



Provincial Department of Education, Northern Province

Pilot Exam – October 2021

Physics - I



Grade 13 (2021 Batch)

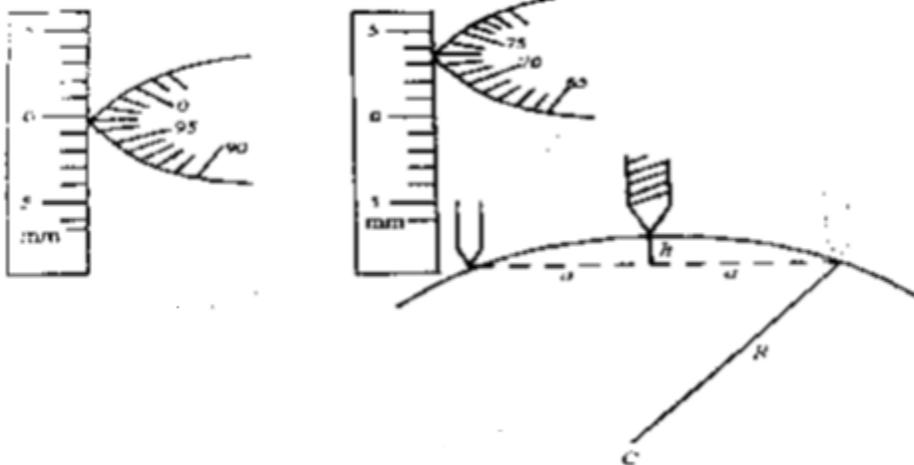
Time :- 2 Hours

Index No :-

- Use of calculators is not allowed
- Answer all questions
- In each of the questions 1 – 50 pick one of the alternatives from (1), (2), (3), (4) and (5) which is correct in each of the questions or most appropriate and mark your response on the answer sheet with a cross (X) on the number of the correct option.

(Consider that the acceleration due to gravity $g = 10 \text{ m s}^{-2}$)

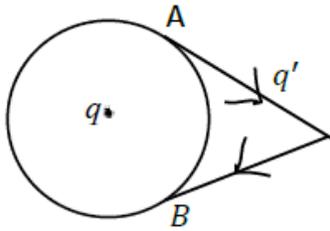
1. Displacement of particle in propagative waves through a medium is given by $Y = A \sin(kt)$.
If t denotes time and A denotes amplitude, unit of k is,
1). rad 2) rad^{-1} 3) rad s^{-1} 4) s^{-1} 5) rad s
2. Number of circular divisions of spherometer is 100 Fig (1) shows initial reading of spherometer when four legs of spherometer touch on the surface of glass block. Fig (2) shows final reading of spherometer when four legs of spherometer touch on the spherical surface of watch glass.



The value of h is

- 1) 3.76 mm
- 2) 3.70 mm
- 3) 4.70 mm
- 4) 2.76 mm
- 5) 3.72 mm

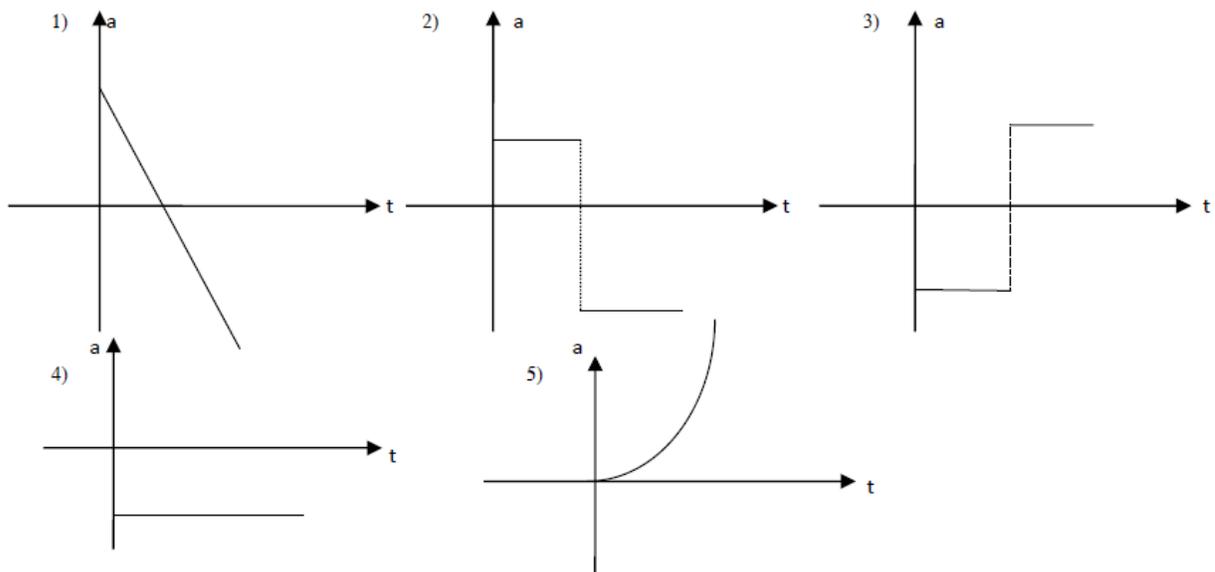
3. Two points A and B are on a circle of radius r around a point charge q is shown below.



- a) Total work done zero when a charge q' carried along the path.
 - b) Total work done zero when a charge carried along the circular path at any point.
 - c) An electric field intensity at points A and B are same.
- In the above statements is/are correct

- 1) Only a
- 2) Only a and c are
- 3) Only a and b are
- 4) Only b and c are
- 5) All a, b and c are

4. A particle is projected vertically up wards. The particle is return to the initial position. The graph of acceleration (a) with respect to time (t) is best represented by



5. If a constant force acts on a particle moves in a plane is perpendicular to its velocity , then
- Velocity is constant
 - Acceleration is constant
 - Kinetic energy is constant
- In the above which is/are true?
- Only a is true
 - Only b is true
 - Only c is true
 - Only a and b are true
 - Only b and c are true
6. Mach number of shock wave of a supersonic flight is 2.3. If speed of sound is 340 m s^{-1} in air, then speed of flight is,
- 680 m s^{-1}
 - 682 m s^{-1}
 - 780 m s^{-1}
 - 782 m s^{-1}
 - 880 m s^{-1}
7. Consider the following statements about the arrangements of spectrometer
- Initially telescope should be arranged from collimator, telescope and prism table
 - Prism should be placed at the center of prism table when arranged on prism table
 - Slit should be illuminated by monochromatic light when arranged on collimator.
- Which of the above statements is/are correct
- Only a
 - Only b
 - Only a and c
 - Only b and c
 - Only a and b
8. Consider the following statements about simple microscope
- Final image is formed at infinity when normal adjustment is done.
 - An angular magnification is high when final image is formed at the least distance of distinct vision from the eye.
 - An angular magnification is D/f when final image is formed at infinity.
- In the above statements.
- All a, b and c are true
 - Only a and b are true
 - Only b and c are true
 - Only a and c are true
 - Only b is true

9. When applying the 1st law of thermodynamic ($dQ = dU + dW$) for system of an ideal gas

- a) If the system is Isolated then $dQ = 0$
- b) If the temperature remain constant then $dU = 0$
- c) If pressure remain same then $dW = 0$

In the above statements which is/ are true?

- 1) Only a
- 2) Only b
- 3) Only a and b
- 4) Only b and c
- 5) Only a and c

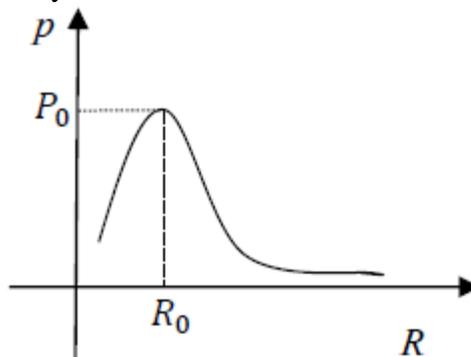
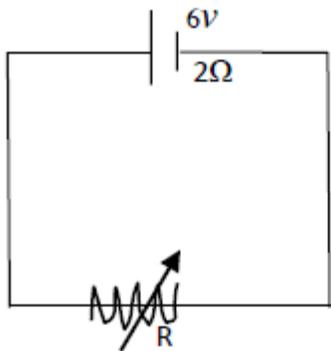
10. A copper disc of radius 0.1 m rotates with 10 revolution / s which is perpendicular to a magnetic field of magnetic flux density 0.1 T . Average induced electromotive force between center and rim of disc is

- 1) 3.1 V 2) 1.0 V 3) 0.8 V 4) 6.2 V 5) 0.031 V

11. A current 10 mA is passing through a long straight conductor. Magnetic flux density at a point that is in a distance 10 cm from the conductor due to a small element of length 1 mm of current carrying conductor is, ($\mu_0 = 4\pi \times 10^{-7}\text{ T mA}^{-1}$)

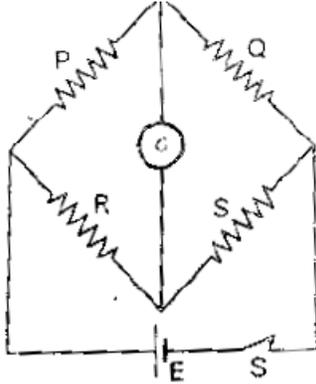
- 1) $1 \times 10^{-9}\text{ T}$ 2) $1 \times 10^{-7}\text{ T}$ 3) $1 \times 10^{-8}\text{ T}$ 4) $2.5 \times 10^{-7}\text{ T}$ 5) $2.5 \times 10^{-8}\text{ T}$

12. The figure shows variation of power dissipation (P) with resistance (R) of an electrical circuit. Values of R_0 and P_0 respectively



- 1) $2\ \Omega, 9\text{ W}$
- 2) $2\ \Omega, 4.5\text{ W}$
- 3) $4\ \Omega, 4.5\text{ W}$
- 4) $12\ \Omega, 8\text{ W}$
- 5) $2\ \Omega, 2\text{ W}$

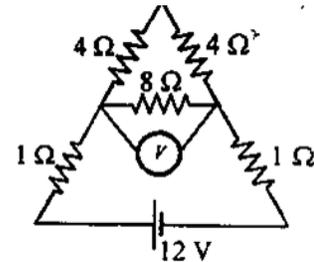
13. Reading of the galvanometer is zero in the given circuit. Consider the following statement about that



- a) When an electric cell of $2E$ is substituted instead of cell A, deflection of galvanometer remain same.
 b) Product of P and S is equal to Product of Q and R
 c) When the cell and galvanometer will interchange deflection of galvanometer changes.
- 1) Only b 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

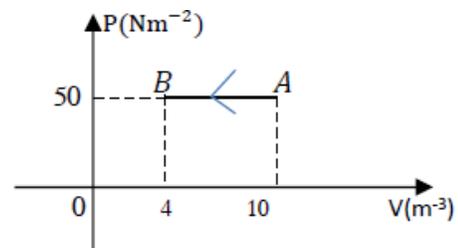
14. Reading of voltmeter if internal resistance of galvanometer is negligible and voltmeter is an ideal in the circuit.

- 1) 8 V
- 2) 12 V
- 3) 6 V
- 4) 5 V
- 5) 0 V



15. The figure shows P-V diagram of an ideal gas. When going through path A-B, if 200 J of heat supplied to the system then internal energy of the gas ,

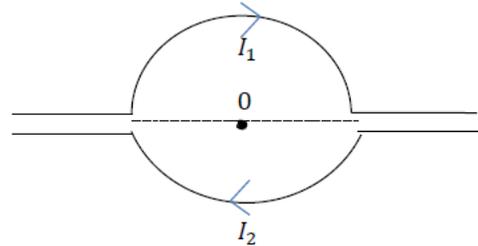
- 1). Increase by 500 J
- 2). decrease by 500 J
- 3). Increase by 250 J.
- 4). decrease by 250 J
- 5). Increase by 200 J



16. Two semicircular rings of radius R are placed perpendicular to each other as shown in the figure.

Current I_1 and I_2 passes as shown. Magnetic flux density at point O is

- 1) $\frac{\mu_0}{4R} \sqrt{(I_1^2 + I_2^2)}$
- 2) $\frac{\mu_0}{4R} (I_1^2 + I_2^2)$
- 3) $\frac{\mu_0}{4R} \sqrt{(I_1^2 - I_2^2)}$
- 4) $\frac{\mu_0}{4R} (I_1 - I_2)$
- 5) $\frac{\mu_0}{4R} (I_1^2 - I_2^2)$



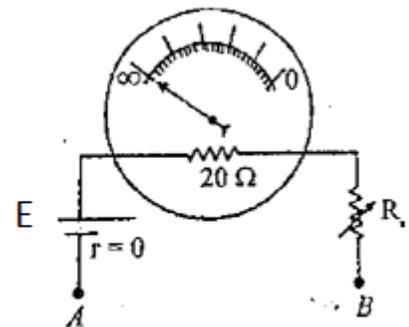
17. In the following statements

- a) When load of sonometer is immersed in water, frequency of fundamental tone decreases
- b) When two tuning fork of frequencies 256 Hz and 324 Hz are sounded together, a sound can heard with a beat frequency of 68 Hz .
- c) Sound waves can be polarized.

- 1) Only a is true
- 2) Only b is true
- 3) Only C is true
- 4) Only b and c are true
- 5) All a, b and c are true

18. Internal resistance of the milliammeter is 20Ω . and full scale deflection is 10 mA as shown in the figure. It is used to measure resistance. E.M.F of cell $E=3\text{V}$. When A and B are connected, it shows full scale deflection. When E.M.F of cell decrease to 2.8 V by discharge, to show full scale deflection the value of R_0 should be

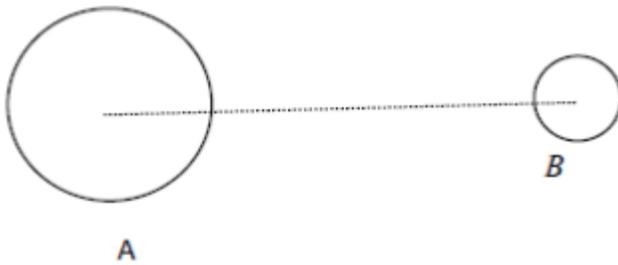
- 1) Increased by 60Ω
- 2) Decreased by 60Ω .
- 3) Increase by 20Ω .
- 4) Decreased by 20Ω
- 5) Increased by 100Ω



19. Consider the following statements about P waves,

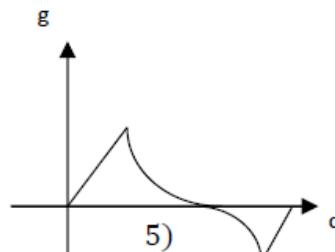
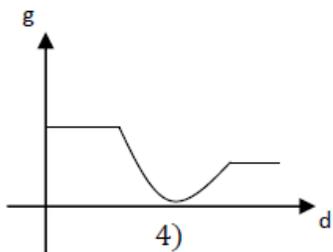
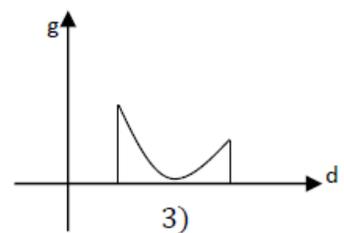
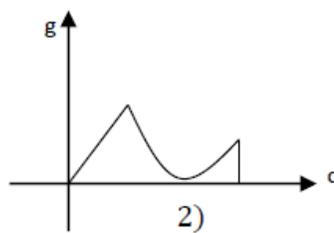
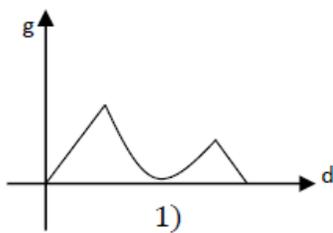
- a) This is the fastest kind of seismic wave, and, consequently, the first to 'arrive' at a seismic station.
 - b) The P wave can move through solid rock and fluids, like water or the liquid layers of the earth.
 - c) Subjected to a P wave, particles move in the same direction that the wave is moving in, which is the direction that the energy is travelling in, P waves are a kind of longitudinal wave.
- 1) Only a and b are true
 - 2) Only a and c are true
 - 3) Only b and c are true
 - 4) All a, b and c are true
 - 5) All a, b and c are true

20. The figure shows two planets with different mass and radius. The variation of gravitational field strength from A to B is best represented by (Where A and B are center of planets)



Mass $80M$
Radius $2R$

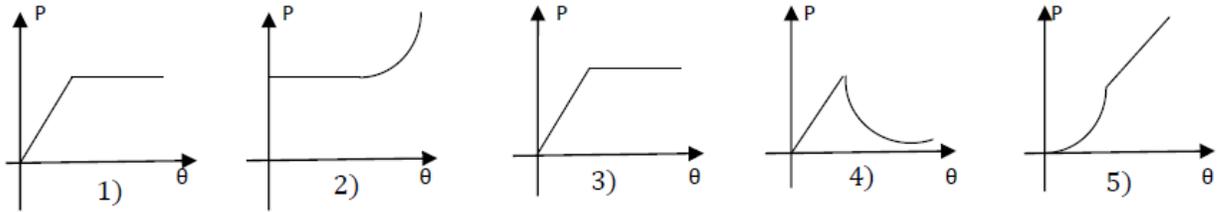
Mass M
Radius R



21. Pressure of oxygen gas in a cylinder is 10 k Pa. Root mean square speed of an oxygen molecules if density of gas is 3 kg m^{-3}

- 1) 100 m s^{-1} 2) 200 m s^{-1} 3) 300 m s^{-1} 4) 400 m s^{-1} 5) 500 m s^{-1}

22. An air in a closed vessel is filled by saturated water vapor at 20°C . There is no any water in liquid state. First cooled down to 0°C then heated up to 50°C . The variation of pressure (P) inside the vessel with respective temperature (θ) is best represented by



23. Under air flow time taken by a calorimeter with water to cool from 72°C to 68°C in a room is 3 minute. The room temperature is 30°C remain constant. Time taken by the same calorimeter to cool from 61°C to 59°C is

- 1) $\frac{3}{4} \times 2 \times \frac{40}{30} \text{ min}$ 2) $\frac{4}{3} \times \frac{1}{2} \times \frac{30}{40} \text{ min}$ 3) $\frac{3}{4} \times 2 \times \frac{30}{40} \text{ min}$ 4) $\frac{4}{3} \times 2 \times \frac{40}{30} \text{ min}$ 5) $\frac{4}{3} \times 2 \times \frac{30}{40} \text{ min}$

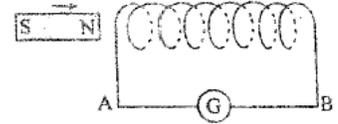
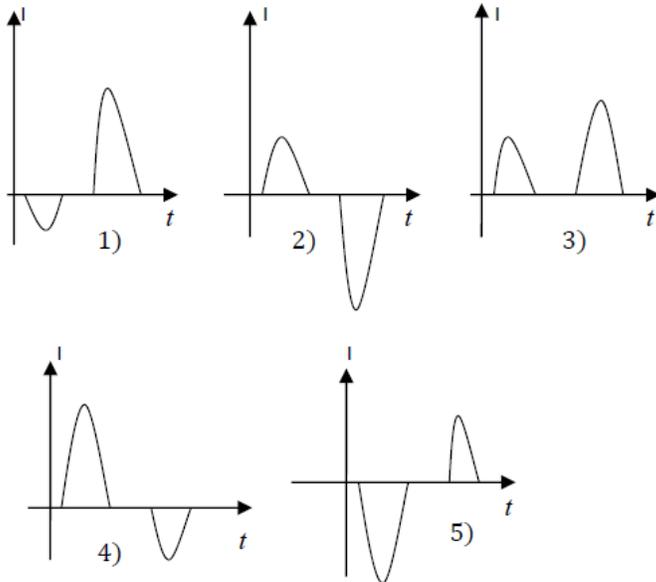
24. Consider the following statements about to increase the sensitivity of a moving coil galvanometer.

- Must increase number of coils
- Must increase magnetic flux density
- Must increase the area of coil
- Must use a spiral spring with high torsional constant.

In the above statements which is/ are true?

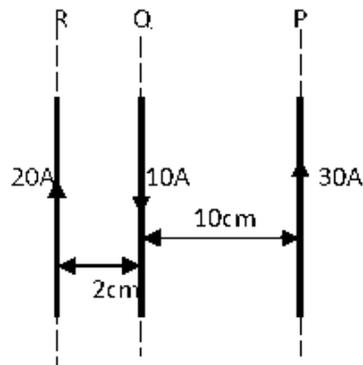
- Only a and b are true
- Only a and c are true
- Only b and c are true
- All a , b and c are true
- All a , b and c are false

25. A bar magnet moves with constant acceleration through a coil towards right hand direction is shown in the figure. The variation of induced current I (current through the galvanometer) with time t is best represented by (Let direction of current from A to B is +)



26. P, Q and R are long straight parallel conductors in a same plane as shown in the figure. Force acts on conductor Q of length 10 cm is ($\mu_0=4\pi\times 10^{-7} T mA^{-1}$)

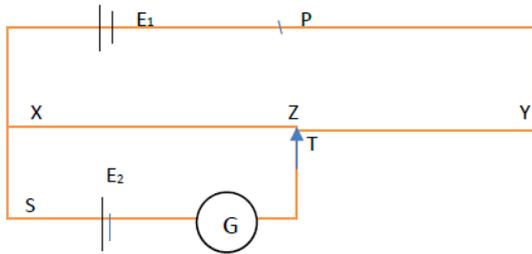
- 1) $1.4 \times 10^{-3} N$ \longrightarrow
- 2) $1.4 \times 10^{-3} N$ \longleftarrow
- 3) $1.4 \times 10^{-4} N$ \longleftarrow
- 4) $1.4 \times 10^{-4} N$ \longrightarrow
- 5) $3 \times 10^{-3} N$ \longleftarrow



27. Consider the following statements about dew point ,
- a) Water vapor is saturated when a surrounding becomes dew point.
 - b) Dew point is less than room temperature always
 - c) Relative humidity is 100 % at dew point only.
- In the above statements
- 1) Only a is true
 - 2) Only b 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

28. When an illuminated square hole is placed a distance 40 cm from convex lens, if an image with nine times of the object is formed on a screen then focal length of lens is
 1) 75 cm 2) 60 cm 3) 50 cm 4) 40 cm 5) 30 cm
29. Relative humidity of water vapor is 30% and absolute humidity is 20 g m^{-3} of a closed vessel of volume 1000 cm^3 at constant temperature. If 0.01g of water vapor is add into the vessel at the same temperature then relative humidity of water vapor in the vessel is,
 1) 32.5 % 2) 35 % 3) 37.5 % 4) 45 % 5) 38.5%
30. Sound intensity level at a point is 30 dB when a source of sound A sounded and sound intensity level at the point is 40dB when a source of sound B sounded. When the sources A and B are sounded together, sound intensity level at that point is,
 ($\log 103= 0.47$, $\log 104= 0.602$, $\log 1011=1.04$)
 1) 47 dB 2) 60.2 dB 3) 10.4 dB 4) 40.4 dB 5) 70 dB
31. A charged parallel plate capacitor is charged and then it is disconnected from the battery. Then separation between the plates of capacitor is increase by insulating handle. In this manner
 1) Charge stored in capacitor will increase.
 2) Charge stored in capacitor will decrease.
 3) Potential difference between the plates of capacitor will increase
 4) Capacitance of capacitor will increase.
 5) Electric potential energy stored in capacitor will increase.
32. Resistance of armature of a motor is 20Ω . When it is connected with a source of 240 V, the current through the motor is 0.5A. In this situation back electro motive force of the motor is
 1) 100 V 2) 150 V 3) 200 V 4) 230 V 5) 0
33. A certain person can see objects clearly only when they were in between 0.5m and 2m from his eyes. To see distant objects clearly, which of the following lenses are most suitable for him?
 1) Convex lenses of focal length 50 cm
 2) Concave lenses of focal length 50 cm
 3) Convex lenses of focal length 2 m
 4) Concave lenses of focal length 2 m
 5) Concave lenses of focal length 66.6 cm

34.



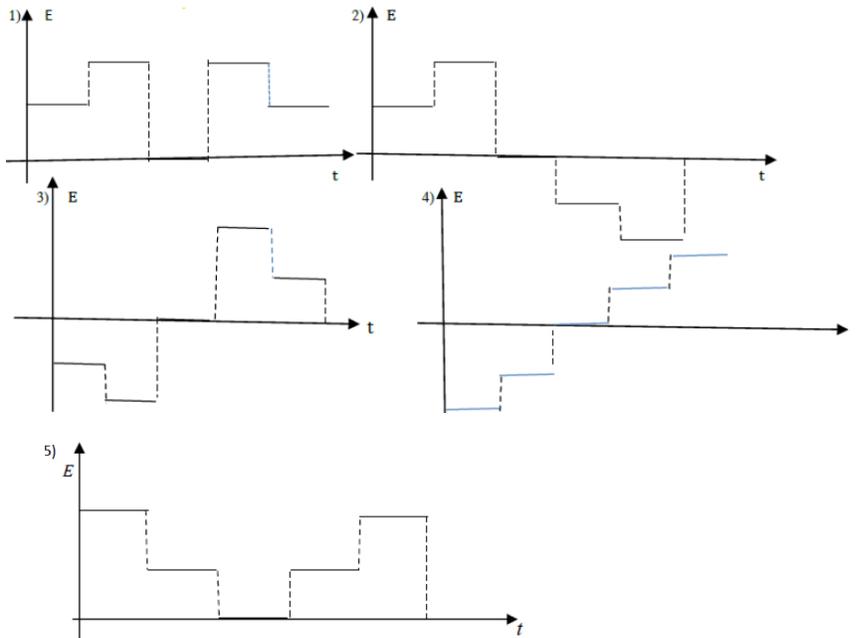
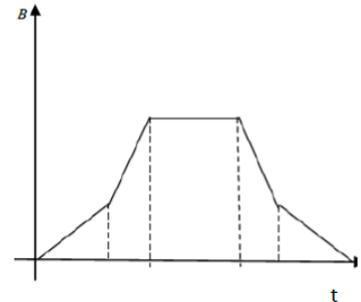
XY is potentiometer wire as shown in the above circuit. The equilibrium point gets at point Z.

- When a resistance is connecting at S, equilibrium point will move towards Y.
- When a resistance is inserted at P, equilibrium point will move towards Y.
- When E_1 and E_2 are interchanged equilibrium point will not change.

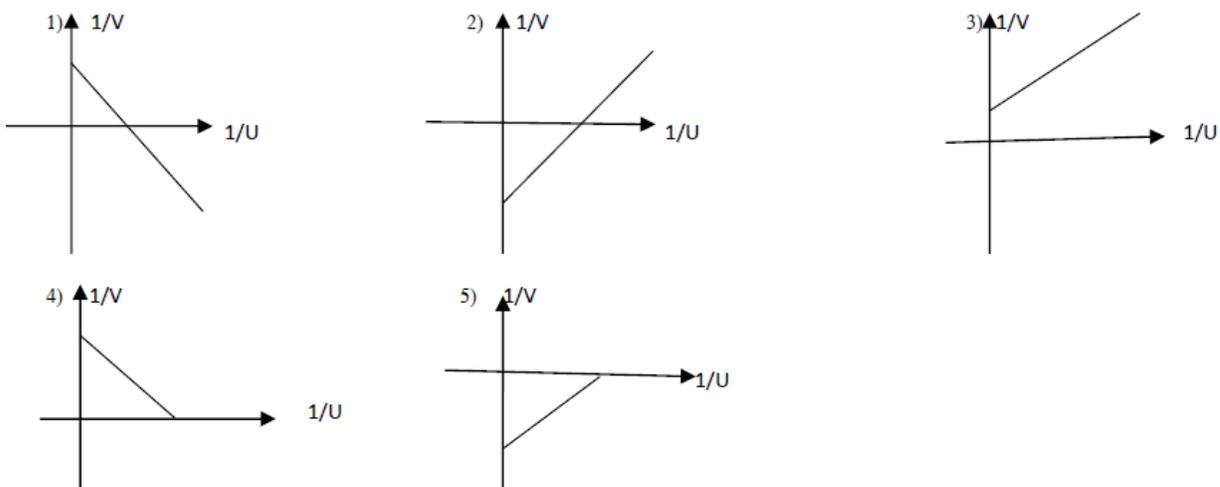
In the above,

- Only a is true
- Only b is true
- Only c is true
- Only a and b are true
- Only b and c are true

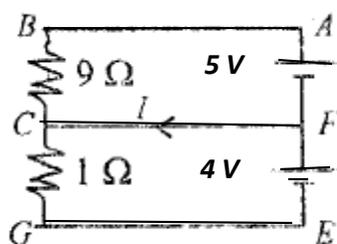
35. The figure shows the variation of magnetic flux density (B) through a conducting loop with time (t). The variation of induced electro motive force (E) across the loop with time (t) is best represented by



36. The graph of $1/v$ versus $1/u$ (u is object distance and v is image distance) is plotted with Cartesian sign convention, for real image formed by convex lens is best represented by



37. Internal resistance of each cells are 1Ω as shown in the circuit. Current (I) through FC is,



- 1) 3 A 2) 0.5 A 3) 2 A 4) 1.5 A 5) 0

38. Which of the following is not a property of an oil which is used in transformers

- 1) Having lower specific heat capacity.
- 2) Having lower viscosity .
- 3) Having high boiling point
- 4) Be a good electrical insulator
- 5) It is not easy to vaporize it.

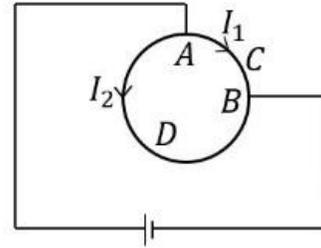
39. Consider the following statements about tsunami waves.

- a) This waves may form when plates are move under sea.
- b) Its speed is high in deep sea, because its speed depends on the depth of water.
- c) Speed of the waves is grater, when the waves reache ground than the deep sea.

In the above statements which is/ are correct?

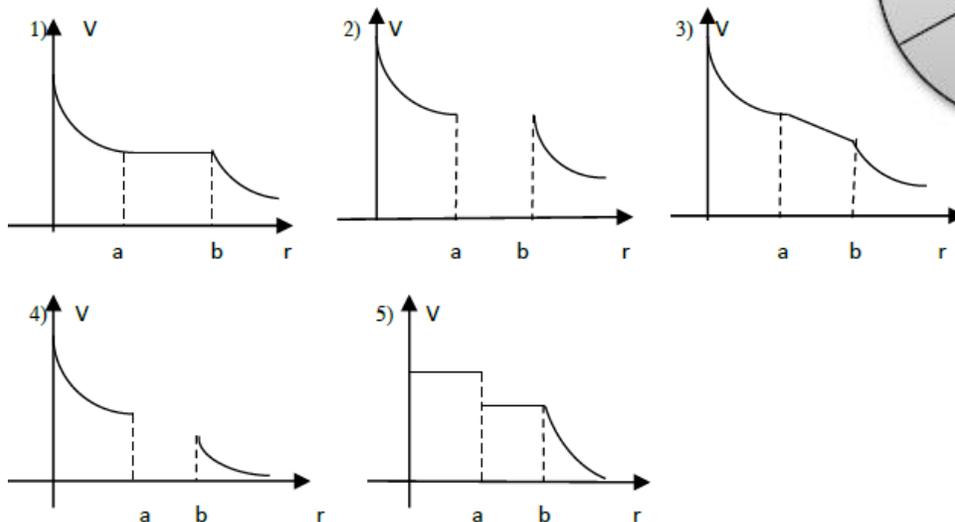
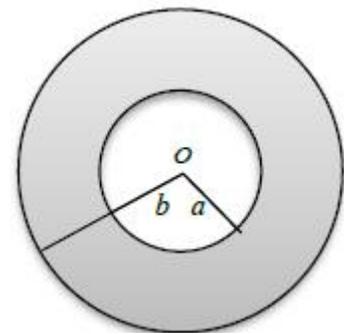
- 1) Only a and b
- 2) Only b and c
- 3) Only b
- 4) Only a and c
- 5) All a, b and c

40. A uniform circular ring of radius r as shown in the figure. A battery is connected between points A and B. ($ACB = \pi r/2$, $ADB = 3\pi r/2$) The current through ACB is I_1 and current through ADB is I_2 . Magnetic flux density at the center of the ring is,



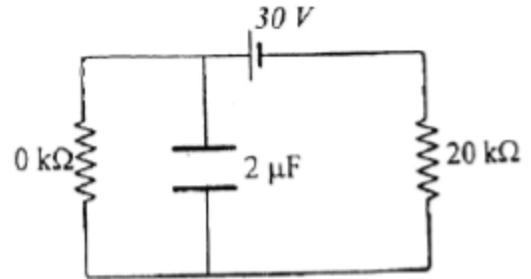
- 1) $4\mu_0 \frac{I_1}{8r}$
 - 2) $\mu_0 \frac{(I_1+3I_2)}{8r}$
 - 3) $\mu_0 \frac{(I_1-3I_2)}{8r}$
 - 4) $\mu_0 \frac{(3I_1-I_2)}{8r}$
 - 5) 0
41. Consider the following statements about the period of revolution of a satellite rotates in a circular path around a planet.
- a) Depends on mass of the satellite.
 - b) Depends on radius of the path of satellite.
 - c) Depends on the radius of the planet.
- In 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

42. A charge $+Q$ is placed at the center of a conducting sphere of inner radius 'a' and outer radius 'b'. The conductor is charged by a charge $-q$. The variation of the electric potential (V) from the center of conductor is best represented by,

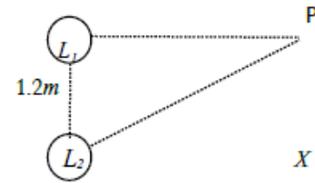


43. Separation between two plates of a capacitor is 2 mm as shown in the figure. Capacitance of the capacitor is $2\mu\text{F}$. Internal resistance of the cell is zero. Electric field intensity between the plates is,

- 1) $5 \times 10^3 \text{ V m}^{-1}$
- 2) 500 V m^{-1}
- 3) $10 \times 10^3 \text{ V m}^{-1}$
- 4) $15 \times 10^3 \text{ V m}^{-1}$
- 5) $20 \times 10^3 \text{ V m}^{-1}$



44. Two speakers L_1 and L_2 are placed 1.2 m apart. Each of these speakers produce sound waves with wave length of 0.8m. When an observer move from X to P, the observer heard a sound with minimum intensity as first time. If $L_2P = 5\text{m}$, the value of is,

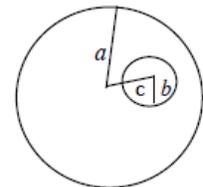


- 1) 3.8 m
- 2) 4.4 m
- 3) 4.6 m
- 4) 5.2 m
- 5) 5.8 m

45. A particle is dropped from a height R from the surface of the earth. What is the speed of the particle, when it reaches the ground (The radius of the earth is R).

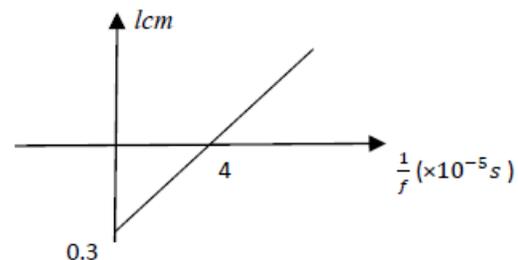
- 1) $\sqrt{2gR}$
- 2) \sqrt{gR}
- 3) $\sqrt{\frac{3gR}{2}}$
- 4) $2gR$
- 5) $4gR$

46. A non-conducting sphere of radius 'a' has a uniform charge density ρ distributed within the sphere. A spherical cavity of radius 'b' is formed in the sphere as shown in the figure. What is the electric field intensity in the cavity, if the distance between the center of sphere and the center of the cavity is 'c'.



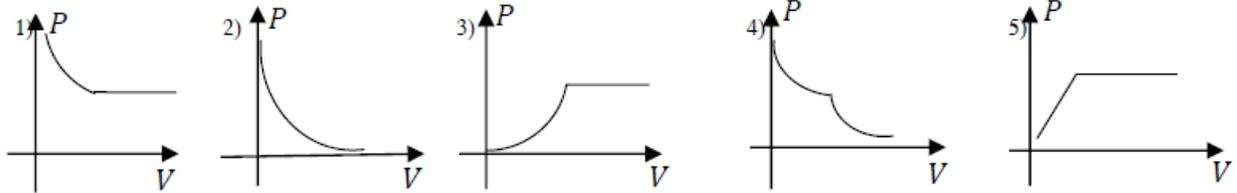
- 1) 0
- 2) $\rho b / 3\epsilon_0$
- 3) $\rho a / 3\epsilon_0$
- 4) $\rho c^2 / 3b\epsilon_0$
- 5) $\rho c / 3\epsilon_0$

47. The graph shows variation of length of the tube l with respect to $1/f$ in a resonance tube experiment. Where f is the resonance frequency of the tube. Speed of the sound in air and the end correction are respectively.



- 1) 300 m s^{-1} , 0.2 cm
- 2) 300 m s^{-1} , 0.3 cm
- 3) 300 m s^{-1} , 0 cm
- 4) 310 m s^{-1} , 0.3 cm
- 5) 300 m s^{-1} , 0.1 cm

48. The total volume of a mixture of air and unsaturated vapour is decreased at a constant temperature. If P is the total pressure and V is the volume of the mixture. Which of the following best represents the variation of P with V ?



49. A flat coil of area 300 cm^2 and number of turns 100 is placed perpendicular to a magnetic field of uniform magnetic flux density 0.2 T . The coil is removed from the field after 0.2 s . Average induced electro motive force of the coil is,

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

50. In an experiment to find the specific latent heat (L) of ice using the method of mixtures, a student dropped a large piece of wet ice without wiping out the water on its surface into a calorimeter containing water at room temperature. During the experiment he observed a layer of mist formed on the outer - surface of the calorimeter. He can expect a lower value for L , because of

- (A) the ice cube was wet
 (B) the ice- piece takes a considerable time to melt
 (C) the formation of mist

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) all (A),(B) and (C) are true)