

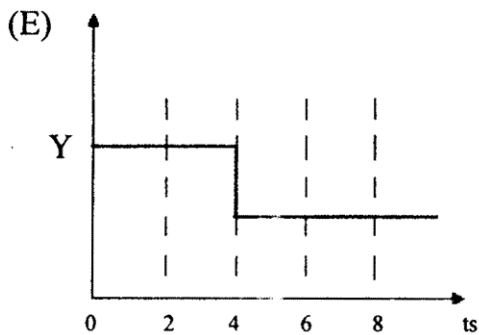
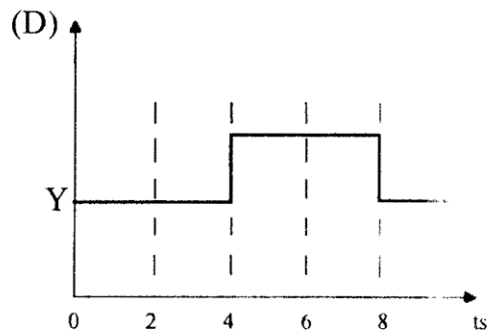
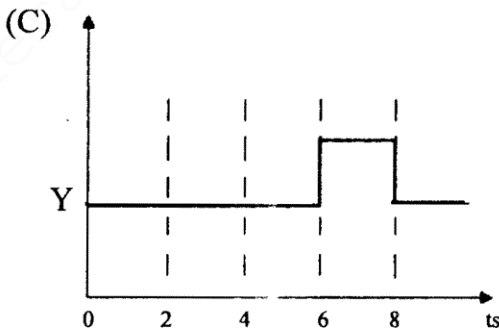
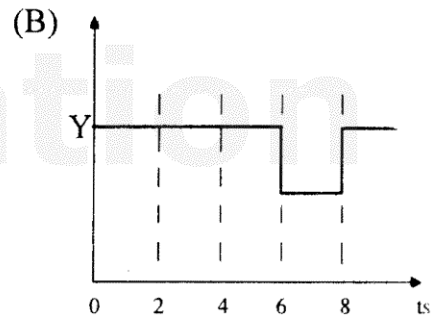
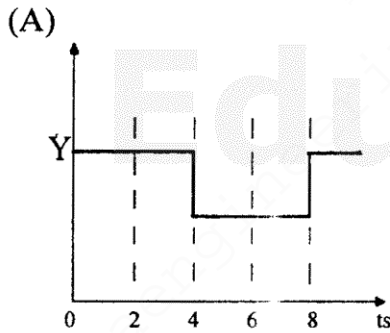
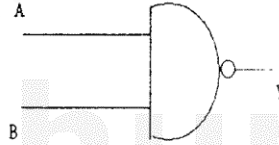
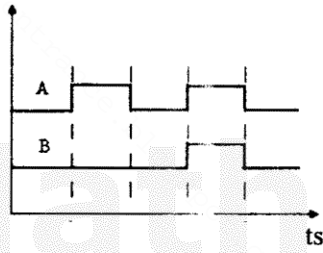
**Kerala Engineering Entrance Examination 2007
Physics and Chemistry**

1. If the polarizing angle of a piece of glass for green light is 54.74° , then the angle of minimum deviation for an equilateral prism made of same glass is [given $\tan 54.74^\circ = 1.414$]
(A) 45° (B) 54.74° (C) 60° (D) 90° (E) 30°
2. 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 1 V
(D) 12 mA and 0.5 V
(E) 3 mA and 0.5 V
3. 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 (E) 1480 MeV
4. 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) 10:11 (D) 15:16 (E) 19:81
5. Radium has half-life of 5 years. The probability of decay of a radium nucleus in 10 years is
(A) 50% (B) 75% (C) 100% (D) 60% (E) 25%

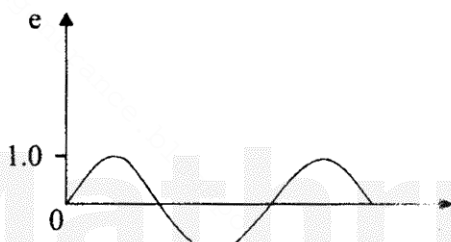
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6. When the forward bias voltage of a diode is changed from 0.6 V to 0.7 V, the current changes from 5 mA to 15 mA. Then its forward bias resistance is
(A) 0.01Ω (B) 0.1Ω (C) 10Ω (D) 100Ω (E) 0.2Ω
7. In common emitter amplifier, the current gain is 62. The collector resistance and input resistance are $5 \text{ k}\Omega$ and 500Ω respectively. If the input voltage is 0.01 V, the output voltage is
(A) 0.62 V (B) 6.2 V (C) 62 V (D) 620 V (E) 0.01 V
8. 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
(A) 197 (B) 201 (C) 198 (D) 202 (E) 199

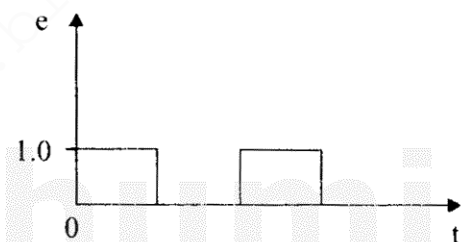
9. The real time variation of input signal A and B are as shown below. If the inputs are fed into NAND gate, then select the out put signal from the following



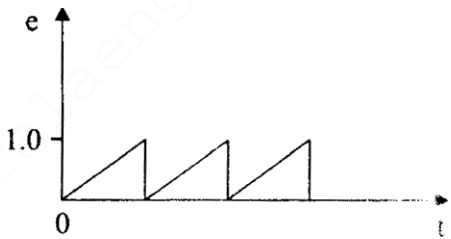
10. The time variations of signals are given as in a, b and c



a



b



c

Point out 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 are digital, but b is analogue signal
- (D) a and c are analogue, but b is digital signal
- (E) a, b and c are digital signal

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11. The optical fibres have an inner core of refractive index n_1 and a cladding of refractive index n_2 such that
(A) $n_1 = n_2$ (B) $n_1 \leq n_2$ (C) $n_1 < n_2$ (D) $n_1 > n_2$ (E) $n_1 \geq n_2$
12. A photodetector used to detect the wavelength of 1700 nm, has energy gap of about
(A) 0.073 eV (B) 1.2 eV (C) 7.3 eV (D) 1.16 eV (E) 0.73 eV
13. 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 (E) a superconductor

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14. The physical quantity angular momentum has the same dimensions as that of
(A) work (B) force (C) momentum
(D) torque (E) Planck's constant
15. 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) 3.125%
(D) 7% (E) 10.125%
16. 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) $4u$ (E) u
17. 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 ($g = 10 \text{ ms}^{-2}$)
(A) 20 m (B) 80 m (C) 170 m
(D) 40 m (E) 160 m
18. 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 (E) 10 s
19. 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. Both the balls collide at 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) 3.75 m
(D) 5 m (E) 1.25 m

20. 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 magnitudes of the forces in newton are
 (A) 6, 12 (B) 11, 7 (C) 5, 13
 (D) 14, 4 (E) 10, 8
21. The position of a particle is given by $\vec{r} = \vec{i} + 2\vec{j} - \vec{k}$ and its linear momentum is given by $\vec{p} = 3\vec{i} + 4\vec{j} - 2\vec{k}$. Then its angular momentum, about the origin is perpendicular to
 (A) yz -plane (B) z -axis (C) y -axis
 (D) x -axis (E) xz -plane
22. 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
 (A) 50° (B) 60° (C) 30°
 (D) 40° (E) 45°
23. 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^{-1} 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 (E) 5.5 kg
24. 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} (E) 8.2 ms^{-1}
25. A rod AB of mass 10 kg and length 4 m rests on 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 (E) 3.0 m

26. 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) $\frac{S}{4}, \frac{3gS}{2}$ (B) $\frac{S}{4}, \frac{\sqrt{3gS}}{2}$ (C) $\frac{S}{2}, \frac{\sqrt{3gS}}{2}$
 (D) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$ (E) $\frac{S}{3}, \sqrt{\frac{3gS}{2}}$

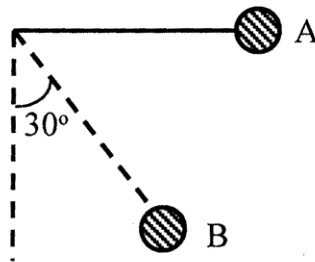
27. An electric pump is used to fill an overhead tank of capacity 9 m^3 kept at a height of 10 m above the ground. If the pump takes 5 minutes to fill the tank by consuming 10 kW power, the efficiency of the pump should be (take $g = 10 \text{ ms}^{-2}$)

(A) 60% (B) 40% (C) 20%
 (D) 30% (E) 50%

28. 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) $u^2/2g$ (E) $11u^2/9g$

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



(A) $\frac{mgl}{2}$ (B) $\frac{mgl}{\sqrt{2}}$ (C) $\frac{\sqrt{3}}{2}mgl$
 (D) $\frac{2}{\sqrt{3}}mgl$ (E) mgl

30. 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 hours (B) 1.5 hours (C) 6 hours
 (D) 4 hours (E) 2 hours

31. 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% (E) 2%
32. 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) $mgR\left(\frac{n}{n-1}\right)$ (B) mgR (C) $mgR\left(\frac{n}{n+1}\right)$
 (D) $mgR\left(\frac{n^2}{n^2+1}\right)$ (E) $\frac{mgR}{n}$
33. The escape velocity of a body on the surface of the 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 (C) 22.4 km/s
 (D) 44.8 km/s (E) 67.2 km/s
34. 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
 (A) $(3/4)H$ (B) $(2/3)H$ (C) $(1/4)H$ (D) $(1/2)H$ (E) $(1/3)H$
35. 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
 (A) $(2.5 l_2 - 1.5 l_1)$ m (B) $(6 l_2 - 1.5 l_1)$ m (C) $(3 l_1 - 2 l_2)$ m
 (D) $(3.5 l_2 - 2.5 l_1)$ m (E) $(2.5 l_2 + 1.5 l_1)$ m
36. 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
 (A) $\frac{1}{2} \frac{YA}{l} x^2$ (B) $\frac{1}{3} \frac{YA}{l} x^2$ (C) $\frac{1}{2} \frac{Yl}{A} x^2$ (D) $\frac{1}{2} \frac{YA}{l^2} x^2$ (E) $\frac{1}{2} \frac{A}{Yl} x^2$
37. 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
 (A) $3, 2$ (B) $2, 3/4$ (C) $3/2, 2$ (D) $4, 3$ (E) $3, 3/2$

38. 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
 (A) $2V, 4V$ (B) $3V, 3V$ (C) $5V, V$ (D) $4V, 2V$ (E) $2.5V, 3.5V$
39. 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 (E) 145°C
40. 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 (E) 1.2 R
41. On heating, the temperature at which water has minimum volume is
 (A) 0°C (B) 4°C (C) 4 K (D) 100°C (E) -273°C
42. In damped oscillations, the amplitude of oscillations is reduced to one-third of its initial value a_0 at the end of 100 oscillations. When the oscillator completes 200 oscillations, its amplitude must be
 (A) $a_0/2$ (B) $a_0/6$ (C) $a_0/12$ (D) $a_0/4$ (E) $a_0/9$
43. A particle executes S.H.M 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) $\sqrt{2} \pi$ (B) $16\sqrt{2} \pi$ (C) $24\sqrt{2} \pi$
 (D) $\frac{4}{\pi}$ (E) $\frac{32\sqrt{2}}{\pi}$
44. For a simple pendulum, the graph between T^2 and L is
 (A) a straight line passing through the origin (B) parabola
 (C) circle (D) ellipse (E) hyperbola

45. 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
 (A) 0.80 m , 0.63 m (B) 0.63 m , 0.80 m (C) 0.50 m , 0.85 m
 (D) 0.63 m , 0.75 m (E) 0.50 m , 0.75 m
46. 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
 (A) 200 s^{-1} (B) 100 s^{-1} (C) 300 s^{-1}
 (D) 250 s^{-1} (E) 150 s^{-1}
47. A transverse wave is described by the equation $y = y_0 \sin 2\pi \left(ft - \frac{x}{\lambda} \right)$. The maximum particle velocity is equal to four times the wave velocity if
 (A) $\lambda = \frac{\pi y_0}{4}$ (B) $\lambda = \frac{\pi y_0}{2}$ (C) $\lambda = \pi y_0$
 (D) $\lambda = 2\pi y_0$ (E) $\lambda = \frac{2\pi y_0}{3}$
48. 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 (E) zero
49. N identical drops of mercury are charged simultaneously to 10 volt. When combined to form one large drop, the potential is found to be 40 volt, the value of N is
 (A) 4 (B) 6 (C) 8
 (D) 10 (E) 12

50. The work done in moving an alpha particle between two points having potential difference 25 volt is
(A) 8×10^{-18} J (B) 8×10^{-19} J (C) 8×10^{-20} J
(D) 8×10^{-16} J (E) 4×10^{-18} J
51. The electrostatic potential energy between proton and electron separated by a distance 1 Å is
(A) 13.6 eV (B) 27.2 eV (C) 14.4 eV (D) 1.44 eV (E) 28.8 eV
52. 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) 4 mm (D) 12 mm (E) 10 mm
53. 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 wire must be
[The temperature coefficient of resistance of the material of the wire is 0.002 per $^\circ\text{C}$]
(A) 36°C (B) 83°C (C) 63°C (D) 33°C (E) 66°C
54. 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} (E) 4.25×10^{20}
55. 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 (E) 0.25

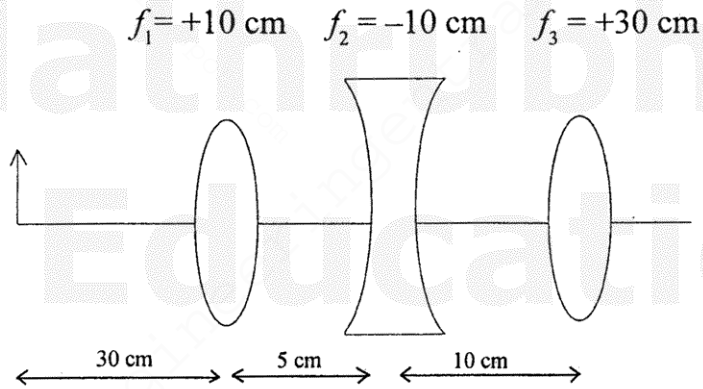
56. A potentiometer wire, 10 m long, has a resistance of 40Ω . It is connected in series with a resistance box and a 2 V storage cell. If the potential gradient along the wire is 0.1 mV/cm , the resistance unplugged in the box is
(A) 260Ω (B) 760Ω (C) 960Ω (D) 1060Ω (E) 1160Ω
57. When a current I flows 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) $\frac{v}{8}$ (B) $\frac{v}{4}$ (C) $\frac{v}{2}$ (D) v (E) $2v$
58. 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
(E) be deflected to the right with increase in speed
59. A galvanometer of resistance 20Ω shows a deflection of 10 divisions when a current of 1 mA is passed through it. If a shunt of 4Ω is connected and there are 50 divisions on the scale, the range of the galvanometer is
(A) 1 A (B) 3 A (C) 10 mA (D) 30 A (E) 30 mA
60. A conducting rod of 1 m length and 1 kg mass is suspended by two vertical wires through its ends. An external magnetic field of 2 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 A (B) 15 A (C) 5 A (D) 1.5 A (E) 2.5 A

61. A circular coil of 5 turns and of 10 cm mean diameter is connected to a voltage source. If the resistance of the coil is 10Ω , the voltage of the source so as to nullify the horizontal component of earth's magnetic field of 30 A turn m^{-1} at the centre of the coil should be
- (A) 6 V, plane of the coil normal to magnetic meridian
(B) 2 V, plane of the coil normal to magnetic meridian
(C) 6 V, plane of the coil along the magnetic meridian
(D) 2 V, plane of the coil along the magnetic meridian
(E) 4 V, plane of the coil normal to magnetic meridian
62. 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} (E) 1.2×10^{-8}
63. A square coil of side 25 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 e.m.f. induced in the coil is $e = 200 \sin 100\pi t$. The magnetic induction is
- (A) 0.50 T (B) 0.02 T (C) 10^{-3} T (D) 0.1 T (E) 0.01 T
64. 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
- (A) 25 A, 20 A (B) 20 A, 16 A (C) 25 A, 16 A
(D) 40 A, 25 A (E) 40 A, 16 A

65. When a d.c. voltage of 200 V is applied to a coil of self inductance $2\sqrt{3}/\pi$ H, a current of 1 A flows through it. But by replacing d.c. source with a.c. source of 200 V, the current in the coil is reduced to 0.5 A. Then the frequency of a.c. supply is
(A) 100 Hz (B) 75 Hz (C) 60 Hz (D) 30 Hz (E) 50 Hz
66. In a L.R. circuit, the value of L is $(0.4/\pi)$ henry and the value of R is 30 Ω . If in the circuit, an alternating e.m.f. of 200 V at 50 cycles per second is connected, the impedance of the circuit and current will be
(A) 11.4 Ω , 17.5 A (B) 30.7 Ω , 6.5 A (C) 40.4 Ω , 5 A
(D) 50 Ω , 4 A (E) 35 Ω , 6.5 A
67. The dielectric constant of air is 1.006. The speed of electromagnetic wave travelling in air is $a \times 10^8$ ms⁻¹, where a is about
(A) 3 (B) 3.88 (C) 2.5 (D) 3.2 (E) 2.8
68. a. The wavelength of microwaves is greater than that of UV-rays
b. The wavelength of IR rays is lesser than that of UV-rays
c. The wavelength of microwaves is lesser than that of IR rays
d. Gamma ray has shortest wavelength in the electromagnetic spectrum
Of the above statements
(A) a and b are true (B) b and c are true
(C) c and d are true (D) a and c are true
(E) a and d are true

69. Magnification at least distance of distinct vision of a simple microscope having its focal length 5 cm is
 (A) 2 (B) 4 (C) 5 (D) 6 (E) 7

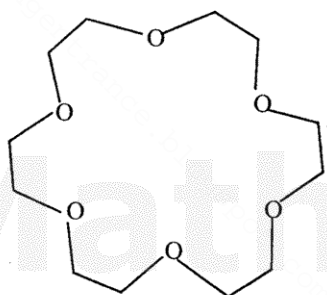
70. The position of final image formed by the given lens combination from the third lens will be at a distance of



- (A) 15 cm (B) infinity (C) 45 cm (D) 30 cm (E) 35 cm
71. A slit of width a is illuminated by red light of wavelength 6500 \AA . If the first minimum falls at $\theta = 30^\circ$, the value of a is
 (A) $6.5 \times 10^{-4} \text{ mm}$ (B) 1.3 micron (C) 3250 \AA
 (D) $2.6 \times 10^{-4} \text{ cm}$ (E) $1.3 \times 10^{-4} \text{ m}$
72. 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 $\frac{25}{9}$, then, $\frac{I_1}{I_2}$ is
 (A) $\frac{5}{3}$ (B) 4 (C) $\frac{81}{625}$ (D) 16 (E) $\frac{1}{2}$

73. Which among the following statements is correct with respect to the optical isomers ?
- (A) Enantiomers are non-superimposable mirror images
 - (B) Diastereomers are superimposable mirror images
 - (C) Enantiomers are superimposable mirror images
 - (D) Meso forms have no plane of symmetry
 - (E) Enantiomers have plane of symmetry
74. The S_N1 reactivity of the following halides will be in the order
1. $(CH_3)_3CBr$
 2. $(C_6H_5)_2CHBr$
 3. $(C_6H_5)_2C(CH_3)Br$
 4. $(CH_3)_2CHBr$
 5. C_2H_5Br
- (A) $5 > 4 > 1 > 2 > 3$ (B) $2 > 1 > 3 > 5 > 4$ (C) $1 > 3 > 5 > 2 > 4$
(D) $5 > 1 > 2 > 4 > 3$ (E) $3 > 2 > 1 > 4 > 5$
75. Which of the following does not answer iodoform test ?
- (A) n-butyl alcohol (B) sec-butyl alcohol
 - (C) acetophenone (D) acetaldehyde (E) ethyl methyl ketone

76. Crown ethers are named as X-Crown-Y. In the following crown ether, X and Y are respectively



- (A) 6 and 12 (B) 18 and 6 (C) 24 and 6 (D) 6 and 24 (E) 6 and 18
77. The most suitable reagent for the conversion of primary alcohol into aldehyde with the same number of carbon is
- (A) Acidified $K_2Cr_2O_7$ (B) Acidified $KMnO_4$ (C) Alkaline $KMnO_4$
(D) Pyridinium chlorochromate (E) CrO_3
78. The strongest base among the following is
- (A) $C_6H_5NH_2$ (B) $(C_6H_5)_2NH$ (C) NH_3
(D) $(C_2H_5)_2NH$ (E) $C_2H_5NH_2$
79. Which one of the following compounds will dissolve in an alkali solution after it has undergone reaction with Hinsberg reagent ?
- (A) CH_3NH_2 (B) $(CH_3)_3N$ (C) $(C_2H_5)_2NH$
(D) $C_6H_5NHC_6H_5$ (E) $(C_6H_5)_3NH^+Cl^-$

80. Which of the following hexoses will form the same osazone when treated with excess phenyl hydrazine
- (A) D – glucose, D – fructose and D – galactose
(B) D – glucose, D – fructose and D – mannose
(C) D – glucose, D – mannose and D – galactose
(D) D – fructose, D – mannose and D – galactose
(E) D – glucose, D – galactose and D – talose
81. Match List I with List II and select the correct answer using the codes given below
- | List I : <i>Polymers</i> | List II : <i>Monomers</i> |
|--------------------------|--|
| 1. Buna-N | a. Phthalic acid and ethylene glycol |
| 2. Nylon-66 | b. Terephthalic acid and ethylene glycol |
| 3. Dacron | c. Hexamethylenediamine and adipic acid |
| 4. Glyptal plastic | d. Isobutylene and isoprene |
| | e. Acrylonitrile and butadiene |
- (A) 1 – b, 2 – a, 3 – d, 4 – e (B) 1 – c, 2 – d, 3 – a, 4 – b
(C) 1 – d, 2 – c, 3 – b, 4 – a (D) 1 – e, 2 – c, 3 – a, 4 – b
(E) 1 – e, 2 – c, 3 – b, 4 – a
82. The photochemical smog can be suppressed by
- (A) nitrogen oxides (B) hydrocarbons (C) radical traps
(D) formaldehyde (E) peroxy acetyl nitrate
83. Pick out the statement which is 'not true'
- (A) Tartrazine is harmful edible colour
(B) Alitame is an artificial sweetener
(C) BHT is an antioxidant
(D) Sodium alkyl sulphate is a cationic detergent
(E) The performance of a rocket propellant is measured in terms of specific impulse

84. The radius of the first Bohr orbit of hydrogen atom is 0.529 \AA . The radius of the third orbit of He^+ will be
 (A) 8.46 \AA (B) 0.705 \AA (C) 1.59 \AA
 (D) 1.41 \AA (E) 2.38 \AA

85. Which diagram best represents the appearance of the line spectrum of atomic hydrogen in the visible region ?

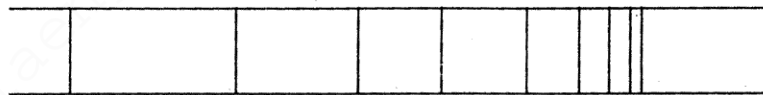
Increasing wavelength



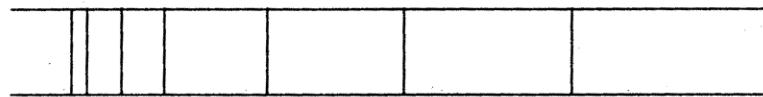
(A)



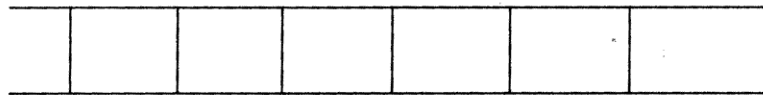
(B)



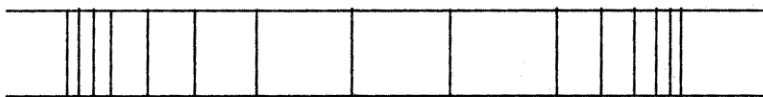
(C)



(D)



(E)



86. Which of the following is paramagnetic with bond order 0.5 ?

- (A) F_2 (B) H_2^+ (C) N_2 (D) O_2^- (E) B_2

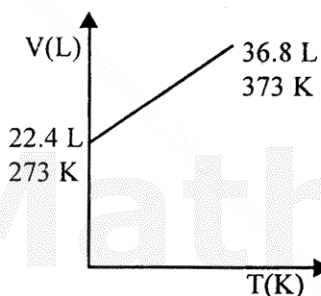
87. Match List I and List II and choose the correct matching codes from the choices given

| List I | List II |
|-------------|---------------------------|
| a. PCl_5 | 1. Linear |
| b. IF_7 | 2. Pyramidal |
| c. H_3O^+ | 3. Trigonal bipyramidal |
| d. ClO_2 | 4. Tetrahedral |
| e. NH_4^+ | 5. Pentagonal bipyramidal |
| | 6. Angular |

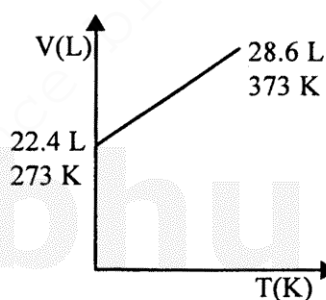
- (A) a - 3; b - 5; c - 2; d - 1; e - 4 (B) a - 3; b - 5; c - 4; d - 1; e - 2
(C) a - 3; b - 5; c - 6; d - 1; e - 2 (D) a - 3; b - 5; c - 2; d - 6; e - 4
(E) a - 3; b - 5; c - 2; d - 4; e - 1

88. Which one of the following volume (V) – temperature (T) plots represents the behaviour of one mole of an ideal gas at one atmospheric pressure ?

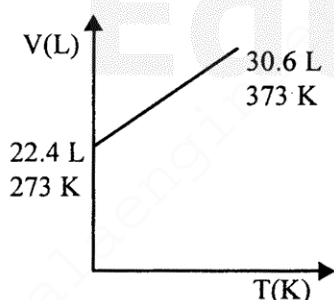
(A)



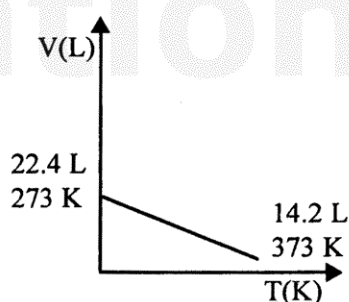
(B)



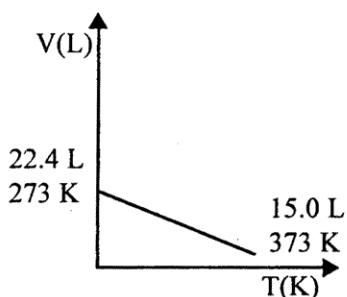
(C)



(D)



(E)



89. The cubic unit cell of Al (molar mass 27 g mol^{-1}) has an edge length of 405 pm . Its density is 2.7 g cm^{-3} . The cubic unit cell is

(A) face centered

(B) body centered

(C) primitive

(D) edge centered

(E) simple

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90. The hardness of a water sample containing 0.002 mole of magnesium sulphate dissolved in a litre of water is expressed as

- (A) 20 ppm (B) 200 ppm (C) 2000 ppm (D) 120 ppm (E) 240 ppm

91. In which one of the following pairs the radius of the second species is greater than that of the first ?

- (A) Na, Mg (B) O^{2-} , N^{3-} (C) Li^+ , Be^{2+} (D) Ba^{2+} , Sr^{2+} (E) Al, Be

92. The carbonate that will not decompose on heating is

- (A) Na_2CO_3 (B) $CaCO_3$ (C) $BaCO_3$ (D) $SrCO_3$ (E) Li_2CO_3

93. Match List I and List II. Choose the correct matching codes from the choices given

List I (*Hydride*)

List II (*Type of Hydride*)

- | | |
|--------------|-----------------|
| a. BeH_2 | 1. Complex |
| b. AsH_3 | 2. Lewis acid |
| c. B_2H_6 | 3. Interstitial |
| d. LaH_3 | 4. Covalent |
| e. $LiAlH_4$ | 5. Intermediate |
| | 6. Ionic |

(A) a - 6; b - 2; c - 4; d - 5; e - 1

(B) a - 6; b - 2; c - 4; d - 3; e - 1

(C) a - 6; b - 4; c - 2; d - 3; e - 5

(D) a - 6; b - 4; c - 2; d - 3; e - 1

(E) a - 5; b - 4; c - 2; d - 3; e - 1

94. Which among the following statements are correct ?
1. Carbon monoxide is neutral whereas SO_3 is acidic
 2. Potassium oxide is basic whereas nitrous oxide is acidic
 3. Aluminium and zinc oxides are amphoteric
 4. Sulphur trioxide is acidic whereas phosphorus pentoxide is basic
 5. Carbon dioxide is neutral whereas sulphur dioxide is amphoteric
- (A) 2 and 3 (B) 1 and 4 (C) 1 and 3 (D) 2 and 4 (E) 3 and 5
95. Among the following, the pair in which the two species are not isostructural is
- (A) IO_3^- & XeO_3 (B) PF_6^- & SF_6 (C) BH_4^- & NH_4^+
(D) CO_3^{2-} & NO_2^- (E) SiF_4 & SF_4
96. Which of the following ions has a magnetic moment of 5.93 BM ?
(At. No. V = 23; Cr = 24; Mn = 25; Fe = 26)
- (A) Mn^{2+} (B) Fe^{2+} (C) Cr^{2+} (D) V^{3+} (E) Cr^{3+}
97. When hydrogen peroxide is added to acidified potassium dichromate, a blue colour is produced due to the formation of
- (A) CrO_3 (B) Cr_2O_3 (C) CrO_5 (D) CrO_4^{-2} (E) $\text{Cr}_2\text{O}_7^{-2}$
98. The radioactive isotope Caesium -137 of weight 8 g was collected on 1st February, 2006 and kept in a sealed tube. On 1st July, 2006 it was found that only 0.25 gram of it remained. The half-life period of the isotope is
- (A) 37.5 days (B) 30 days (C) 25 days (D) 50 days (E) 60 days

99. Which of the following make up an isotonic triad ?

- (A) ${}^{78}_{32}\text{Ge}$, ${}^{77}_{33}\text{As}$, ${}^{74}_{31}\text{Ga}$ (B) ${}^{40}_{18}\text{Ar}$, ${}^{40}_{19}\text{K}$, ${}^{40}_{20}\text{Ca}$ (C) ${}^{233}_{92}\text{U}$, ${}^{232}_{90}\text{Th}$, ${}^{239}_{94}\text{Pu}$
 (D) ${}^{13}_6\text{C}$, ${}^{12}_6\text{C}$, ${}^{14}_7\text{N}$ (E) ${}^{14}_6\text{C}$, ${}^{16}_8\text{O}$, ${}^{15}_7\text{N}$

100. The age of a specimen t is related to the daughter/parent ratio of number of atoms (D/P) by the equation (λ =decay constant)

- (A) $t = \frac{1}{\lambda} \ln \left\{ \frac{D}{P} \right\}$ (B) $t = \frac{1}{\lambda} \ln \left\{ 1 + \frac{P}{D} \right\}$ (C) $t = \frac{1}{\lambda} \ln \left\{ 2 + \frac{P}{D} \right\}$
 (D) $t = \frac{1}{\lambda} \ln \left\{ 1 + \frac{D}{P} \right\}$ (E) $t = \frac{1}{\lambda} \ln \left\{ 2 + \frac{D}{P} \right\}$

101. Which one of the following set of units represents the smallest and the largest amount of energy respectively ?

- (A) J and erg (B) erg and cal (C) cal and eV
 (D) lit-atm and J (E) eV and lit-atm

102. The equilibrium constant for the reaction $2 \text{NO}_2(\text{g}) \rightleftharpoons 2 \text{NO}(\text{g}) + \text{O}_2(\text{g})$ is 2×10^{-6} at 185°C . Then the equilibrium constant for the reaction $4 \text{NO}(\text{g}) + 2 \text{O}_2(\text{g}) \rightleftharpoons 4 \text{NO}_2(\text{g})$ at the same temperature would be

- (A) 2.5×10^{-5} (B) 4×10^{-12} (C) 2.5×10^{11}
 (D) 2×10^6 (E) 5×10^5

103. The pH of a neutral water is 6.5. Then the temperature of water

- (A) is 25°C (B) is more than 25°C
 (C) is less than 25°C (D) can be more or less than 25°C
 (E) cannot be predicted

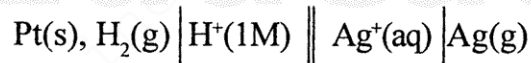
104. The relative lowering of vapour pressure of a dilute aqueous solution containing non-volatile solute is 0.0125. The molality of the solution is about

- (A) 0.70 (B) 0.50 (C) 0.90 (D) 0.80 (E) 0.60

105. If the elevation in boiling point of a solution of 10 g of solute (mol. wt = 100) in 100 g of water is ΔT_b , the ebullioscopic constant of water is

- (A) 10 (B) $100 T_b$ (C) ΔT_b (D) $\frac{\Delta T_b}{10}$ (E) $10 T_b$

106. An alloy of Pb-Ag weighing 1.08 g was dissolved in dilute HNO_3 and the volume made to 100 ml. A silver electrode was dipped in the solution and the EMF of the cell set up



was 0.62 V. If $E_{\text{Cell}}^0 = 0.80$ V what is the percentage of Ag in the alloy ?

[At 25°C , $\frac{RT}{F} = 0.06$]

- (A) 25 (B) 2.50 (C) 10 (D) 1 (E) 5

107. The standard oxidation potentials of Zn, Cu, Ag and Ni electrodes are +0.76, -0.34, -0.80 and +0.25 V respectively. Which of the following reaction will provide maximum voltage ?

- (A) $\text{Cu} + 2 \text{Ag}^+\text{(aq)} \rightarrow \text{Cu}^{2+}\text{(aq)} + 2 \text{Ag}$ (B) $\text{Zn} + 2 \text{Ag}^+\text{(aq)} \rightarrow \text{Zn}^{2+}\text{(aq)} + 2 \text{Ag}$
 (C) $\text{H}_2 + \text{Ni}^{2+}\text{(aq)} \rightarrow 2 \text{H}^+\text{(aq)} + \text{Ni}$ (D) $\text{Zn} + \text{Cu}^{2+}\text{(aq)} \rightarrow \text{Zn}^{2+}\text{(aq)} + \text{Cu}$
 (E) $\text{Zn} + 2 \text{H}^+\text{(aq)} \rightarrow \text{Zn}^{2+}\text{(aq)} + \text{H}_2$

108. The activation energy of exothermic reaction $\text{A} \rightarrow \text{B}$ is 80 kJ mol^{-1} . The heat of reaction is 200 kJ mol^{-1} . The activation energy for the reaction $\text{B} \rightarrow \text{A}$ (in kJ mol^{-1}) will be

- (A) 80 (B) 120 (C) 40 (D) 200 (E) 280

109. At 500 K, the half-life period of a gaseous reaction at an initial pressure of 80 kPa is 350 s. When the pressure is 40 kPa the half-life period is 175 s. The order of the reaction is
- (A) Zero (B) One (C) Two (D) Three (E) Half
110. The efficiency of enzyme catalysis is due to its capacity to
- (A) form a strong enzyme-substrate complex
(B) change the shape of the substrate
(C) lower the activation energy of the reaction
(D) form a colloidal solution in water
(E) decrease the bond energies in substrate molecules
111. On adding one ml solution of 10% NaCl to 10 ml of gold sol in the presence of 0.25 g of starch, the coagulation is just prevented. The gold number of starch is
- (A) 0.25 (B) 0.025 (C) 2.5 (D) 25 (E) 250
112. Which of the following statements is not correct ?
- (A) The complexes $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CN})_4]^{2-}$ differ in the state of hybridization of nickel
- (B) The complexes $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CN})_4]^{2-}$ differ in the magnetic properties
- (C) The complexes $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CN})_4]^{2-}$ differ in geometry
- (D) The complexes $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CN})_4]^{2-}$ differ in primary valencies of nickel
- (E) Nickel ion has the same secondary valency in the complexes $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{CN})_4]^{2-}$

113. Both Co^{3+} and Pt^{4+} have a coordination number of six. Which of the following pairs of complexes will show approximately the same electrical conductance for their 0.001 M aqueous solutions ?

- (A) $\text{CoCl}_3 \cdot 4\text{NH}_3$ and $\text{PtCl}_4 \cdot 4\text{NH}_3$
- (B) $\text{CoCl}_3 \cdot 3\text{NH}_3$ and $\text{PtCl}_4 \cdot 5\text{NH}_3$
- (C) $\text{CoCl}_3 \cdot 6\text{NH}_3$ and $\text{PtCl}_4 \cdot 5\text{NH}_3$
- (D) $\text{CoCl}_3 \cdot 6\text{NH}_3$ and $\text{PtCl}_4 \cdot 3\text{NH}_3$
- (E) $\text{CoCl}_3 \cdot 5\text{NH}_3$ and $\text{PtCl}_4 \cdot 6\text{NH}_3$

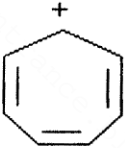
114. Compare List I and List II, and choose the correct matching codes from the choices given

| List I | List II |
|---------------------|--------------------------|
| a. Glycerol | 1. Sublimation |
| b. o-nitrophenol | 2. Beilstein's test |
| c. Anthracene | 3. Victor-Meyer's method |
| d. Halogens | 4. Steam distillation |
| e. Molecular weight | 5. Vacuum distillation |
| | 6. Eudiometry |

- (A) a - 5; b - 4; c - 1; d - 2; e - 3
- (B) a - 4; b - 5; c - 1; d - 6; e - 2
- (C) a - 6; b - 4; c - 1; d - 3; e - 2
- (D) a - 5; b - 4; c - 6; d - 2; e - 3
- (E) a - 4; b - 6; c - 2; d - 3; e - 5

118. Pick out the wrong statement

(A) Toluene shows resonance

(B)  is non aromatic

(C) The hybrid state of carbon in carbonyl group is sp^2

(D) The hyperconjugative effect is known as no bond resonance

(E) Dipole moment of vinyl chloride is less than that of methyl chloride

119. Which of the following is not true of carbanions ?

(A) The carbon carrying the charge has eight valence electrons

(B) They are formed by heterolytic fission

(C) They are paramagnetic

(D) The carbon carrying the charge is sp^3 hybridised

(E) They have pyramidal structure

120. The number of isomers for the compound with the molecular formula $C_2BrClFI$ is

(A) 3

(B) 4

(C) 5

(D) 6

(E) 7