

Physics

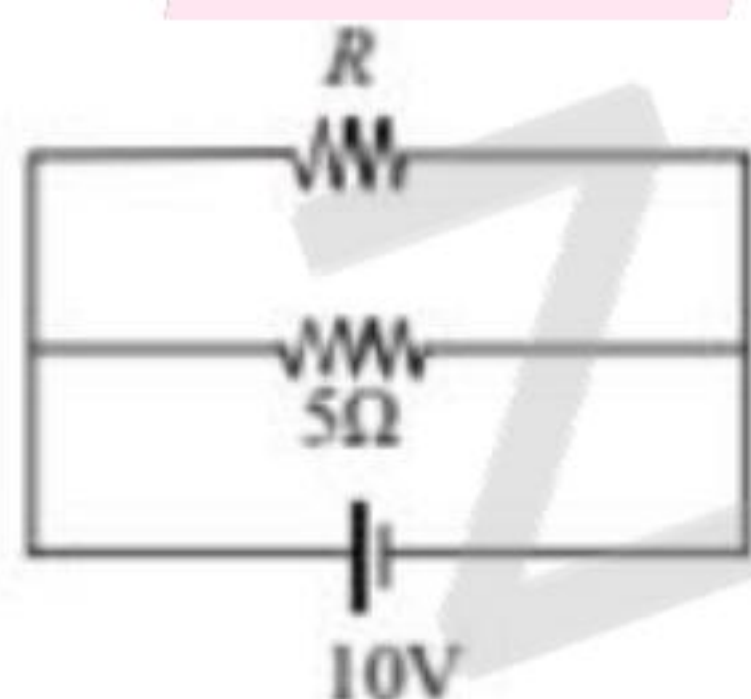
Single correct answer type:

1. A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 m/s . To give an initial upward acceleration of 20 m/s^2 , the amount of gas ejected per second to supply the needed thrust will be (Take $g = 10 \text{ m/s}^2$)

- (A) 127.5 kg/s (B) 137.5 kg/s (C) 155.5 kg/s (D) 187.5 kg/s

Solution: (D)

2. The power dissipated in the circuit shown in the figure is 30 Watts. The value of R is



- (A) 20Ω (B) 15Ω (C) 10Ω (D) 30Ω

Solution: (C)

3. If the kinetic energy of a moving particle is E , then the de-Broglie wavelength is

- (A) $\lambda = h\sqrt{2mE}$ (B) $\lambda = \sqrt{\frac{2mE}{h}}$ (C) $\lambda = \frac{h}{\sqrt{2mE}}$ (D) $\lambda = \frac{hE}{\sqrt{2mE}}$

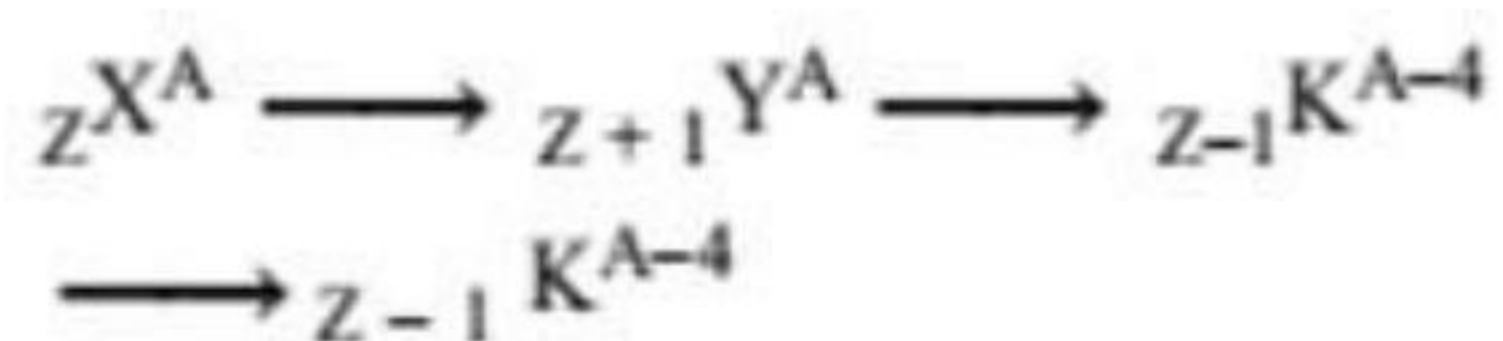
Solution: (C)

4. Two bodies A and B having masses in the ratio of 3 : 1 possess the same kinetic energy. The ratio of linear momentum of B to A is

- (A) 1 : 3 (B) 3 : 1 (C) $1 : \sqrt{3}$ (D) $\sqrt{3} : 1$

Solution: (C)

5. In which sequence the radioactive radiations are emitted in the following nuclear reaction?



- (A) γ, α, β (B) α, β, γ (C) β, γ, α (D) β, α, γ

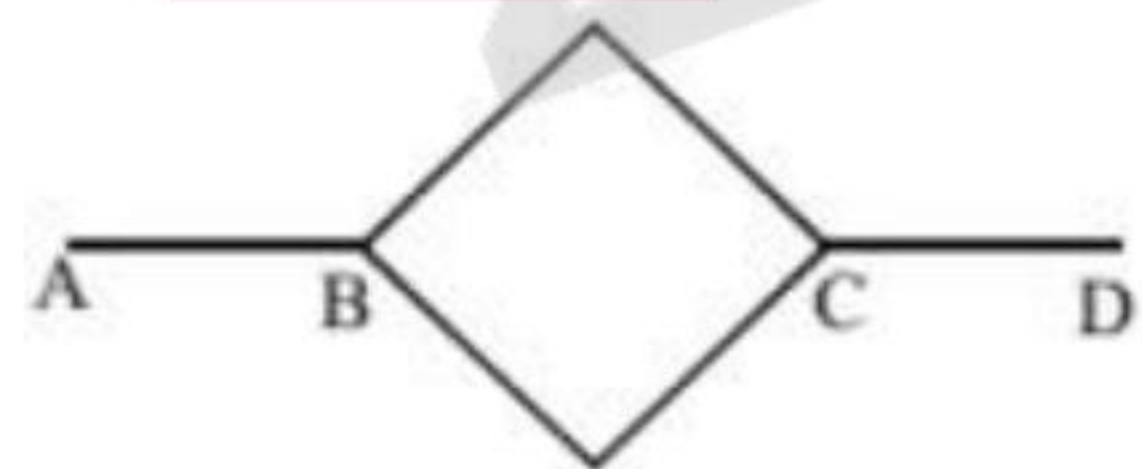
Solution: (D)

6. Which of the following does not support the wave nature of light?

- (A) Interference (B) Diffraction (C) Polarisation (D) Photoelectric effect

Solution: (D)

7. Six identical conducting rods are joined as shown in figure, Points A and D are maintained at 200°C and 20°C respectively. The temperature of junction B will be



- (A) 120°C (B) 100°C (C) 140°C (D) 80°C

Solution: (C)

8. A hydrogen atom is in ground state. Then to get six lines in emission spectrum, wavelength of incident radiation should be

- (A) $800 \text{ \AA}$ (B) $825 \text{ \AA}$ (C) $975 \text{ \AA}$ (D) $1025 \text{ \AA}$

Solution: (C)

9. A conducting circular loop of radius r carries a constant current i . It is placed in a uniform magnetic field $\vec{B}_0$ such that $\vec{B}_0$ is perpendicular to the plane of the loop. The magnetic force acting on the loop is

- (A) $ir B_0$ (B) $2\pi ir B_0$ (C) Zero (D) $\pi ir B_0$

Solution: (C)

10. A vessel of depth $2d$ cm is half filled with a liquid of refractive index μ_1 and the upper half with a liquid of refractive index μ_2 . The apparent depth of the vessel seen perpendicularly is

- (A) $\left(\frac{\mu_1 \mu_2}{\mu_1 + \mu_2}\right) d$ (B) $\left(\frac{1}{\mu_1} + \frac{1}{\mu_2}\right) d$
 (C) $\left(\frac{1}{\mu_1} + \frac{1}{\mu_2}\right)$ (D) $\left(\frac{1}{\mu_1 \mu_2}\right) 2d$

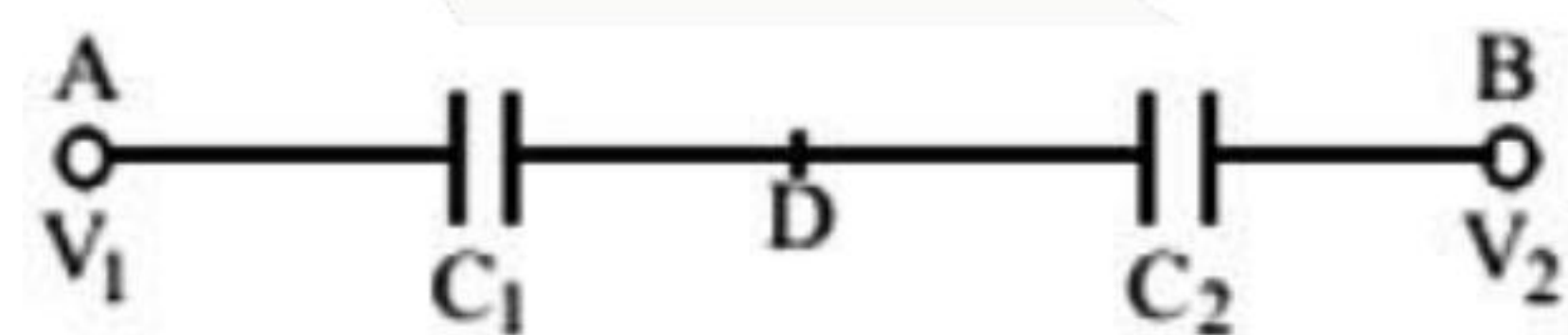
Solution: (B)

11. A smooth sphere of mass M moving with velocity u directly collides elastically with another sphere of mass m at rest. After collision, their final velocities are V and v respectively.

- (A) $\frac{2uM}{m}$ (B) $\frac{2um}{M}$ (C) $\frac{2u}{1+\frac{m}{M}}$ (D) $\frac{2u}{1+\frac{M}{m}}$

Solution: (C)

12. Two capacitors C_1 and C_2 in a circuit are joined as show in figure. The potentials of points A and B are V_1 and V_2 respectively. Then the potential of point D will be



- (A) $\frac{(V_1 + V_2)}{2}$ (B) $\frac{C_2 V_1 + C_1 V_2}{C_1 + C_2}$ (C) $\frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$ (D) $\frac{C_2 V_1 + C_1 V_2}{C_1 + C_2}$

Solution: (C)

13. Light of wavelength 500 nm is incident on a metal with work function 2.28 eV. The de Broglie wavelength of the emitted electron is:

- (A) $< 2.8 \times 10^{-9} m$ (B) $\geq 2.8 \times 10^{-9}$

(C) $\leq 2.8 \times 10^{-12}m$ (D) $< 2.8 \times 10^{-10}m$

Solution: (B)

14. Kerosene oil rises up in a wick of a lantern because of

- (A) Diffusion of the oil through the wick
- (B) Capillary action
- (C) Buoyant force of air
- (D) The gravitational pull of the wick

Solution: (B)

15. The current in a coil of $L = 40 \text{ mH}$ is to be increased uniformly from 1A to 11A in 4 milli sec. The induced e.m.f. will be

- (A) 100 V
- (B) 0.4 V
- (C) 440 V
- (D) 40 V

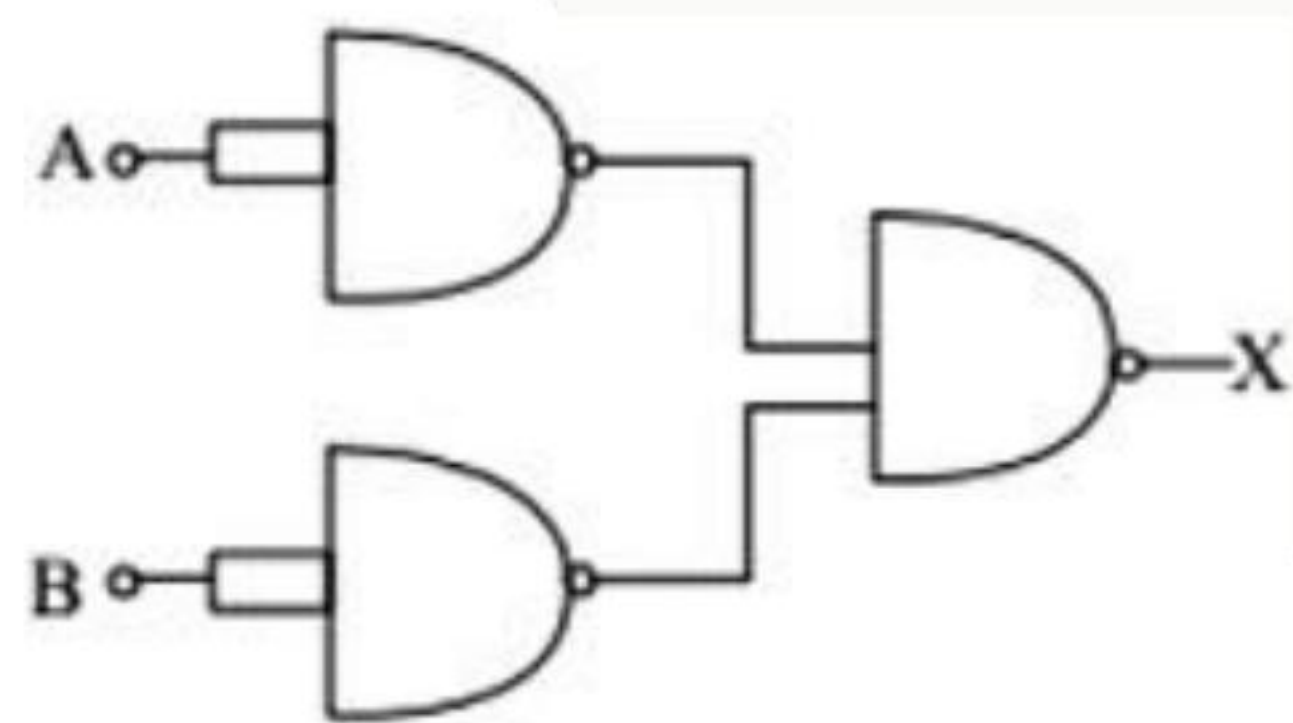
Solution: (A)

16. An alternating voltage of 220V , 50 Hz frequency is applied across a capacitor of capacitance $2\mu\text{F}$. The impedance of the circuit is

- (A) $\frac{\pi}{5000}$
- (B) $\frac{1000}{\pi}$
- (C) 500π
- (D) $\frac{5000}{\pi}$

Solution: (D)

17. The combination of gates shown below yields



- (A) OR gate
- (B) NOT gate
- (C) XOR gate
- (D) NAND gate

Solution: (A)

18. A hollow insulated conduction sphere is given a positive charge of $10 \mu C$, What will be the electric field at the centre of the sphere if its radius is 2 metres?

- (A) Zero (B) $5 \mu C m^{-2}$ (C) $20 \mu C m^{-2}$ (D) $8 \mu C m^{-2}$

Solution: (A)

19. Two mercury drops (each of radius r) merge to form a bigger drop. The surface energy of the bigger drop, if T is the surface tension, is

- (A) $2^{\frac{5}{3}} \pi r^2 T$ (B) $4 \pi^2 T$ (C) $2 \pi r^2 T$ (D) $2^{\frac{8}{3}} \pi r^2 T$

Solution: (D)

20. Resistance 1Ω , 2Ω and 3Ω are connected to form a triangle. If a $1.5 V$ cell of negligible internal resistance is connected across the 3Ω resistor, the current flowing through this resistor will be

- (A) $0.25 A$ (B) $0.5 A$ (C) $1.0 A$ (D) $1.5 A$

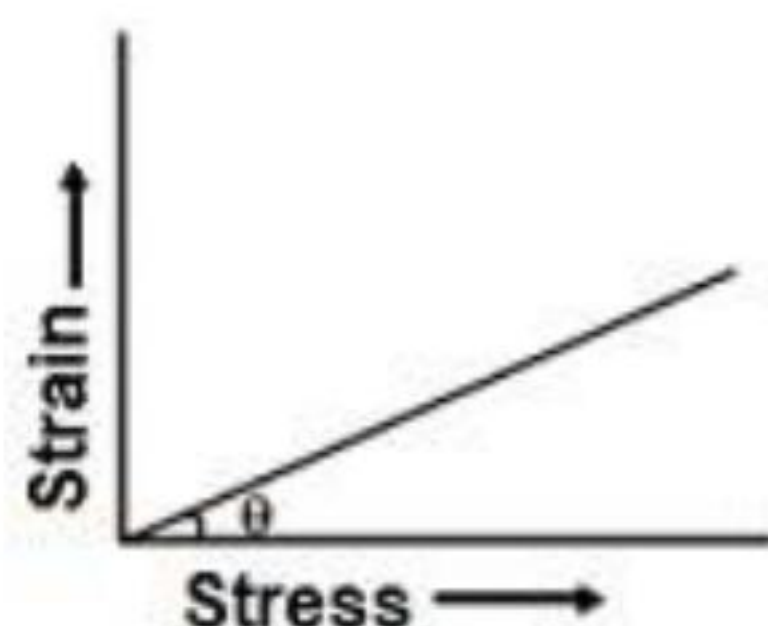
Solution: (B)

21. A current carrying coil is subjected to a uniform magnetic field. The coil will orient so that its plane becomes

- (A) Inclined at 45° to the magnetic field
(B) Inclined at any arbitrary angle to the magnetic field
(C) Parallel to the magnetic field
(D) Perpendicular to the magnetic field

Solution: (D)

22. The value of $\tan(90^\circ - \theta)$ in the graph gives



- (A) Young's modulus of elasticity

- (B) Compressibility
- (C) Shear strain
- (D) Tensile strength

Solution: (A)

23. An electron makes a transition from an excited state to the ground state of a hydrogen – like atom. Then

- (A) Kinetic energy decreases, potential energy increases but total energy remains same
- (B) Kinetic energy and total energy decrease but potential energy increases
- (C) Its kinetic energy increases but potential energy and total energy decrease
- (D) Kinetic energy, potential energy and total energy decrease

Solution: (C)

24. An A.C. source is connected to a resistive circuit. Which of the following is true?

- (A) Current leads ahead of voltage in phase
- (B) Current lags behind voltage in phase
- (C) Current and voltage are in same phase
- (D) Any of the above may be true depending upon the value of resistance

Solution: (C)

25. A milli voltmeter of 25 milli volt range is to be converted into an ammeter of 25 ampere range. The value (in ohm) of necessary shunt will be

- (A) 0.001
- (B) 0.01
- (C) 1
- (D) 0.05

Solution: (A)

26. In young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is I , λ being the wavelength of light used. The intensity at a point where the path difference is $\frac{\lambda}{4}$ will be

- (A) $\frac{I}{4}$
- (B) $\frac{I}{2}$
- (C) I
- (D) Zero

Solution: (B)

27. Which of the following is a self adjusting force?

- (A) Static friction (B) Limiting friction
(C) Dynamic friction (D) Sliding friction

Solution: (A)

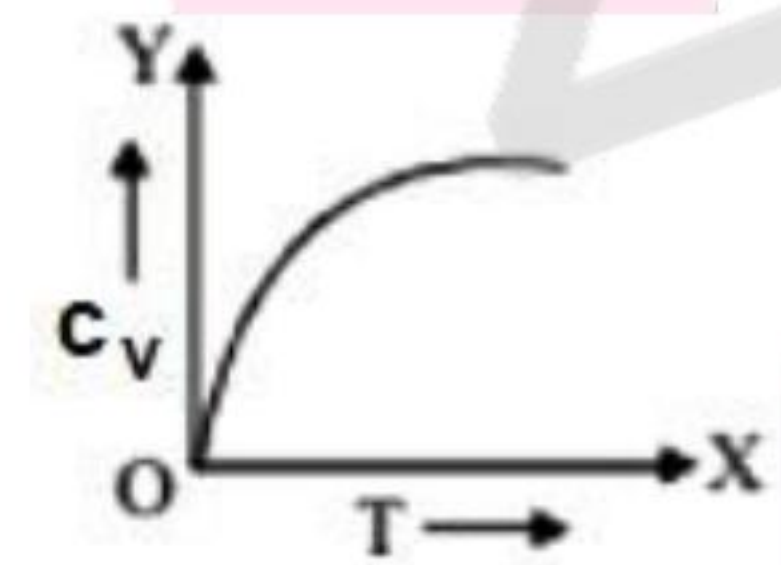
28. Which of the following are not electromagnetic waves?

- (A) Cosmic rays (B) Gamma rays
(C) β -rays (D) X-rays

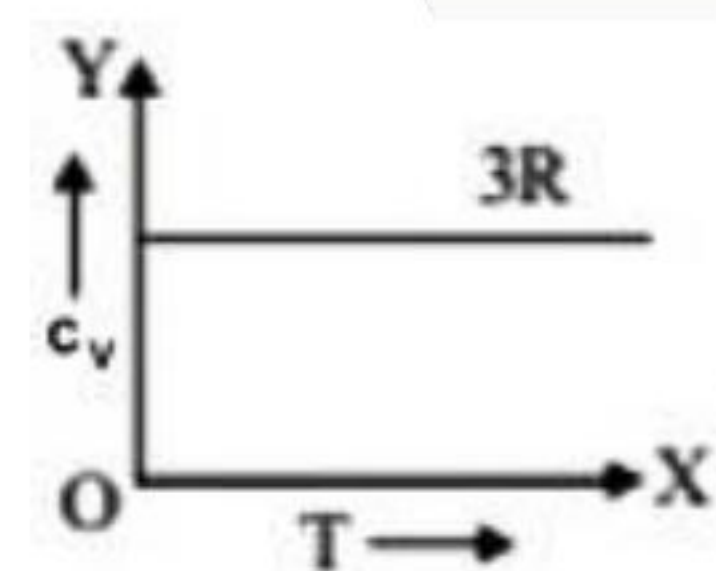
Solution: (A)

29. Graph of specific heat at constant volume for a monatomic gas is

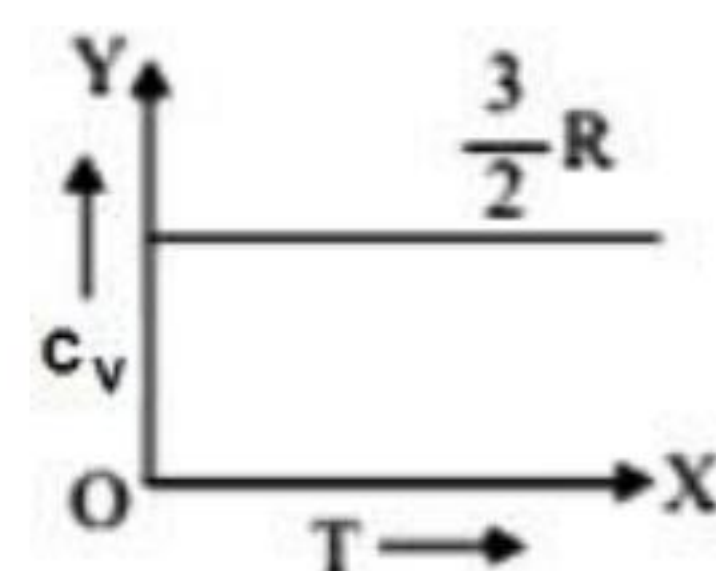
(A)



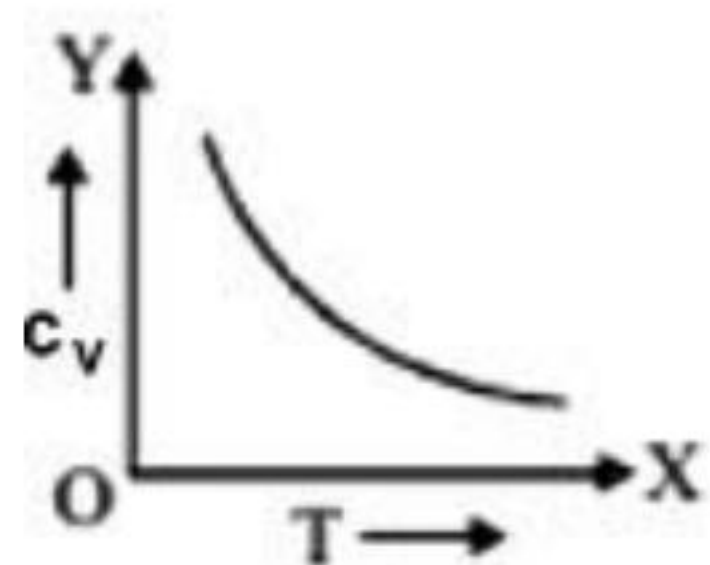
(B)



(C)



(D)



Solution: (C)

30. A charge $+q$ is at a distance $L/2$ above a square of side L . Then what is the flux linked with the surface?

- (A) $\frac{q}{4\epsilon_0}$ (B) $\frac{2q}{3\epsilon_0}$ (C) $\frac{q}{6\epsilon_0}$ (D) $\frac{6q}{\epsilon_0}$

Solution: (C)

31. The potential energy of a system increases if work is done

- (A) Upon the system by a non conservative force
 (B) By the system against a conservative force
 (C) By the system against a non conservative force
 (D) Upon the system by a conservative fore

Solution: (D)

32. Two capacitor when connected in series have a capacitance of $3\mu F$, and when connected in parallel have a capacitance of $16\mu F$. Their individual capacities are

- (A) $1\mu F, 2\mu F$ (B) $6\mu F, 2\mu F$ (C) $12\mu F, 4\mu F$ (D) $3\mu F, 16\mu F$

Solution: (C)

33. Resonance frequency of LCR series a.c. circuit is f_0 . Now the capacitance is made 4 times, then the new resonance frequency will become

- (A) $\frac{f_0}{4}$ (B) $2f_0$ (C) f_0 (D) $\frac{f_0}{2}$

Solution: (D)

34. If the light is polarized by reflection, then the angle between reflected and refracted light is

- (A) 180° (B) 90° (C) 45° (D) 36°

Solution: (B)

35. The velocity of efflux of a liquid through an orifice in the bottom of the tank does not depend upon

- (A) Size of orifice (B) Height of liquid
(C) Acceleration due to gravity (D) Density of liquid

Solution: (A)

36. On a smooth plane surface (figure) two block A and B are accelerated up by applying a force 15 N on A. If mass of B is twice that A, the force on B is



- (A) 30 N (B) 15 N (C) 10 N (D) 5 N

Solution: (C)

37. A potentiometer wire, 10 m long, has a resistance of $40\ \Omega$. It is connected in series with a resistance box and a 2V storage cell. If the potential gradient along the wire .1 m is V/cm , the resistance unplugged in the box is

- (A) $260\ \Omega$ (B) $760\ \Omega$ (C) $960\ \Omega$ (D) $1060\ \Omega$

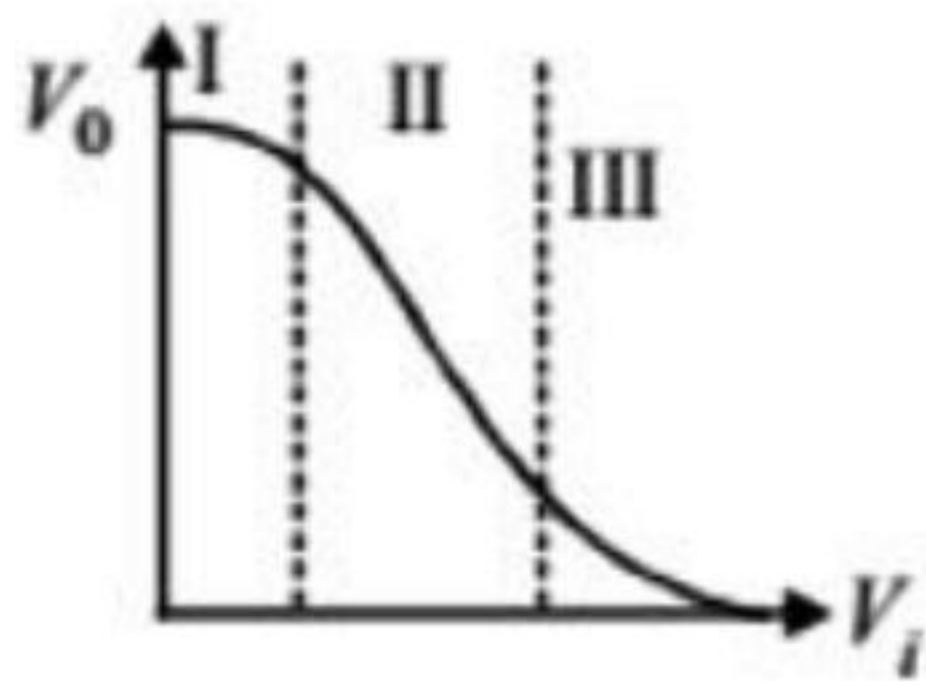
Solution: (B)

38. A prism has a refracting angle of 60° . When placed in the position of minimum deviation, it produces a deviation of 30° . The angle of incidence is

- (A) 30° (B) 45° (C) 15° (D) 60°

Solution: (B)

39. Transfer characteristics [output voltage (V_o) vs input voltage (V_i)] for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used



- (A) In region (III) (B) both in region (I) and (III)
(C) In region (II) (D) In region (I)

Solution: (B)

40. A bar magnet of magnetic moment M , is placed in a magnetic field of induction B . The torque exerted on it is

- (A) $\vec{M} \cdot \vec{B}$ (B) $-\vec{M} \cdot \vec{B}$
(C) $\vec{M} \times \vec{B}$ (D) $-\vec{B} \cdot \vec{M}$

Solution: (C)