

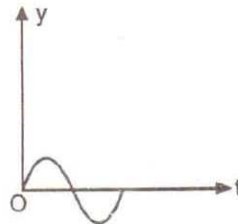
1. The dimensions of $\frac{a}{b}$ in the equation

$$P = \frac{a - t^2}{bx}$$

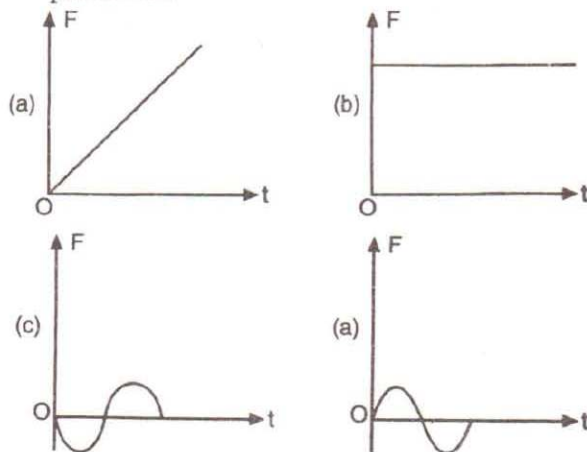
where P is pressure, x is distance and t is time, are:

- (a) $[M^2LT^{-3}]$ (b) $[MT^{-2}]$
 (c) $[LT^{-3}]$ (d) $[ML^3T^{-1}]$
2. Three vectors satisfy the relation $\vec{A} \cdot \vec{B} = 0$ and $\vec{A} \cdot \vec{C} = 0$, then \vec{A} is parallel to:
 (a) \vec{C} (b) \vec{B}
 (c) $\vec{B} \times \vec{C}$ (d) $\vec{B} \cdot \vec{C}$
3. A student is standing at a distance of 50 metre from the bus. As soon as the bus begins its motion with an acceleration of 1 ms^{-2} , the student starts running towards the bus with a uniform velocity u . Assuming the motion to be along a straight road, the minimum value of u , so that the student is able to catch the bus is:
 (a) 8 ms^{-1} (b) 5 ms^{-1}
 (c) 12 ms^{-1} (d) 10 ms^{-1}
4. For a given velocity, a projectile has the same range R for two angles of projection if t_1 and t_2 are the time of flight in the two cases, then:
 (a) $t_1 t_2 \propto R$ (b) $t_1 t_2 \propto R^2$
 (c) $t_1 t_2 \propto \frac{1}{R^2}$ (d) $t_1 t_2 \propto \frac{1}{R}$
5. Weight of a body of mass m decreases by 1% when it is raised to height h above the earth's surface. If the body is taken to a depth h in a mine, change in its weight is:
 (a) 0.5% decrease (b) 2% decrease
 (c) 0.5% increase (d) 1% increase

6. The displacement time graph of a particle executing S.H.M. is as shown in the figure.



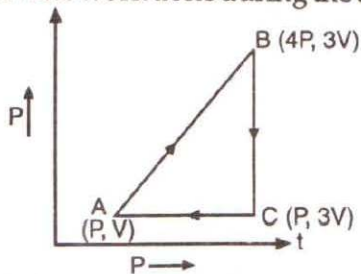
The corresponding force-time graph of the particle is:



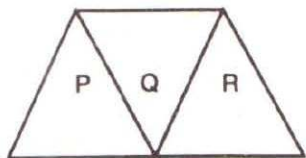
7. Which of the following sets of concurrent forces may be in equilibrium?
 (a) $F_1 = 3\text{N}$, $F_2 = 5\text{N}$, $F_3 = 1\text{N}$
 (b) $F_1 = 3\text{N}$, $F_2 = 5\text{N}$, $F_3 = 9\text{N}$
 (c) $F_1 = 3\text{N}$, $F_2 = 5\text{N}$, $F_3 = 6\text{N}$
 (d) $F_1 = 3\text{N}$, $F_2 = 5\text{N}$, $F_3 = 15\text{N}$
8. Young's modulus of perfectly rigid body material is:
 (a) infinite (b) zero
 (c) $10 \times 10^{10} \text{ N/m}^2$ (d) $1 \times 10^{10} \text{ N/m}^2$

9. An ideal monoatomic gas at 27°C is compressed adiabatically to $8/27$ times of its present volume. The increase in temperature of the gas is :
- (a) 375°C (b) 402°C
 (c) 175°C (d) 475°C

10. A sample of ideal monoatomic gas is taken round the cycle $ABCA$ as shown in the figure. The work done during the cycle is :



- (a) $3 PV$ (b) zero
 (c) $9 PV$ (d) $6 PV$
11. A bucket full of hot water is kept in a room. It cools from 75°C to 70°C in t_1 minutes, from 70°C to 65°C in t_2 minutes and from 65°C to 60°C in t_3 minutes. Then :
- (a) $t_1 < t_2 < t_3$ (b) $t_1 = t_2 = t_3$
 (c) $t_1 < t_2 > t_3$ (d) $t_1 > t_2 > t_3$
12. A fish, looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is $4/3$ and the fish is 12 cm below the surface of water, the radius of the circle in centimetre is :
- (a) $\frac{12 \times 3}{\sqrt{5}}$ (b) $12 \times 3 \times \sqrt{5}$
 (c) $\frac{12 \times 3}{\sqrt{7}}$ (d) $12 \times 3 \times \sqrt{7}$
13. A given ray of light suffers minimum deviation in an equilateral prism P . Additional prisms Q and R of identical



shape and material are now added to P , as shown in the figure. The ray will suffer :

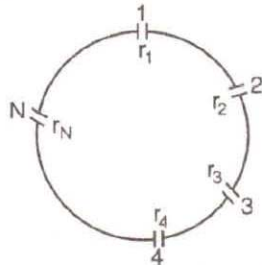
- (a) same deviation
 (b) greater deviation
 (c) total internal reflection
 (d) no deviation
14. The aperture of the objective lens of a telescope is made large so as to :
- (a) increase the resolving power of the telescope
 (b) increase the magnifying power of the telescope.
 (c) to focus on distant objects
 (d) make image aberrationless
15. A lamp hanging 4 metres above the table is lowered by 1 metre. The illumination on the table :
- (a) decreased by 25%
 (b) increased by 25%
 (c) decreased by 66.7%
 (d) increased by 77.7%
16. The equation of a transverse wave travelling along positive x axis with amplitude 0.2 m , velocity 360 m/sec and wavelength 60 m can be written as :
- (a) $y = 0.2 \sin \pi \left[6t + \frac{x}{60} \right]$
 (b) $y = 0.2 \sin \pi \left[6t - \frac{x}{60} \right]$
 (c) $y = 0.2 \sin 2\pi \left[6t - \frac{x}{60} \right]$
 (d) $y = 0.2 \sin 2\pi \left[6t + \frac{x}{60} \right]$
17. If v_m is the velocity of sound in moist air, v_d is the velocity of sound in dry air, under identical conditions of pressure and temperature :
- (a) $v_m < v_d$ (b) $v_m > v_d$
 (c) $v_m v_d = 1$ (d) $v_m = v_d$
18. If T is the reverberation time of an auditorium of volume V , then
- (a) $T \propto V^2$ (b) $T \propto V$
 (c) $T \propto \frac{1}{V}$ (d) $T \propto \frac{1}{V^2}$

19. Two wires are fixed in a sonometer. Their tensions are in the ratio 8 : 1. The lengths are in the ratio 36 : 35. The diameters are in the ratio 4 : 1. Densities of the materials are in the ratio 1 : 2. If the higher frequency in the setting is 360 Hz, the beat frequency when the two wires are sounded together, is :
- (a) 8 (b) 5
(c) 10 (d) 6
20. A sound source is moving towards stationary listener with $\frac{1}{10}$ th of the speed of sound. The ratio of apparent to real frequency is :
- (a) $\left(\frac{9}{10}\right)^2$ (b) $\frac{10}{9}$
(c) $\frac{11}{10}$ (d) $\left(\frac{11}{10}\right)^2$
21. If v is the speed of sound in air then the shortest length of the closed pipe which resonates to a frequency n , is :
- (a) $\frac{v}{2n}$ (b) $\frac{v}{4n}$
(c) $\frac{4n}{v}$ (d) $\frac{2n}{v}$
22. Cavitation is a special application property exhibited only by :
- (a) ultrasonics
(b) electromagnetic waves
(c) audible sound
(d) infrasonics
23. In Young's double slit experiment, the fringe width is β , If the entire arrangement is placed in a liquid of refractive index n , the fringe width becomes :
- (a) $n\beta$ (b) $\frac{\beta}{n+1}$
(c) $\frac{\beta}{n-1}$ (d) $\frac{\beta}{n}$
24. Yellow light is used in single slit diffraction experiment with slit width 0.6 mm. If yellow light is replaced by X-rays, then the pattern will reveal that :
- (a) no diffraction pattern
(b) that the central maxima narrower
(c) less number of fringes
(d) more number of fringes
25. In an interference experiment, third bright fringe is obtained at a point on the screen with a light of 700 nm. What should be the wavelength of the light source in order to obtain 5th bright fringe at the same point?
- (a) 630 nm (b) 500 nm
(c) 420 nm (d) 750 nm
26. If a ray of light in a denser medium enters into a rarer medium at an angle of incidence i , the angle of reflection and refraction are respectively r and r' . If the reflected and refracted rays are at right angles to each other, the critical angle for the given pair of media is :
- (a) $\sin^{-1}(\tan r')$ (b) $\sin^{-1}(\tan r)$
(c) $\tan^{-1}(\sin i)$ (d) $\cot(\tan i)$
27. Waves that can not be polarised are :
- (a) electromagnetic waves
(b) light waves
(c) longitudinal waves
(d) transverse waves
28. The phenomenon of rotation of plane of plane polarized light is called :
- (a) Kerr effect
(b) double refraction
(c) optical activity
(d) dichroism
29. As a result of interference of two coherent sources of light energy is :
- (a) redistributed and the distribution does not vary with time
(b) increased
(c) redistributed and that distribution changes with time
(d) decreased
30. There are n_1 photons of frequency ν_1 in a beam of light. In an equally energetic

(a) $\frac{4R}{3} \Omega$ (b) $2R \Omega$

(c) $R \Omega$ (d) $\frac{2R}{3} \Omega$

40. A group of N cells whose emf varies directly with the internal resistance as per the equation $E_N = 1.5 r_N$ are connected as shown in the figure above. The current I in the circuit is:



(a) 5.1 A (b) 0.51 A (c) 1.5 A (d) 0.15 A

41. The temperature coefficient of resistance of a wire is $0.00125/^\circ\text{C}$. Its resistance is 1 ohm at 300 K. Its resistance will be 2 ohm at:

(a) 1127 K (b) 1400 K
(c) 1154 K (d) 1100 K

42. A potentiometer has uniform potential gradient. The specific resistance of the material of the potentiometer wire is 10^{-7} ohm-metre and the current passing through it is 0.1 ampere, cross-section of the wire is 10^{-6}m^2 . The potential gradient along the potentiometer wire is:

(a) 10^{-6}V/m (b) 10^{-4}V/m
(c) 10^{-8}V/m (d) 10^{-2}V/m

43. A fuse wire with radius 1 mm blows at 1.5 ampere. The radius of the fuse wire of the same material to blow at 3A will be:

(a) $3^{1/4} \text{mm}$ (b) $4^{1/3} \text{mm}$
(c) $3^{1/2} \text{mm}$ (d) $2^{1/3} \text{mm}$

44. A wire in the form of a circular loop of one turn carrying a current produces a magnetic field B at the centre. If the same wire is looped into a coil of two turns and carries the same current, the new value of magnetic induction at the centre is:

(a) $3B$ (b) $5B$ (c) $4B$ (d) $2B$

45. To send 10% of the main current through a moving coil galvanometer of resistance 99 ohm, the shunt required is :

(a) 10 ohm (b) 9.9 ohm

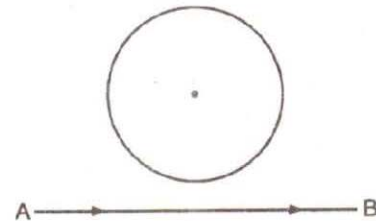
(c) 9 ohm (d) 11 ohm

46. The magnetic flux linked with a coil at any instant ' t ' is given by $\phi = 5t^3 - 100t + 300$, the emf induced in the coil at $t = 2$ second is :

(a) 40 V (b) -40 V

(c) 300 V (d) 140 V

47. A charged particles moves along the line AB , which lies in the same plane of a circular loop of conducting wire as shown in the figure. Then :



- (a) no current will be induced in the loop
(b) the current induced in the loop will change its direction as the charged particle passes by

- (c) the current induced will be anticlockwise

- (d) the current induced, will be clockwise

48. The time taken by A.C. of 50 Hz in reaching from zero to the maximum value is:

(a) $50 \times 10^{-3} \text{sec}$ (b) $5 \times 10^{-3} \text{sec}$

(c) $1 \times 10^{-3} \text{sec}$ (d) $2 \times 10^{-3} \text{sec}$

49. The ratio of the secondary to the primary turns in a transformer is 3 : 2 and the output power is P . Neglecting all power losses, the input power must be :

(a) $P/2$

(b) P

(c) $2P/3$

(d) $3P/2$

50. The material used for permanent magnet has :

- (a) low retentivity, high coercivity

- (b) high retentivity, low coercivity

- (c) high retentivity, high coercivity

- (d) low retentivity, low coercivity

51. A particle of mass M at rest decays into two masses m_1 and m_2 with non zero velocities. The ratio of de-Broglie

wavelengths of the particles $\frac{\lambda_1}{\lambda_2}$ is :

- (a) $\frac{m_2}{m_1}$ (b) $\frac{m_1}{m_2}$
 (c) $\frac{\sqrt{m_1}}{\sqrt{m_2}}$ (d) 1 : 1

52. For an electron in the second orbit of Bohr's hydrogen atom, the moment of linear momentum is :

- (a) πh (b) $2\pi h$
 (c) $\frac{h}{\pi}$ (d) $\frac{2h}{\pi}$

53. If elements with principal quantum number $n > 4$ were not allowed in nature, the number of possible elements would have been :

- (a) 32 (b) 60
 (c) 64 (d) 4

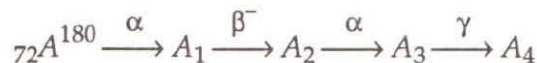
54. In photoelectric effect, the number of electrons ejected per second is :

- (a) proportional to the wavelength of light
 (b) proportional to the intensity of light
 (c) proportional to the work function of the metal
 (d) proportional to the frequency of light

55. Half life of a radioactive substance is 20 minutes. The time between 20% and 80% decay will be :

- (a) 40 minutes (b) 20 minutes
 (c) 25 minutes (d) 30 minutes

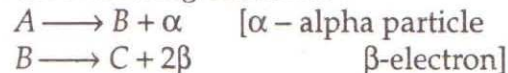
56. A hypothetical radioactive nucleus decays according to the following series



If the mass number and atomic number of A are respectively 180 and 72. Then the atomic number and mass number of A will respectively be :

- (a) 69, 171 (b) 70, 172
 (c) 68, 172 (d) 69, 172

57. Nucleus A is converted into C through the following reactions :



then :

- (a) A and B are isotopes
 (b) A and C are isobars
 (c) A and B are isobars
 (d) A and C are isotopes

58. If m , m_n and m_p are the masses of ${}_Z X^A$ nucleus, neutron and proton respectively :

- (a) $m = (A - Z)m_n + Zm_p$
 (b) $m < (A - Z)m_n + Zm_p$
 (c) $m > (A - Z)m_n + Zm_p$
 (d) $m = (A - Z)m_p + Zm_n$

59. The electrical circuit used to get smooth D.C output from a rectifier circuit is called :

- (a) filter (b) oscillator
 (c) logic gates (d) amplifier

60. In the case of constants α and β of a transistor :

- (a) $\alpha = \beta$ (b) $\beta < 1, \alpha > 1$
 (c) $\alpha\beta = 1$ (d) $\beta > 1, \alpha < 1$

Answer – Key

1.	b	2.	c	3.	d	4.	a	5.	a	6.	a	7.	c	8.	a	9.	a	10.	a
11.	a	12.	c	13.	a	14.	a	15.	d	16.	c	17.	b	18.	b	19.	c	20.	b
21.	b	22.	a	23.	d	24.	a	25.	c	26.	b	27.	c	28.	c	29.	a	30.	c
31.	d	32.	d	33.	d	34.	c	35.	d	36.	a	37.	d	38.	b	39.	d	40.	c
41.	a	42.	d	43.	b	44.	c	45.	d	46.	a	47.	c	48.	b	49.	b	50.	c
51.	d	52.	c	53.	b	54.	b	55.	a	56.	d	57.	d	58.	b	59.	a	60.	d