Physics

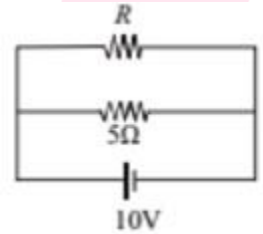
Single correct answer type:

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 $g = 10\,m/s^2$)

(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) $20\ \Omega$ (B) $15\ \Omega$ (C) $10\ \Omega$ (D) $30\ \Omega$

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?

$$_{Z}X^{A} \longrightarrow {}_{Z+1}Y^{A} \longrightarrow {}_{Z-1}K^{A-4} \longrightarrow {}_{Z-1}K^{A-4}$$

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

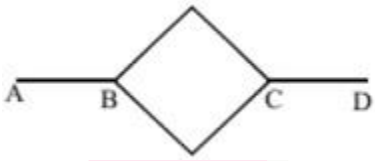
Solution: (D)

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 $200^{o}C$ and $20^{o}C$ respectively. The temperature of junction B will be



(A) $120^{o}C$ (B) $100^{o}C$ (C) $140^{o}C$ (D) $80^{o}C$

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 Å (B) 825 Å (C) 975 Å (D) 1025 Å

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) $\left(\frac{1}{\mu_1\,\mu_2}\right)2d$

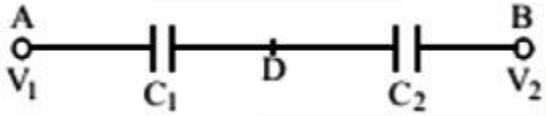
Solution: (B)

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) $\frac{C_2V_1+C_1V_2}{C_1+C_2}$ (C) $\frac{C_1V_1+C_2V_2}{C_1+C_2}$ (D) $\frac{C_2V_1+C_1V_2}{C_1+C_2}$

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) $< 2.8\times10^{-9}m$ (B) $\geq 2.8\times10^{-9}$

(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 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

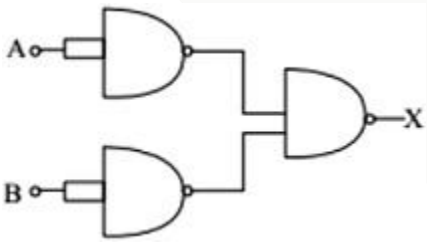
Solution: (A)

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

(A) $\frac{\pi}{5000}$ (B) $\frac{1000}{\pi}$ (C) $500\ \pi$ (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 $1\ \Omega, 2\ \Omega$ and $3\ \Omega$ are connected to form a triangle. If a 1.5 V cell of negligible internal resistance is connected across the $3\ \Omega$ 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^o to the magnetic field

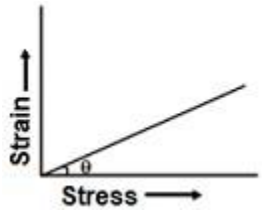
(B) Inclined at any arbitrary angle to the magnetic field

(C) Parallel to the magnetic field

(D) Perpendicular to the magnetic field

Solution: (D)

22. The value of $\tan(90^o - \theta)$ 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?

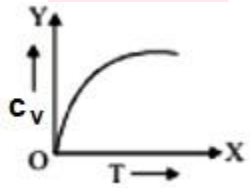
(A) Cosmic rays (B) Gamma rays

(C) β-rays (D) X-rays

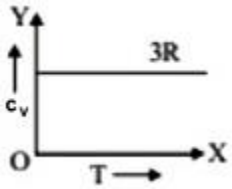
Solution: (A)

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

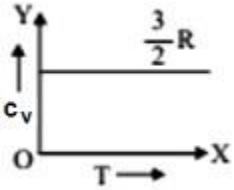
(A)



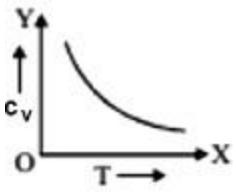
(B)



(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) $\frac{q}{4\varepsilon_0}$ (B) $\frac{2q}{3\varepsilon_0}$ (C) $\frac{q}{6\varepsilon_0}$ (D) $\frac{6q}{\varepsilon_0}$

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^o (B) 90^o (C) 45^o (D) 36^o

Solution: (B)

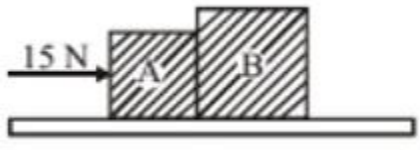
35. The velocity of efflux of a liquid through an orifice in the bottom of the tank does not depend upon

(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) $1060\ \Omega$

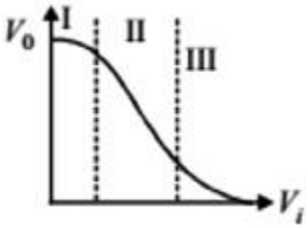
Solution: (B)

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

(A) 30^o (B) 45^o (C) 15^o (D) 60^o

Solution: (B)

39. Transfer characteristics [output voltage (V_0) 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) $\vec{M}.\vec{B}$ (B) $-\vec{M}.\vec{B}$

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

Solution: (C)