not** depend on
(1) velocity of the wire.
(2) radius four wire.
(3) length of the wire.
(4) flux density of the magnetic field
(5) the angle that the wire makes with the magnetic field.

05. Consider the following statements made regarding the photoelectric effect.
(A) This effect can be explained by assuming light as energy packets.
(B) For a given incident monochromatic light, the energy of emitted electrons **does not** depend on the material.
(C) Rate of emission of electrons depends on the intensity of the incident light.
Of the above statements,
(1) only (A) and (B) are true.
(2) only (B) and (C) are true.
(3) only (A) and (C) are true.
(4) all (A), (B) and (C) are true.
(5) all (A), (B) and (C) **are false.**

06. A sound emitted by a source of intensity I reaches a certain point. The change in the sound intensity level at the same point when the sound intensity is increased to 2I is (log 2 = 0.3)
(1) 0.3 dB (2) 3dB (3) 6dB (4) 9dB (5) 15dB

07. Consider the following statements made regarding a monochromatic light ray refracting through a glass prism placed in air.
(A) The speed of the light ray inside the prism is lower than that outside the prism.
(B) The frequency of the light ray inside the prism is lower than that outside the prism.
(C) The wavelength of the light ray inside the prism is lower than that outside the prism.
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.

08. Figures A, B, C and D show four ways in which a light spring balance can be loaded with a weight of 100N using frictionless pulleys.

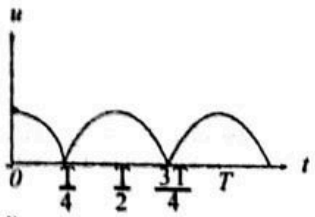


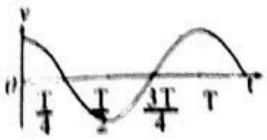

The scale readings of the spring balances in the four cases would be

| | A | B | C | D |
|---|---|---|---|---|
| (1) | 100 N | 100 N | 100 N | 100 N |
| (2) | 100 N | 0 N | 200 N | 100 N |
| (3) | 100 N | 100 N | 100 N | 200 N |
| (4) | 100 N | 0 N | 200 N | 200 N |
| (5) | 100 N | 100 N | 200 N | 200 N |

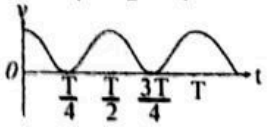
09. Consider the following statements made about the linear expansivity of a material.
(A) Its SI unit is $K^{-1}$
(B) Its value changes when the temperature is measured in Celsius instead of Kelvin.
(C) Its value changes when the temperature is measured in Fahrenheit instead of Kelvin.
Of the above statements,
(1) only (A) is true
(2) only (A) and (C) are true.
(3) only (A) and (B) are true
(4) only (B) and (C) are true
(5) all (A), (B) and (C) are true.

10. The variation of the speed $u$ with time $t$ of a simple harmonic oscillator is shown in the figure. The variation of its velocity $v$ with time $t$ is best represented by




(1)

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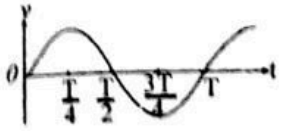


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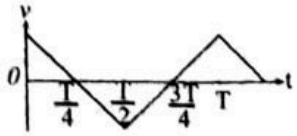


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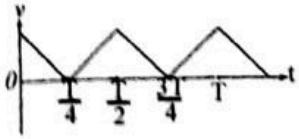
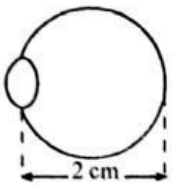



(5)

11. A normal eye ball has a diameter of 2 cm as shown in the figure. The magnitude of the minimum power of the eye lens is
(1) 0 (2) 10D (3) 25D
(4) 50D (5) 100D

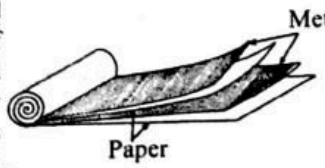



12. The size of the image of an object placed at a distance of 10cm from a convex lens is twice that of the object. If the image is erect, the focal length of the lens is
(1) 7 cm (2) 10cm (3) 20cm (4) 30cm (5) 40cm

13. The focal length of the lens of a simple microscope is 10cm. If the near point of an eye is 25cm, the **approximate value** of the object distance required to obtain the maximum angular magnification is
(1) 5cm (2) 6cm (3) 7cm (4) 8cm (5) 9cm

14. An object weighs 100N on the earth surface. When it is carried to a height equal to the radius of the earth, from the earth's surface, its weight becomes.
(1) 10N (2) 25N (3) 50N (4) 75N (5) 100N

15. A cylindrical capacitor is formed by inserting two sheets of paper of dielectric constant 4 and thickness $10^{-4}$ m, alternately between two rectangular sheets of metal foils, each of length 1 m and breadth $10^{-2}$m, and rolling them as shown in the figure.




($\varepsilon_0 = 9 \times 10^{-12}$ Fm$^{-1}$)

The capacitance of the capacitor is
(1) 3600 pF (2) 360 pF (3) 36 pF
(4) 18 pF (5) 3.6 pF

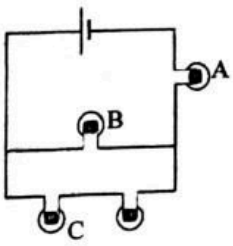
16. 


The figure shows a spherical conducting shell. A point charge +Q is placed at the centre of the shell and a charge -q is given to the shell.

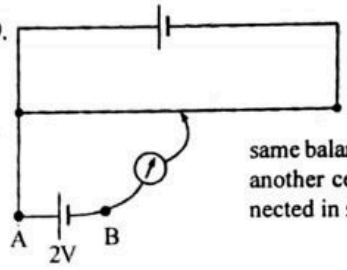
Finally the shell will have
(1) zero charge on the inner surface, -q on the outer surface.
(2) -Q charge on the inner surface, -q on the outer surface.
(3) -Q charge on the inner surface, -q + Q on the outer surface.
(4) +Q charge on the inner surface, -q - Q on the outer surface.
(5) $-Q-\frac{q}{2}$ on the inner surface, $+Q-\frac{q}{2}$ on the outer surface.

17. If a wire of resistance $R$ and length $l$ is used to form another wire of length $2l$ without changing its volume, the resistance of the new wire is
(1) 4R (2) 3R (3) 2R (4) R (5) $\frac{R}{2}$

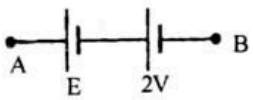
18. Four identical electric bulbs are connected to a bettery as shown in the figure. If all the bulbs are lit, and the intensities of the bulbs A, B and C are $I_A$, $I_B$ and $I_C$ respectively then



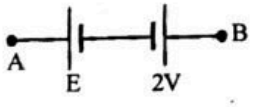

(1) $I_A > I_C > I_B$ (2) $I_A > I_B = IC$
(3) $I_B > I_C > I_A$ (4) $I_A > I_B > I_C$
(5) $I_A = I_B = I_C$

19. 


A potentiometer is balanced by connecting a cell of e.m.f. 2V across A and B, as shown in the figure. The same balanced length can be obtained of another cell E of suitable e.m.f. is con nected in series with the 2V cell as




(1)

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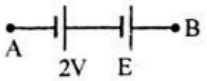


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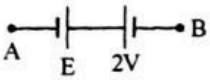


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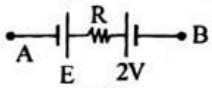
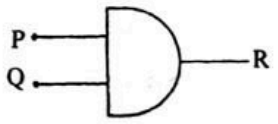



(5)

20. An archeologist extracted 100mg of carbon from an ancient wooden tool and found that it is $\frac{1}{4}$ as radioactive as 100 mg of carbon extracted from a live tree. Half-life of carbon -14 is 5730 years. How old is the wooden tool?
(1) 1432.5 years (2) 5730 years (3) 10162.5 years
(4) 11 460 years (5) 22 920 years

21. Consider the following statements made regarding the logic gate shown in the figure.
(A) When P = 1, R = Q
(B) When Q = 0, R = P
(C) When P = 0, R = 0

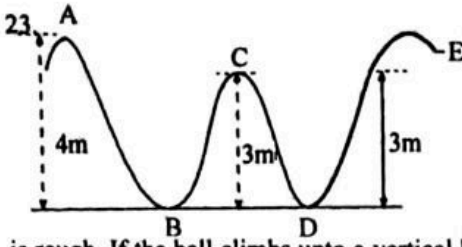



Of the above statements,
(1) only (C) is true (2) only (A) and (B) are true
(3) only (A) and (C) are true (4) only (B) and (C) are true.
(5) all (A), (B) and (C) are true.

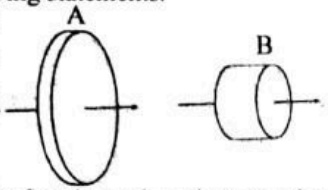
22. 


A ball B is projected horizontally with speed $u$ and a ball A is dropped vertically from rest at the same in stant as shown in the figure. Which of the following statements is true? (Neglect air resistance)

(1) A reaches the ground first with a higher speed than B.
(2) B reaches the ground first with a higher speed than A.
(3) A reaches the ground first with a lower speed than B.
(4) Both A and B reach the ground at the same instant with the same speed.
(5) Both A and B reach the ground at the same instant but B with higher speed than A.

23. 

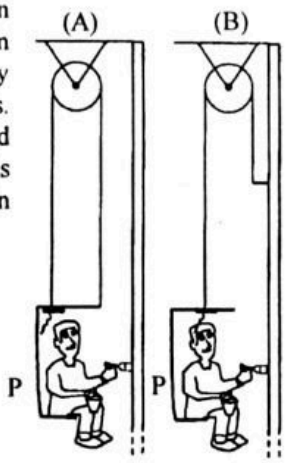
As shown in the figure a ball of mass 6kg released from rest at point A on a smooth track ABCD slips without rolling. The portion DE of the track is rough. If the ball climbs upto a vertical height of 3 m along the rough surface, the energy lost due to friction is
(1) 240J (2) 180J (3) 120J (4) 60J (5) 0

24. The two uniform disks A and B shown in the figure are made of the same material and have equal masses. The radius of the disk A is greater than that of B. The disks are kept in isolation at outer space. Consider the following statements.
(A) The disk A takes a longer time than B to gain a given speed under an external force acting through the centres of the disks.


(B) The disk B takes a longer time than A to gain a given angular speed under an external torque about the axis of the disks.
(C) The disk B has a higher rotational inertia about the axis of the disk than disk A.
Of the above statements,
(1) only (A) is true (2) only (A) and (B) are true
(3) only (B) and (C) are true (4) all (A), (B) and (C) are true
(5) all (A), (B) and (C) are **false.**

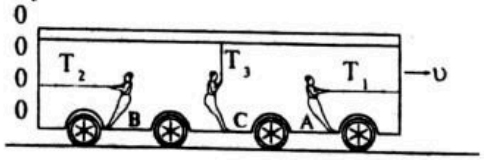
25. Figures A and B show two ways in which a painter could use a system consisting of a platform P, a pulley and a rope in painting tall buildings. The total weight of the painter and the platform is 400N. If the rope is light then the tensions of the rope in the two cases are.

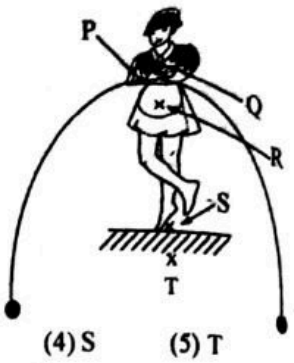
| | A | B |
|---|---|---|
| (1) | 400 N | 400 N |
| (2) | 400N | 200 N |
| (3) | 200 N | 400 N |
| (4) | 200 N | 200 N |
| (5) | 100 N | 200 N |




26. A trolley is moving with a constant velocity υ. Three men, A, B, and C, are pulling three strings in such a way that their tensions are $T_1$, $T_2$, and $T_3$ respectively, as shown in the figure. When the trolley moves a distance L, the work done by the men are

| | A | B | C |
|---|---|---|---|
| (1) | $T_1L$ | $T_2L$ | $T_3L$ |
| (2) | $-T_1L$ | $T_2L$ | 0 |
| (3) | $T_1L$ | $-T_2L$ | 0 |
| (4) | $T_1L$ | $T_2L$ | 0 |
| (5) | 0 | 0 | 0 |

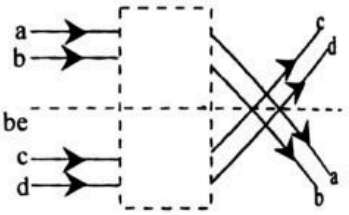



27. A toy in the form of a child-figure holding a section of a thin ring, which carries two identical heavy metal balls, is made from a thin metal sheet as shown in the figure. If the toy can be balanced in stable equilibrium from the toe of the child-figure, most probably the centre of gravity of the system can be found close to a point.


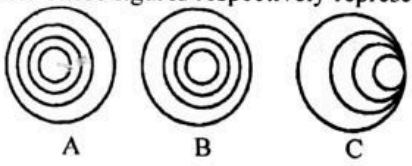
(1) P (2)Q (3) R (4) S (5) T

28. Starting from rest, a sphere takes a time t to roll down a rough inclined plane. If the plane is made frictionless, the time taken by the sphere to slip down will be
(1) t.
(2) higher than t.
(3) lower than t.
(4) determined by the mass of the sphere
(5) determined by the radius of the sphere.

29. An organ pipe filled with $O_2$ has a fundamental frequency $f_0$. If the pipe is filled with $H_2$ at the same temperature and pressure, the new fundamental frequency of the pipe is (relative molecular masses of $H_2$ and $O_2$ are 2 and 32 respectively),
(1) $\frac{1}{4}f_0$ (2) $\frac{1}{2}f_0$ (3) $f_0$ (4) $2f_0$ (5) $4f_0$

30. Rays from a monochromatic source of light are deviated by an optical element as shown is the figure.


This optical element is likely to be
(1) a convex lens
(2) a concave lens.
(3) a single prism.
(4) a combination of two prisms.
(5) a combination of a prism and a convex lens.

31. Figures A, B and C show wave fronts emitted from three sources of sound. These figures respectively represent sources


(1) moving to the right, moving to the left, and stationary.
(2) moving to the left, moving to the right, and stationary.
(3) stationary, stationary, and moving to the right.
(4) moving to the left, moving to the right, and moving to the left with the speed of sound.
(5) moving to the left, moving to the right, and moving to the right with the speed of sound.

32. A student vibrated a tuning fork and listened to its sound while keeping it in air. Then he vibrated this tuning fork again with the same amplitude and listened to the sound while holding its handle against a large wooden board.
(1) Sound intensity heard by him in both cases in the same.
(2) Sound intensity heard when the tuning fork is in air is larger than when it is held against the wooden board.
(3) The time during which the tuning fork goes on vibrating is the same in both cases.
(4) The time during which the tuning fork goes on vibrating is higher when it is kept on the board than in air.
(5) The time during which the tuning fork goes on vibrating is higher when it is kept in air than on the board.

33. A tuning fork is at resonance with a sonometer wire. Consider the following statements

(A) A Standing wave is set up in the wire.

(B) If the tension of the wire is increased its resonance length will decrease.

(C) The amplitude of vibrations would be maximum if it resonates in the fundamental mode of vibration.

Of the above statements,

(1) only (C) 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.

34. Which of the following statements is true for a mixture of ideal gases at a given temperature?

(1) All the gas molecules in the mixture have the same speed.

(2) Molecules of each component of the gas mixture have the same average kinetic energy.

(3) Lighter gas molecules have a lower average kinetic energy.

(4) Heavier gas molecules have a lower average kinetic energy.

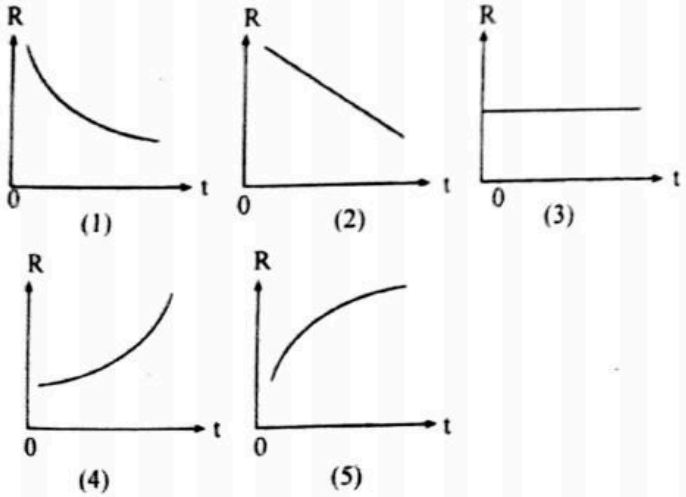
(5) Root mean square velocities of gas molecules of each component of the gas mixture are the same.

35. A volume $V_1$ of air at 100% relative humidity is mixed with volume $V_2$ of completely dry air at the same temperature and pressure so that the final volume becomes $V_1 + V_2$. The relative humidity of the mixture is

(1) $\left[\frac{V_1}{V_2}\right] \times 100\%$ (2) $\left[\frac{V_1 - V_2}{V_1 + V_2}\right] \times 100\%$ (3) $\left[\frac{V_1}{V_1 + V_2}\right] \times 100\%$

(4) $\left[\frac{V_2}{V_1}\right] \times 100\%$ (5) $\left[\frac{V_2}{V_1 + V_2}\right] \times 100\%$

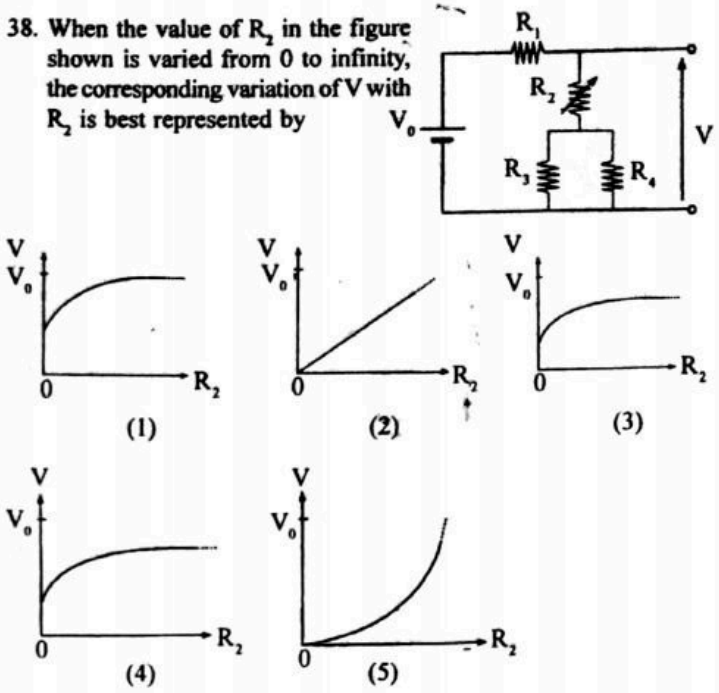
36. Consider a situation where a layer of ice is being formed on Arctic sea water due to a constant temperature difference between sea water and the atmosphere. The variation of the rate (R) at which the heat is extracted from a unit area of ice-atmosphere interface by the atmosphere with time (t) is best represented by



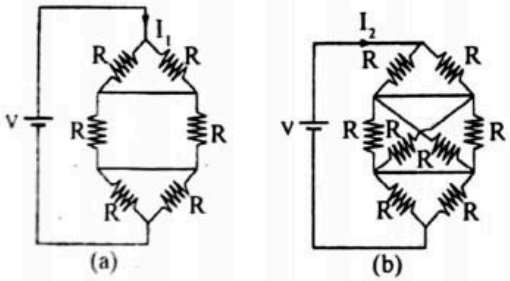

37. A Particle with charge q and mass m travels perpendicular to a uniform magnetic field along a circular path of radius *R* with frequency *f*. The magnitude of the magnetic flux density is given by

(1) $\frac{mf}{q}$ (2) $\frac{2\pi fm}{q}$ (3) $\frac{m}{2\pi fq}$ (4) $\frac{mf}{qR}$ (5) $\frac{af}{2\pi R}$

38. When the value of $R_2$ in the figure shown is varied from 0 to infinity, the corresponding variation of V with $R_2$ is best represented by

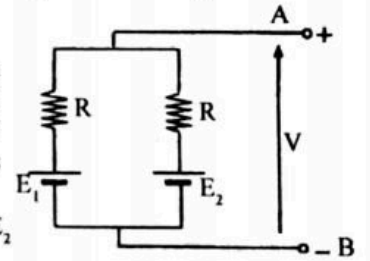



39. If the currents passing through networks shown in figures (a) and (b) are $I_1$ and $I_2$ respectively then the ratio $\frac{I_2}{I_1}$ is equal to (Neglect the internal resistance of the cell)



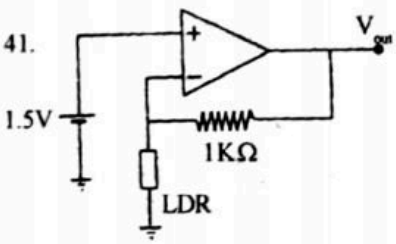

(1) $\frac{4}{5}$ (2) $\frac{5}{3}$ (3) $\frac{7}{4}$ (4) $\frac{6}{5}$ (5) 2

40. The cells $E_1$ and $E_2$ shown in the figure have zero internal resistance. The voltage V across the terminals *A* and *B* is




(1) $E_1 - E_2$ (2) $E_1 + E_2$

(3) $\frac{E_1 + E_2}{4}$ (4) $\frac{E_1 - E_2}{2}$ (5) $\frac{E_1 + E_2}{2}$

41. 


The figure shows an operational amplifier circuit with a light dependent resistor (LDR) and a 1 kΩ resistor.

The supply voltage to the operational amplifier is ±16.5V and its saturation voltage is ±15V. The resistance of the LDR is I MΩ at complete darkness and 100Ω at bright light.

The approximate values of the output voltage of the circuit $V_{out}$ at complete darkness and bright light will be respectively

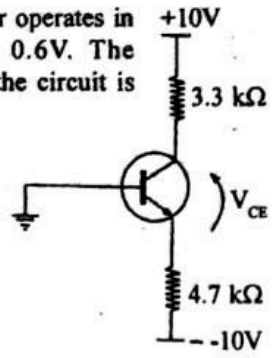
(1) 1.5 V and 15V (2) 1.5V and 16. 5 V

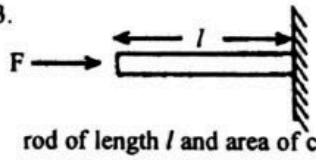
(3) -1.5mv and -15V (4) -1.5V and -16.5V

(5) 1.5mV and 15V

42. In the circuit shown, the transistor operates in the active mode with $V_{BE}$ = 0.6V. The collector-emitter voltage $V_{CE}$ in the circuit is approximately

(1) 0 (2) 2V (3) 4V
(4) 6V (5) 10V




43. 

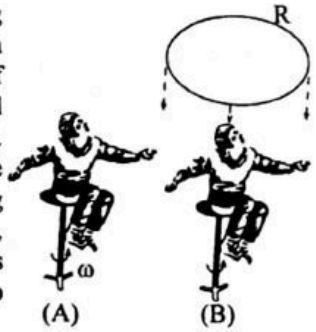

As shown in the figure, a device is made to measure the magnitude of a force by applying it to a uniform metal rod of length $l$ and area of cross-section A, and measuring the resultant compressing ($\Delta l$). $E$ is the Young's modulus of the material of the rod.

The smallest value of the compression that can be measured with a measuring instrument attached to the rod is $\Delta l_0$. If the smallest value of $F$ that can be measured with the device is $F_0$, then the legth $l$ of the rod should be such that

(1) $l \geq \frac{EA}{F_0}\Delta l_0$ (2) $l \geq \frac{F_0}{EA}\Delta l_0$ (3) $l \leq \frac{F_0}{EA\,\Delta l_0}$

(4) $l \geq \frac{F_0 A}{E\,\Delta l_0}$ (5) $l \leq \frac{EA}{F_0}\Delta l_0$

44. As shown in figure A, a child sitting on a rotating chair, rotates with an angular speed ω. The moment of inertia of the system with the child around the axis of rotation is 2kg m². As shown in figure *B*, while rotating, the child catches a thin ring *R* of mass 4kg and diameter 1m, which is falling vertically with its plane horizontal, and with no angular momentum. The final angular momentum of the whole system would be




(1) 0 (2) $\frac{2}{3}\omega$ (3) ω (4) $\sqrt{\frac{2}{3}}\omega$ (5) $\sqrt{\frac{1}{3}}\omega$

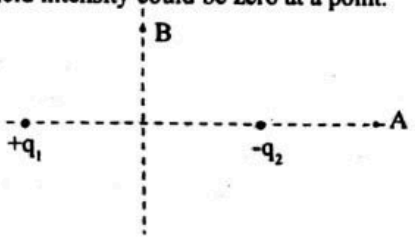
45. A boat made of metal floats in water with one fifth of its volume submerged. If a second boat is made with a volume five times bigger than the first using the same mass of the same metal that has been used to construct the first boat, then the ratio,

$$\frac{\text{the maximum load that can be carried by the second boat}}{\text{the maximum load that can be carried by the first boat}}$$ is equal to

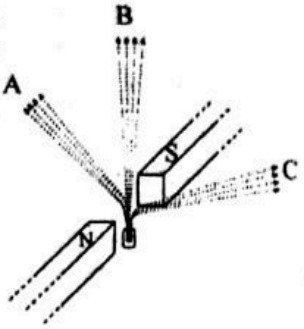
(1) 3 (2) 5 (3) 6 (4) 8 (5) 10

46. Two point charges $+q_1$ and $-q_2$ are placed as shown in the figure. Resultant electric field intensity could be zero at a point.

(1) A, if $q_1 = q_2$
(2) A, if $q_1 > q_2$
(3) A, if $q_1 < q_2$
(4) B, if $q_1 = q_2$
(5) B, if $q_1 > q_2$

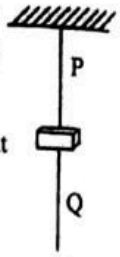



47. A radioactive source is placed at the bottom of a hole in a lead block. The beam of radiation emanating through the hole is allowed to pass through a magnetic field as shown in the figure. Three separated beams *A*, *B* and *C* could be, respectively




(1) α, $\beta^-$ and γ
(2) $\beta^-$, γ and α
(3) γ, α, and $\beta^-$
(4) α, γ and $\beta^-$
(5) γ, $\beta^-$ and α

48. A metal block is hung from a support by a string *P* as shown in the figure. An identical piece of string *Q* is attached underneath the block




Consider the following statements,

(A) If *Q* is taut the tension in *P* is greater than that of *Q*
(B) If *Q* is pulled with slowly increasing tension, then *P* has a tendency to break before *Q*.
(C) If *Q* is pulled with a jerk, then *Q* has a tendency to break before *P*.

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.

49. A decoration consists of four independently rotating sets of small lanterns *P*, *Q*, *R* and *S* which are fixed to a rotating central pole as shown in the figure (*A*). All the rotations take place around vertical axes. Which of the following modes of rotations provides the best stability to the entire decoration?

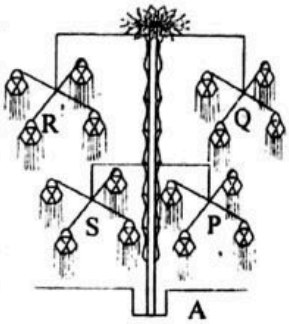
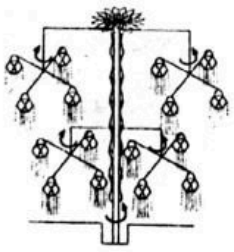
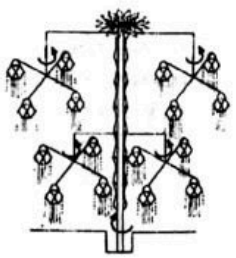


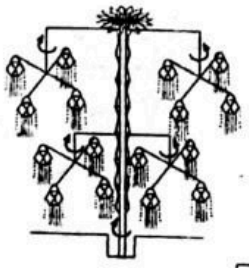

Figure (A)



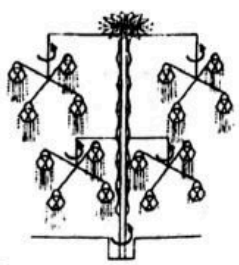
(1)



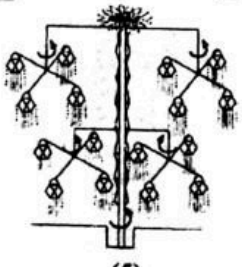
(2)



(3)

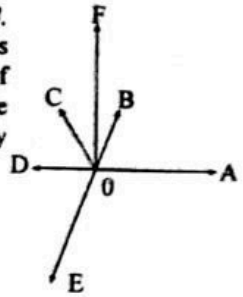


(4)



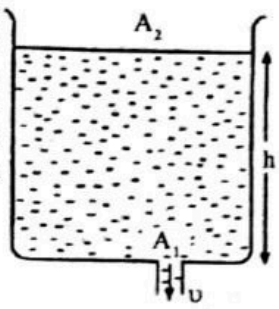
(5)

50. A system of coplanar forces *OA*, *OB*, *OC*, *OD*, *OE* and *OF* acts on an object as shown in the figure. Magnitude of $OA = 2\,CD$ and $OE = 2\,OB$. The resultant force on the object is most likely to be




(1) along the direction of *OC*.
(2) along the direction of *OE*.
(3) along the direction of *OF*.
(4) along the direction of *OA*
(5) zero

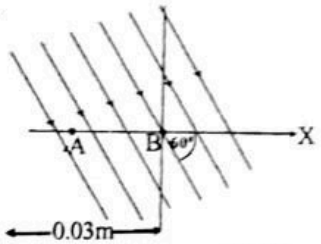
51. Water drains through an opening of area $A_1$ in a container of cross-sectional area $A_2$ as shown in the figure. If the motion of the water surface in the container is **not** ignored the speed u at which the water drains is given by




(1) $\upsilon = \sqrt{\dfrac{2gh}{1 - \dfrac{A_1^2}{A_2^2}}}$ (2) $\upsilon = \sqrt{2gh}$

(3) $\upsilon = \sqrt{\dfrac{gh}{\dfrac{A_1^2}{A_2^2} + 1}}$ (4) $\upsilon = \sqrt{\dfrac{2gh}{\dfrac{A_1^2}{A_2^2} - 1}}$ (5) $\upsilon = \sqrt{\dfrac{gh}{\dfrac{A_1^2}{A_2^2} - 1}}$

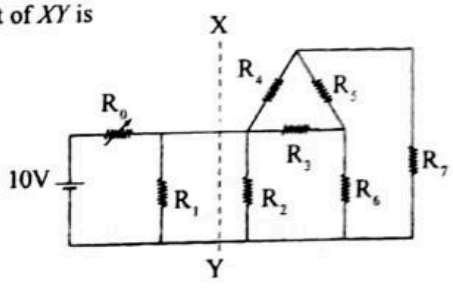
52. A uniform electric field of magnitude $400\,Vm^{-1}$ is acting in the direction as shown in the figure. If $V_A$ and $V_B$ are the electric potentials at points *A* and *B* respectively, then $V_B - V_A$ is equal to



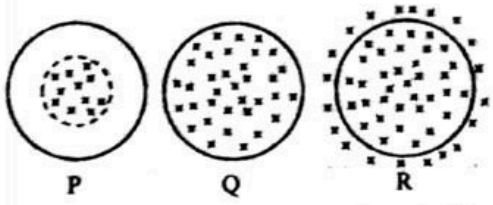

(1) -6V (2) -3V (3) 0 (4) 3V (5) 6V

53. The internal resistance of the battery shown in the circuit is zero. The value of $R_0$ is adjusted until the voltage across it becomes 5V. The equivalent resistance of the part of the network to the right of *XY* is

(1) $R_0$
(2) $R_0 + R_1$
(3) $\dfrac{R_0R_1}{R_1 - R_0}$
(4) $\dfrac{R_0R_1}{R_1 + R_0}$
(5) $R_1$

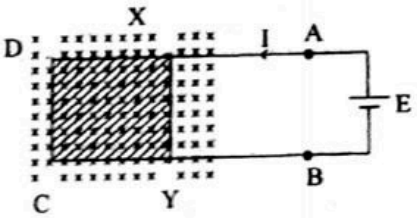



54. Three identical circular wire loops are placed perpendicularly to uniform magnetic fields of flux density *B*. The extent of the magnetic fields are different from one another in situations *P*, *Q* and *R* as shown in figures. The extent of the magnetic field in *Q* is equal to the area of the loop. When the flux density *B* varies with time at the same constant rate, the induced e. m. f. s of the respective wire loops are $E_P$, $E_Q$ and $E_R$. Which of the following is true regarding the magnitude of $E_P$, $E_Q$ and $E_R$?




(1) $E_P = 0,\ E_Q = E_R$ (2) $E_P = 0,\ E_R > E_Q$
(3) $E_P = E_Q = 0,\ E_R \neq 0$ (4) $E_P < E_Q,\ E_Q = E_R$
(5) $E_P < E_Q < E_R$

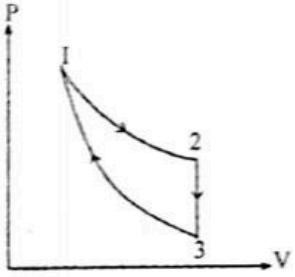
55. A rectangular wire frame made from a smooth resistive wire is connected to a battery of e.m.f. E with negligible internal resistance as shown in the figure. XY is a piece cut from the same wire, which can slide along the wire frame. *A* non conducting liquid film of surface tension *T* is formed in the region *CDXY*, and the entire structure is placed in a uniform magnetic field of flux density B acting in the direction shown.




If $XY = XD = CD = CY$, and the current through *AX* is I, then the wire *XY* will tend to move to the right when

(1) $B > \dfrac{8T}{3I}$ (2) $B > \dfrac{4T}{I}$ (3) $B < \dfrac{8T}{3I}$
(4) $B > \dfrac{4T}{3I}$ (5) $B < \dfrac{4T}{3I}$

56. P




An ideal gas is taken through a thermodynamic cycle as shown in the figure.
Process 1→2 is isothermal and during the process 60 J of heat enters the system. Process 2→3 takes place at constant volume and during this process 40J of heat leaves the system.

The change in internal energy (ΔU) of the system during process 3→1 is
(1) -40J (2) -20 J (3) 0 (4) + 20J (5) + 40 J

57. Thermometers must possess good sensitivity as well as good accuracy. In this connection which of the following is true regarding a mercury-in-glass thermometer?

| | To increase accuracy | To increase sensitivity |
|---|---|---|
| (1) | Reduce the radius of the capillary. | Increase the volume of mercury in the glass bulb. |
| (2) | Increase the volume of mercury in the glass bulb. | Reduce the radius of the capillary |
| (3) | Reduce the volume of the glass bulb. | Reduce the radius of the capillary |
| (4) | Increase the radius of the capillary. | Reduce the volume of the glass bulb. |
| (5) | Reduce the volume of the glass bulb. | Increase the volume of mercury in the glass bulb. |

58. Two bulbs, A (110V, 40W) and B (110V, 100W) are connected in series with an electric supply of 220V. Which of the following statements is **false**?
(1) The current through *A* is the same as the current through *B*.

(2) The potential drop across $A$ is greater than the potential drop across $B$.
(3) The current through $B$ is less than its rated current.
(4) The power dissipation of $A$ is greater than the power dissipation of B.
(5) There is a higher probability of burning the bulb B.

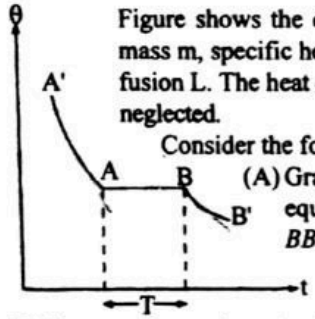
59. 


Figure shows the cooling curve of liquid wax of mass m, specific heat capacity $S_l$ and latent heat of fusion L. The heat capacity of the container can be neglected.

Consider the following statements.

(A) Gradient of the curve $AA'$ at $A$ is equal to the gradient of the curve $BB'$ at B.

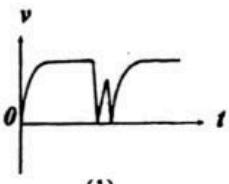
(B) The rate of heat released to the surrounding during the time $T$ is $\frac{mL}{T}$

(C) Gradient of the curve AA' at A = $\frac{I}{S_l} \cdot \frac{L}{T}$

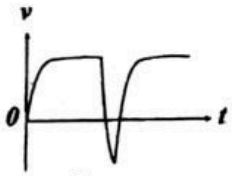
Of the above statements,
(1) only (A) is true. (2) only (A) and (B) are true.
(3) only (B) and (C) are true. (4) all (A), (B) and (C) are true.
(5) all (A), (B) and (C) are **false.**

60. A tiny sphere with a static charge $+q$ starts to fall through air under gravity at $t = 0$. After the sphere has reached terminal velocity, a vertically upward electric field $E$ of constant magnitude is applied. A short time after the sphere changes direction of its motion, the electric field is removed.

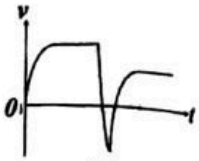
The variation of the velocity ($\upsilon$) of the sphere with time ($t$) is best represented by



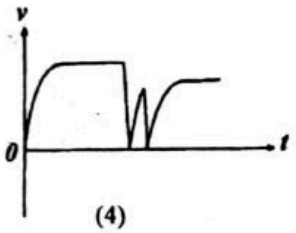
(1)



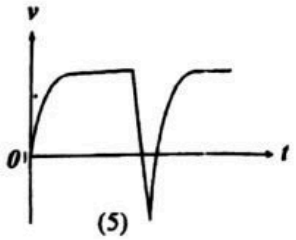
(2)



(3)



(4)



(5)