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Previous Year Paper

Physics - 2007



Multiple Choice Questions

1. The work done in moving an alpha particle between two points having potential difference 25 V is

A. $8 \times 10^{-18} \text{ J}$
 B. $8 \times 10^{-19} \text{ J}$
 C. $8 \times 10^{-20} \text{ J}$
 D. $8 \times 10^{-16} \text{ J}$

Answer

2. The physical quantity angular momentum has the same dimensions as that of
- A. work
 B. force
 C. Planck's constant
 D. torque

Answer

3. The values of two resistors are $R_1 = (6 \pm 0.3)\text{k}\Omega$ and $R_2 = (10 \pm 0.2)\text{k}\Omega$. The percentage error in the equivalent resistance when they are connected in parallel is
- A. 5.125 %
 B. 2 %
 C. 10.125 %
 D. 7 %

Answer

4. Two trains are moving with equal speed in opposite directions along two parallel railway tracks. If the wind is blowing with speed u along the track so that the relative velocities of the trains with respect to the wind are in the ratio 1 : 2, then the speed of each train must be
- A. $3u$
 B. $2u$
 C. $5u$
 D. $4u$

Answer

5. Two balls are dropped to the ground from different heights. One ball is dropped 2 s after the other but they both strike the ground at the same time. If the first ball takes 5 s to reach the ground, then the difference in initial heights is ($g = 10 \text{ ms}^{-2}$)

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B. 80 m

C. 170 m

D. 40 m

Answer

6. A ball is thrown vertically upwards with a velocity of 25 ms^{-1} from the top of a tower of height 30 m. How long will it travel before it hits ground ?

A. 6 s

B. 5 s

C. 4 s

D. 12 s

Answer

7. A ball is projected from the ground at a speed of 10 ms^{-1} making an angle of 30° with the horizontal. Another ball is simultaneously released from a point on the vertical line along the maximum height of the projectile. The initial height of the second ball is ($g = 10 \text{ ms}^{-2}$)

A. 6.25 m

B. 2.5 m

C. 1.25 m

D. 5 m

Answer

8. The sum of the magnitudes of two forces acting at a point is 18 N and the magnitude of their resultant is 12 N. If the resultant is at 90° with the smaller force, the magnitude of the forces in N are

A. 6, 12

B. 11, 7

C. 5, 13

D. 14, 4

Answer

9. The position of a particle is given by $\mathbf{r} = i^{\wedge} + 2j^{\wedge} - k^{\wedge}$ and its linear momentum is given by $\mathbf{p} = 3i^{\wedge} + 4j^{\wedge} - 2k^{\wedge}$. Then its angular momentum, about the origin is perpendicular to

A. yz-plane

B. z-axis

C. y-axis

D. x-axis

Answer

10. A mass of 6 kg is suspended by a rope of length 2 m from a ceiling. A force of 50 N in the horizontal direction is applied at the mid-point of the rope. The angle made by the rope with the vertical, in equilibrium is

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C. 30°

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Answer

11. A shell at rest at the origin explodes into three fragments of masses 1 kg, 2 kg and m kg. The 1 kg and 2 kg pieces fly off with speeds of 5 ms^{-1} along x-axis and 6 ms^{-2} along y-axis respectively.

If the m kg piece flies off with a speed of 6.5 ms^{-1} , the total mass of the shell must be

- A. 4 kg
- B. 5 kg
- C. 3.5 kg
- D. 4.5 kg

Answer

12. If the road is unbanked and the coefficient of friction between the road and the tyres is 0.8, then the maximum speed with which an automobile can move around a curve of 84.5 m radius without slipping ($g = 10 \text{ ms}^{-2}$) is

- A. 26 ms^{-1}
- B. 67.6 ms^{-1}
- C. 13 ms^{-1}
- D. 36.7 ms^{-1}

Answer

13. A rod AB of mass 10 kg and length 4 m rests on a horizontal floor with end A fixed so as to rotate it in vertical plane about perpendicular axis passing through A. If the work done on the rod is 100 J, the height to which the end B be raised vertically above the floor is

- A. 1.5 m
- B. 2.0 m
- C. 1.0 m
- D. 2.5 m

Answer

14. A particle is released from a height S . At certain height its kinetic energy is three times its potential energy. The height and speed of the particle at that instant are respectively

- A. $S/4$, $3gS/2$
- B. $S/4$, $3gS/2$
- C. $S/2$, $3gS/2$
- D. $S/4$, $3gS/2$

Answer

15. An electric pump is used to fill an overhead tank of capacity 9 m^3 kept at a height of 10 m above the ground. If the pump takes 5 min to fill the tank by consuming 10 kW power, the efficiency of

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- A. 60 %
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B. 40 %

- C. 20 %
D. 30 %

Answer

16. A sphere of mass m and radius r rolls on a horizontal plane without slipping with the speed u . Now, if it rolls up vertically, the maximum height it would attain will be

- A. $3u^2/4g$
B. $5u^2/2g$
C. $7u^2/10g$
D. $u^2/2g$

Answer

17. If the earth were to contract such that its radius becomes one quarter, without change in its mass, the duration of one full day would be

- A. 3 h
B. 1.5 h
C. 6 h
D. 4 h

Answer

18. A satellite is launched in a circular orbit of radius R around the earth. A second satellite is launched into an orbit of radius $1.01 R$. The period of second satellite is longer than the first one (approximately) by

- A. 1.5 %
B. 0.5 %
C. 3 %
D. 1 %

Answer

19. The change in potential energy when a body of mass m is raised to a height nR from earth's surface is (R = radius of the earth)

- A. $mgR n n - 1$
B. mgR
C. $mgR n n + 1$
D. $mgR n^2 n^2 + 1$

Answer

20. The escape velocity of body on the surface of earth is 11.2 km/s . If the mass of the earth is doubled and its radius halved, the escape velocity becomes

- A. 5.6 km/s
B. 11.2 km/s

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D. 44.8 km/s

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21. A train is moving at 30 ms^{-1} in still air. The frequency of the locomotive whistle is 500 Hz and the speed of sound is 345 ms^{-1} . The apparent wavelength of sound in front of and behind the locomotive are respectively
- 0.80 m , 0.63 m
 - 0.63 m , 0.80 m
 - 0.50 m , 0.85 m
 - 0.63 m , 0.75 m

Answer

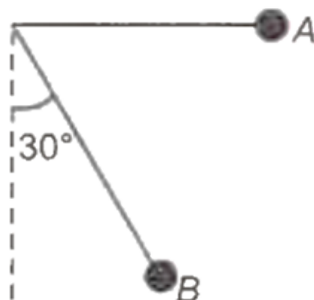
22. An open organ pipe is closed suddenly with the result that the second overtone of the closed pipe is found to be higher in frequency by 100 than the first overtone of the original pipe. Then the fundamental frequency of the open pipe is
- 200 s^{-1}
 - 100 s^{-1}
 - 300 s^{-1}
 - 250 s^{-1}

Answer

23. A transverse wave is described by the equation $y = y_0 \sin 2\pi ft - x/\lambda$. The maximum particle velocity is equal to four times the wave velocity, if
- $\lambda = \pi y_0^4$
 - $\lambda = \pi y_0^2$
 - $\lambda = \pi y_0$
 - $\lambda = 2\pi y_0$

Answer

24. A simple pendulum is released from A as shown. If m and l represent the mass of the bob and length of the pendulum, the gain in kinetic energy at B is



- $mg l^2$
- $mg l$

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Answer

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25. A tank of height H is fully filled with water. If the water rushing from a hole made in the tank below the free surface, strikes the floor at maximum horizontal distance, then the depth of the hole from the free surface must be
- $3/4 H$
 - $2/3 H$
 - $1/4 H$
 - $1/2 H$

Answer

26. The length of a rubber cord is l_1 metre when the tension is 4 N and l_2 metre when the tension is 6 N . The length when the tension is 9 N , is
- $(2.5 l_2 - 1.5 l_1) \text{ m}$
 - $(6 l_2 - 1.5 l_1) \text{ m}$
 - $(3 l_2 - 2 l_1) \text{ m}$
 - $(3.5 l_2 - 2.5 l_1) \text{ m}$

Answer

27. A wire of natural length l , Young's modulus Y and area of cross-section A is extended by x . Then the energy stored in the wire is given by
- $1/2 YAl x^2$
 - $1/3 YAl x^2$
 - $1/2 YlA x^2$
 - $1/2 YAl^2 x^2$

Answer

28. A piece of solid weighs 120 g in air, 80 g in water and 60 g in a liquid. The relative density of the solid and that of the liquid are respectively
- $3, 2$
 - $2, 3/4$
 - $3, 3/2$
 - $4, 3$

Answer

29. A closed gas cylinder is divided into two parts by a piston held tight. The pressure and volume of gas in two parts respectively are $(p, 5V)$ and $(10p, V)$. If now the piston is left free and the system undergoes isothermal process, then the volume of the gas in two parts respectively are
- $10/11 V, 20/11 V$
 - $3 V, 3 V$
 - $5 V, V$
 - $4 V, 2 V$

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30. A Carnot engine with sink's temperature at 17°C has 50% efficiency. By how much should its source temperature be changed to increase its efficiency to 60%?

- A. 225 K
- B. 128°C
- C. 580 K
- D. 145 K

Answer

31. Two moles of oxygen is mixed with eight moles of helium. The effective specific heat of the mixture at constant volume is

- A. 1.3 R
- B. 1.4 R
- C. 1.7 R
- D. 1.9 R

Answer

32. On heating, the temperature at which water has minimum volume is

- A. 0°C
- B. 4°C
- C. 4 K
- D. 100°C

Answer

33. In damped oscillations, the amplitude of oscillations is reduced to one-third of its initial value at the end of 100 oscillations. When the oscillator completes 200 oscillations, its amplitude must be

- A. $a/2$
- B. $a/6$
- C. $a/9$
- D. $a/4$

Answer

34. A particle executes simple harmonic motion with a time period of 16 s. At time $t = 2$ s, the particle crosses the mean position while at $t = 4$ s, its velocity is 4 ms^{-1} . The amplitude of motion in metre is

- A. 2π
- B. 162π
- C. 322π
- D. 4π

Answer

35. For a simple pendulum, the graph between T^2/L and is

- A. a straight line passing through the origin

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C. circle
D. ellipse

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Answer

36. Charges $+2q$, $+q$ and $+q$ are placed at the corners A, B and C of an equilateral triangle ABC. If E is the electric field at the circumcentre O of the triangle, due to the charge $+q$, then the magnitude and direction of the resultant electric field at O is
- A. E along AO
 - B. $2E$ along AO
 - C. E along BO
 - D. E along CO

Answer

37. N identical drops of mercury are charged simultaneously to 10 V. When combined to form one large drop, the potential is found to be 40 V, the value of N is
- A. 4
 - B. 6
 - C. 8
 - D. 10

Answer

38. The electrostatic potential energy between proton and electron separated by a distance $1 \text{ \AA}$ is
- A. 13.6 V
 - B. 27.2 eV
 - C. 14.4 eV
 - D. 1.44 eV

Answer

39. The plates of a parallel plate capacitor with air as medium are separated by a distance of 8 mm. A medium of dielectric constant 2 and thickness 4 mm having the same area is introduced between the plates. For the capacitance to remain the same, the distance between the plates is
- A. 8 mm
 - B. 6 mm
 - C. 10 mm
 - D. 12 mm

Answer

40. The resistance of a wire at room temperature 30°C is found to be 10Ω . Now to increase the resistance by 10%, the temperature of the wire must be [The temperature coefficient of resistance of the material of the wire is $0.002/^\circ\text{C}$]
- A. 36°C
 - B. 83°C
 - C. 63°C

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41. In a closed circuit, the current I (in ampere) at an instant of time t (in second) is given by $I = 4 - 0.08t$. The number of electrons flowing in 50 s through the cross-section of the conductor is

- A. 1.25×10^{19}
- B. 6.25×10^{20}
- C. 5.25×10^{19}
- D. 2.55×10^{20}

Answer

42. If R_1 and R_2 be the resistances of the filaments of 200 W and 100 W electric bulbs operating at 220 V, then $R_1 R_2$ is
- A. 1
 - B. 2
 - C. 0.5
 - D. 4

Answer

43. A potentiometer wire, 10 m long, has a resistance of 40 Ω . It is connected in series with a resistance box and a 2 V storage cell. If the potential gradient along the wire is (0.1 mV / cm), the resistance unplugged in the box is
- A. 260 Ω
 - B. 760 Ω
 - C. 960 Ω
 - D. 1060 Ω

Answer

44. When a current I flows through a wire, the drift velocity of the electrons is v . When current $2I$ flows through another wire of the same material having double the length and double the area of cross-section, the drift velocity of the electrons will be
- A. $v/8$
 - B. $v/4$
 - C. $v/2$
 - D. v

Answer

45. A uniform electric field and a uniform magnetic field exist in a region in the same direction. An electron is projected with a velocity pointed in the same direction. Then the electron will
- A. be deflected to the left without increase in speed
 - B. be deflected to the right without increase in speed
 - C. not be deflected but its speed will decrease
 - D. not be deflected but its speed will increase

Answer

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46. A galvanometer of resistance $20\ \Omega$ shows a deflection of 10 division when a current of $1\ \text{mA}$ is passed through it. If a shunt of $4\ \Omega$ is connected and there are 50 division on the scale, the range of the galvanometer is

- A. $1\ \text{A}$
- B. $3\ \text{A}$
- C. $30\ \text{mA}$
- D. $30\ \text{A}$

Answer

47. A conducting rod of $1\ \text{m}$ length and $1\ \text{kg}$ mass is suspended by two vertical wires through its ends. An external magnetic field of $2\ \text{T}$ is applied normal to the rod. Now the current to be passed through the rod so as to make the tension in the wires zero is [Take $g = 10\ \text{ms}^{-2}$]
- A. $0.5\ \text{A}$
 - B. $15\ \text{A}$
 - C. $5\ \text{A}$
 - D. $1.5\ \text{A}$

Answer

48. A circular coil of 5 turns and of $10\ \text{cm}$ mean diameter is connected to a voltage source. If the resistance of the coil is $10\ \Omega$, the voltage of the source so as to nullify the horizontal component of earth's magnetic field of $30\ \text{A turn m}^{-1}$ at the centre of the coil should be
- A. $6\ \text{V}$, plane of the coil normal to magnetic meridian
 - B. $2\ \text{V}$, plane of the coil normal to magnetic meridian
 - C. $6\ \text{V}$, plane of the coil along the magnetic meridian
 - D. $2\ \text{V}$, plane of the coil along the magnetic meridian

Answer

49. A paramagnetic substance of susceptibility 3×10^{-4} is placed in a magnetic field of $4 \times 10^4\ \text{Am}^{-1}$. Then the intensity of magnetization in the units of Am^{-1} is
- A. 1.33×10^8
 - B. 0.75×10^{-8}
 - C. 12×10^{-8}
 - D. 14×10^{-8}

Answer

50. A square coil of side $25\ \text{cm}$ having 1000 turns is rotated with a uniform speed in a magnetic field about an axis perpendicular to the direction of the field. At an instant t , the emf induced in the coil is $e = 200 \sin 100\pi t$. The magnetic induction is
- A. $0.50\ \text{T}$
 - B. $0.02\ \text{T}$
 - C. $0.01\ \text{T}$

Answer

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51. A transformer has an efficiency of 80%. It is connected to a power input of 5 kW at 200 V. If the secondary voltage is 250 V, the primary and secondary currents are respectively
- 25 A, 20 A
 - 20 A, 16 A
 - 25 A, 16 A
 - 40 A, 25 A

Answer

52. When a DC voltage of 200 V is applied to a coil of self-inductance 23π H, a current of 1 A flows through it. But by replacing DC source with AC source of 200 V, the current in the coil is reduced to 0.5 A. Then the frequency of AC supply is
- 100 Hz
 - 75 Hz
 - 50 Hz
 - 30 Hz

Answer

53. In a L-R circuit, the value of L is 0.4π H and the value of R is 30 Ω . If in the circuit, an alternating emf of 200 V at 30 cycles/s is connected, the impedance of the circuit and current will be
- 11.4 Ω , 17.5 A
 - 30.7 Ω , 6.5 A
 - 40.4 Ω , 5 A
 - 50 Ω , 4 A

Answer

54. The dielectric constant of air is 1.006. The speed of electromagnetic wave travelling in air is a x 10^8 ms⁻¹, where a is about
- 3
 - 3.88
 - 2.5
 - 3.2

Answer

- The wavelength of microwaves is greater than that of UV-rays.
- The wavelength of IR rays is lesser than that of UV-rays.
- The wavelength of microwaves is lesser than that of IR rays.
- Gamma rays have shortest wavelength in the electromagnetic spectrum.

Of the above statements

- A and B are true
- B and C are true
- A and D are true

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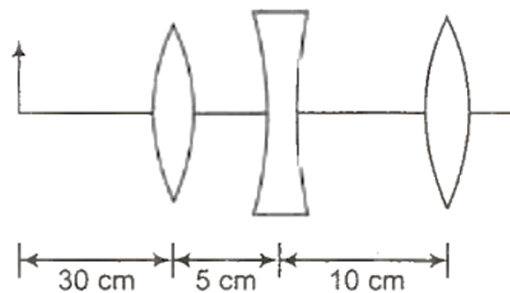
Answer

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56. Magnification at least distance of distinct vision of a simple microscope having its focal length 5 cm is
- 2
 - 4
 - 5
 - 6

Answer

57. The position of final image formed by the given lens combination from the third lens will be at a distance of ($f_1 = +10$ cm, $f_2 = -10$ cm, $f_3 = +30$ cm)



- 15 cm
- infinity
- 45 cm
- 30 cm

Answer

58. A slit of width a is illuminated by red light of wavelength $6500 \text{ \AA}$. If the first minimum falls at $\theta = 30^\circ$, the value of a is
- $6.5 \times 10^{-4} \text{ mm}$
 - 1.3 micron
 - $3250 \text{ \AA}$
 - $2.6 \times 10^{-4} \text{ cm}$

Answer

59. Two beams of light of intensity I_1 and I_2 interfere to give an interference pattern. If the ratio of maximum intensity to that of minimum intensity is 259, then $I_1 I_2$ is
- 53
 - 4
 - 81625
 - 16

Answer

60. If the polarizing angle of a piece of glass for green light is 54.74° , then the angle of minimum

A. 45°

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B. 54.74° C. 30° D. 90°

Answer

61. When a monochromatic point source of light is at a distance 0.2 m from a photoelectric cell, the saturation current and cut-off voltage are 12.0 mA and 0.5 V. If the same source is placed 0.4 m away from the photoelectric cell, then the saturation current and the stopping potential respectively are

A. 4 mA and 1 V

B. 12 mA and 1 V

C. 3 mA and 0.5 V

D. 12 mA and 0.5 V

Answer

62. Consider the nuclear reaction $X^{200} \rightarrow A^{110} + B^{80}$, If the binding energy per nucleon for X, A and B are 7.4 MeV, 8.2 MeV and 8.1 MeV respectively, then the energy released in the reaction is

A. 70 MeV

B. 200 MeV

C. 190 MeV

D. 10 MeV

Answer

63. The natural boron of atomic weight 10.81 is found to have two isotopes B^{10} and B^{11} . The ratio of abundance of isotopes in natural boron should be

A. 11 : 10

B. 81 : 19

C. 19 : 81

D. 15 : 16

Answer

64. Radium has a half-life of 5 yr. The probability of decay of a radium nucleus in 10 yr is

A. 50 %

B. 75 %

C. 100 %

D. 60 %

Answer

65. When the forward bias voltage of a diode is changed from 0.6 V to 0.7 V, the current changes from 5 mA to 15 mA. Then its forward bias resistance is

A. 0.01Ω B. 0.1Ω

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D. $100\ \Omega$

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Answer

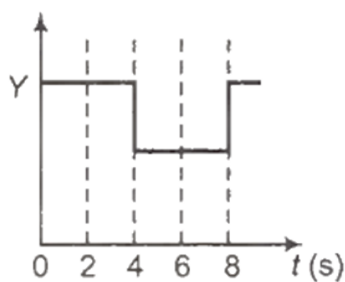
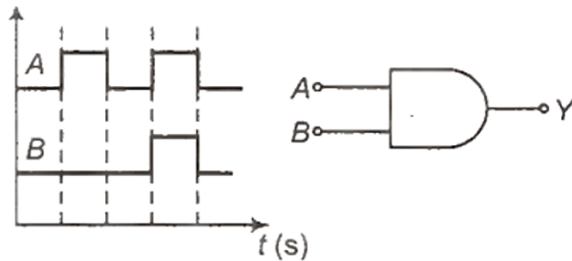
66. In common emitter amplifier, the current gain is 62. The collector resistance and input resistance are $5\text{ k}\Omega$ and $500\ \Omega$ respectively. If the input voltage is 0.1 V , the output voltage is
- 0.61 V
 - 6.2 V
 - 62 V
 - 620 V

Answer

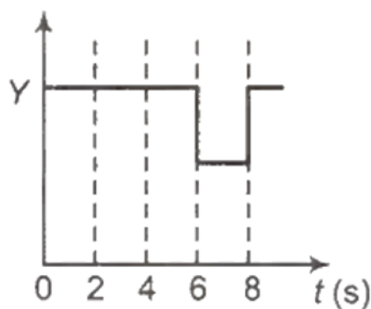
67. The current gain of a transistor in common base mode is 0.995 . The current gain of the same transistor in common emitter mode is
- 197
 - 201
 - 199
 - 202

Answer

68. The real time variation of input signals A and B are as shown below. If the inputs are fed into NAND gate, then select the output signal from the following

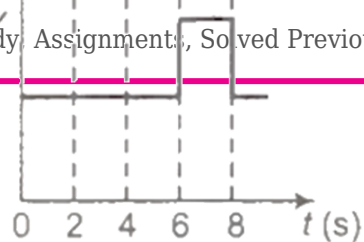


A.

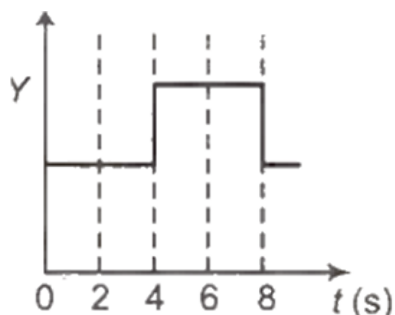


B.

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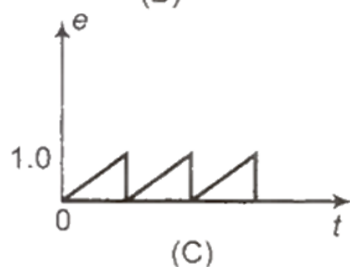
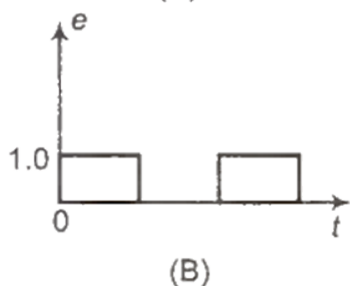
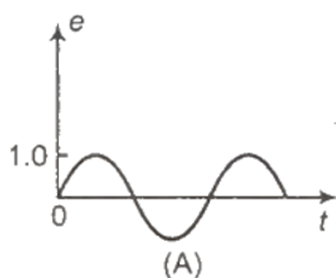
C.



D.

[Answer](#)

69. The time variations of signals are given as in A, B and C. Point out the true statement from the following



- A. A, B and C are analogue signals
- B. A and B are analogue, but C is digital signal
- C. A and C digital, but B is analogue signal
- D. A and C are analogue but B is digital signal

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70. The optical fibres have an inner core of refractive index n_1 and a cladding of refractive index n_2

such that

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- A. $n_1 = n_2$
- B. $n_1 \leq n_2$
- C. $n_1 < n_2$
- D. $n_1 > n_2$

Answer

71. A photodetector used to detect the wavelength of 1700 nm, has energy gap of about

- A. 0.073 eV
- B. 1.2 eV
- C. 0.73 eV
- D. 1.16 eV

Answer

72. The energy gap between conduction band and the valence band is of the order of 0.7 eV. Then it is

- A. an insulator
- B. a conductor
- C. a semiconductor
- D. an alloy

Answer