NOTE : DO NOT BREAK THE SEAL UNTIL YOU GO THROUGH THE FOLLOWING INSTRUCTIONS

COMMON ENTRANCE TEST - 2011

Question Booklet PHYSICS

Booklet No.

Roll No. | | | | | | |

Series A 108497

(Enter your Roll Number in the above space)

Time Allowed : 1.30 Hours **Max. Marks : 75**

INSTRUCTIONS :

1. Use only BLACK or BLUE Ball Pen.
2. All questions are COMPULSORY.
3. Check the BOOKLET thoroughly.

   IN CASE OF ANY DEFECT - MISPRINTS, MISSING QUESTION/S OR DUPLICATION OF QUESTION/S, GET THE BOOKLET CHANGED WITH THE BOOKLET OF THE SAME SERIES. NO COMPLAINT SHALL BE ENTERTAINED AFTER THE ENTRANCE TEST.
4. Before you mark the answer, fill in the particulars in the ANSWER SHEET carefully and correctly. Incomplete and incorrect particulars may result in the non-evaluation of your answer sheet by the technology.
5. Write the SERIES and BOOKLET NO. given at the TOP RIGHT HAND SIDE of the question booklet in the space provided in the answer sheet by darkening the corresponding circles.
6. Do not use any **eraser, fluid pens, blades** etc., otherwise your answer sheet is likely to be rejected whenever detected.
7. After completing the test, candidates are advised to hand over the OMR ANSWER SHEET to the Invigilator and take the candidate's copy with yourself.

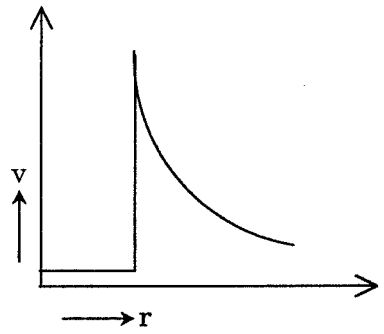
SEAL

1. An electric charge of 8.85×10^{-13} C is placed at the centre of a sphere of radius 1 m. The electric flux through the sphere is :

(1) 0.2 $NC^{-1}m^2$ (2) 0.1 $NC^{-1}m^2$ (3) 0.3 $NC^{-1}m^2$ (4) 0.01 $NC^{-1}m^2$

2. In the case of a hollow metallic sphere, without any change inside the sphere, electric potential (v) changes with respect to distance (r) from the centre as :

(1)



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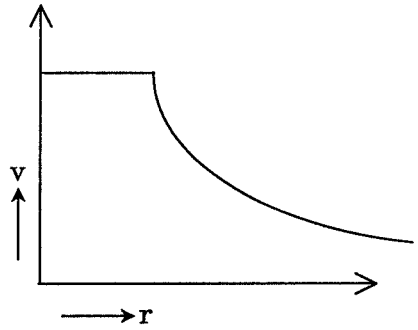

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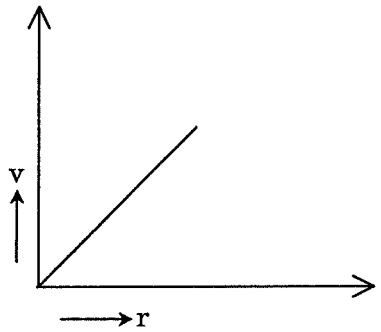

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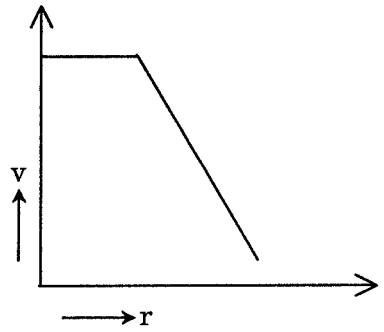
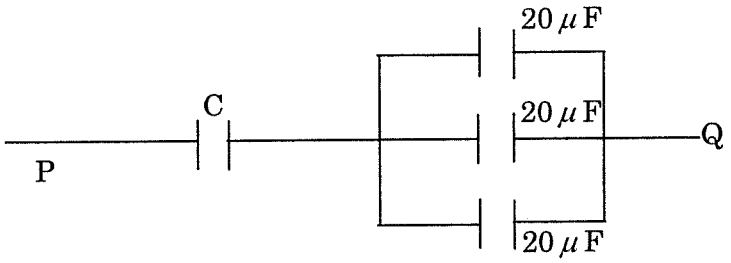


3. An electric dipole is placed in an uniform electric field with the dipole axis making an angle 'θ' with the direction of the electric field. The orientation of the dipole for stable equilibrium is :

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$ (3) 0 (4) $\frac{\pi}{2}$

Space For Rough Work

4. If the equivalent capacitance between P and Q of the combination of the capacitors shown in figure below is $30\,\mu F$, the capacitor C is :



(1) $60\ \mu F$ (2) $30\ \mu F$ (3) $10\ \mu F$ (4) $5\ \mu F$

5. A charge Q is placed at the origin. The electric potential due to this charge at a given point in space is 'v'. The work done by an external force in bringing another charge q from infinity up to the point is :

(1) $\frac{v}{q}$ (2) vq (3) $v+q$ (4) v

6. A parallel plate capacitor has two square plates with equal and opposite charges. The surface charge densities on the plates are $+\sigma$ and $-\sigma$ respectively. In the region between the plates the magnitude of the electric field is :

(1) $\frac{\sigma}{2\varepsilon_0}$ (2) $\frac{\sigma}{\varepsilon_0}$ (3) 0 (4) None of the above

7. A capacitor of capacitance C_1 is charged to a potential V and then connected in parallel to an uncharged capacitor of capacitance C_2. The final potential difference across each capacitor will be :

(1) $\frac{C_1V}{C_1+C_2}$ (2) $\frac{C_2V}{C_1+C_2}$ (3) $1+\frac{C_2}{C_1}$ (4) $1-\frac{C_2}{C_1}$

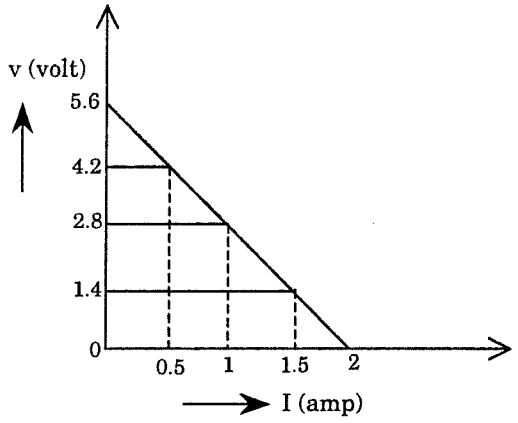
Space For Rough Work

8. Magnitude of drift velocity per unit electric field is :

(1) Current density (2) Current

(3) Resistivity (4) Mobility

9. Four cells of identical emf '*E*' and internal resistance '*r*' are connected is series to a variable resistor. The following graph shows the variation of terminal voltage of the combination with current. The emf of each cell used is :



(1) 1.4 V (2) 5.6 V (3) 2 V (4) 1 V

10. Fractional increase in resistivity per unit increase in temperature is defined as :

(1) Resistivity (2) Temperature Coefficient of resistivity

(3) Conductivity (4) Drift velocity

11. Kirchhoff 's I^{st} law for analysis of current at a junction in a circuit is based on :

(1) Conservation of charge (2) Conservation of energy

(3) Conservation of momentum (4) Newton's 3^{rd} law of motion

Space For Rough Work

12. The material whose resistivity is insensitive to temperature is :
(1) Silicon (2) Copper
(3) Silver (4) Nichrome

13. The path of a charged particle in a uniform magnetic field, when the velocity and the magnetic field are perpendicular to each other is a :
(1) Circle (2) Parabola
(3) Helix (4) Straight line

14. The particle that cannot be accelerated by a cyclotron is :
(1) Proton (2) α-Particle
(3) Electron (4) Deuteron nucleus

15. A Galvanometer can be converted into a voltmeter by connecting :
(1) Low resistance in series (2) High resistance in series
(3) Low resistance in parallel (4) High resistance in parallel

16. A 100 turn closely wound circular coil of radius 10 cm carries a current of 3.2 A. The magnetic moment of the coil is, approximately,
(1) 5 Am^2 (2) 10 Am^2 (3) 20 Am^2 (4) 40 Am^2

17. The angle which the total magnetic field of earth makes with the surface of the earth is called :
(1) Declination (2) Magnetic meridian
(3) Geographic Meridian (4) Inclination

18. If the magnetic susceptibility of a material is large and positive. The material is :
(1) Diamagnetic (2) Ferromagnetic
(3) Paramagnetic (4) Perfect diamagnetic

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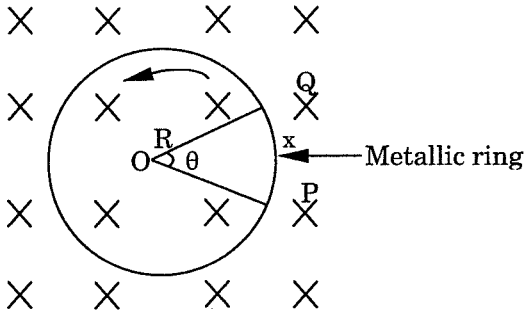
19. The statement "Polarity of induced emf is such that it tends to produce a current which opposes the change in magnetic flux that produced it" is known as :

(1) Faraday's Law (2) Gauss's Law

(3) Coulomb's Law (4) Lenz's Law

20. A metallic rod of length 'R' is rotated with an angular frequency 'W' with one end hinged at the centre and the other end at the circumference of a circular metallic ring of radius R, about an axis passing through the centre and perpendicular to the plane of the ring. There is a magnetic field B, perpendicular to the plane of the ring. The emf induced between the centre and the metallic ring is :



(1) $B \sin wt$ (2) $\frac{BR^2W}{2}$

(3) $2\,BR^2W$ (4) BR^2W

21. When the current changes form $+2A$ to $-2A$ in 0.05 seconds, an emf of 8 V is induced in a coil. The coefficient of self inductance of the coil is :

(1) 0.2 H (2) 0.4 H (3) 0.8 H (4) 0.1 H

Space For Rough Work

22. An LCR series circuit is under resonance. If I_m is current amplitude, V_m is voltage amplitude, R is the resistance, Z is the impedance, X_L is the inductive reactance and X_C is the Capacitive reactance then,

(1) $I_m = \frac{V_m}{Z}$ (2) $I_m = \frac{V_m}{X_L}$ (3) $I_m = \frac{V_m}{X_C}$ (4) $I_m = \frac{V_m}{R}$

23. In the case of an Inductor :

(1) Voltage lags the current by $\frac{\pi}{2}$ (2) Voltage leads the current by $\frac{\pi}{2}$

(3) Voltage leads the current by $\frac{\pi}{3}$ (4) Voltage leads the current by $\frac{\pi}{4}$

24. The part of the spectrum of the electromagnetic radiation used to cook food is :

(1) Ultraviolet rays (2) Cosmic rays

(3) X rays (4) Microwaves

25. A point source that emits waves uniformly in all directions, produces wavefronts that are :

(1) Spherical (2) Elliptical

(3) Cylindrical (4) Planar

26. Sun is visible a little before the actual sunrise and until a little after the actual sunset. This is due to :

(1) Total internal reflection (2) Reflection

(3) Refraction (4) Polarization

Space For Rough Work

27. Rainbow is a phenomenon due to :

(1) Dispersion alone

(2) Refraction alone

(3) Reflection alone

(4) Combined effect of dispersion, refraction and reflection

28. In a double-slit experiment, the two slits are separated by one millimeter and the screen is placed one meter away. The fringe separation for blue green light of wavelength 500 nm is :

(1) 10 mm (2) 0.5 mm (3) 20 mm (4) 15 mm

29. In the case of light waves from two coherent sources S_1 and S_2, there will be constructive interference at an arbitrary point 'P', if the path difference $S_1P - S_2P$ is :

(1) $(n + ½)\lambda$ (2) $n\lambda$ (3) $(n - ½)\lambda$ (4) $\lambda/2$

30. Which of the following statements is correct regarding the photoelectric experiment?

(1) The photocurrent increases with Intensity of light

(2) Stopping potential increases with increase in intensity of incident light

(3) The photo current increases with increase in frequency

(4) All of the above

31. The de Broglie Wavelength λ of an electron accelerated through a potential V (in volts) is :

(1) $\frac{1.227}{\sqrt{V}}$ nm (2) $\frac{0.1227}{\sqrt{V}}$ nm

(3) $\frac{0.01227}{\sqrt{V}}$ nm (4) $\frac{0.1227}{\sqrt{V}}$ A°

Space For Rough Work

32. If the particles listed below all have the same kinetic energy, which one would possess the shortest de Broglie wavelength?

(1) Deuteron (2) α - Particle

(3) Proton (4) Electron

33. Which of the following quantities for a nucleus is independent of its mass number?

(1) Density (2) Volume

(3) Mass (4) Radius

34. The element with maximum value of binding energy per nucleon is :

(1) Iron (2) Aluminium

(3) Uranium (4) Hydrogen

35. The S.I. unit of activity of a radioactive sample is :

(1) Curie (2) Rutherford

(3) Becquerel (4) MilliCurie

36. In Beta minus decay a neutron transforms within the nucleus according to :

(1) $P \rightarrow n + e^{+} + v$ (2) $n \rightarrow p + e^{-} + \overline{v}^{-}$

(3) $n \rightarrow p + e^{+} + \overline{v}^{-}$ (4) $n \rightarrow p + e^{+} + v$

37. P type semiconductor is obtained by doping :

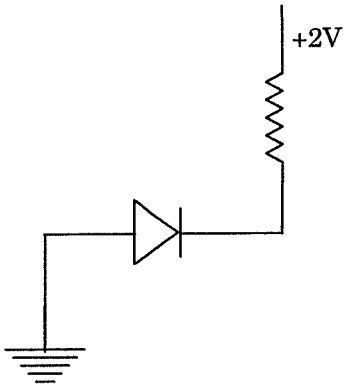
(1) Germanium with Arsenic (2) Germanium with Aluminium

(3) Germanium with Antimony (4) Germanium with Phosphorus

Space For Rough Work

38. In which of the following figures, the PN diode is forward biased :

(1)



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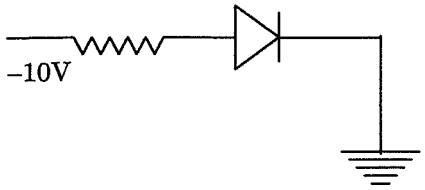

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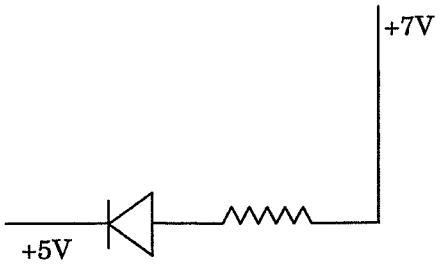

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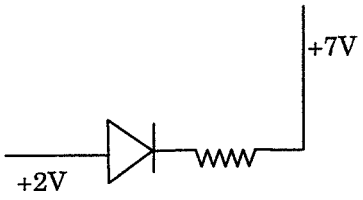

39. The PN Junction which generates an emf when solar radiation falls on it, with no external bias applied, is a :

(1) Light emitting diode
(2) Photodiode
(3) Solar Cell
(4) Zener Diode

40. The transfer characteristics of a base biased transistor has the operation regions, namely, cutoff, active region and saturation region. For using the transistor as an amplifier it has to operate in the :

(1) Active region
(2) Cutoff region
(3) Saturation region
(4) Cutoff and saturation

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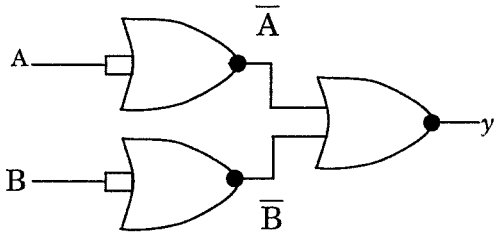
41. The output y of the circuit shown is :



(1) $y = A \cdot B$ (2) $y = \overline{A} \cdot \overline{B}$

(3) $y = \overline{A + B}$ (4) $y = A + B$

42. A radio wave that travels in a straight line from the transmitting antenna to the receiving antenna is known as :

(1) Sky wave (2) Ground wave

(3) Space wave (4) Ionospheric wave

43. The ratio of Tensile stress to the longitudinal strain is defined as :

(1) Bulk modulus (2) Young's modulus

(3) Shear modulus (4) Compressibility

44. In the case of a sphere falling through a viscous medium, it attains terminal velocity when :

(1) Viscous force plus buoyant force becomes equal to force of gravity

(2) Viscous force is zero

(3) Viscous force plus force of gravity becomes equal to buoyant force

(4) Buoyant force becomes equal to force of gravity

Space For Rough Work

45. If R is the radius of a soap bubble and 'S' its surface tension then the excess pressure inside is :

(1) $\frac{2S}{R}$ (2) $\frac{3S}{R}$ (3) $\frac{4S}{R}$ (4) $\frac{S}{R}$

46. For a body immersed in a liquid, when the weight of the body is less than the upthrust then the body will :

(1) Float partially immersed (2) Sink

(3) Float fully immersed (4) Be of zero weight

47. An aeroplane of mass 3×10^4 kg and total wing area of $120\,m^2$ is in a level flight at some height. The difference in pressure between the upper and lower surface of its wings in kilopascal is ($g = 10\,m/s^2$)

(1) 2.5 (2) 5 (3) 10 (4) 15

48. The S.I. unit of thermal conductivity is :

(1) $JSM^{-1}K^{-1}$ (2) $W^{-1}M^{-1}K^{-1}$ (3) $WM^{-1}K^{-1}$ (4) $WM^{-2}K^{-1}$

49. The rate of loss of heat of a body is directly proportional to the difference of temperature of the body and the surroundings. This statement is known as :

(1) Stefan's Law (2) Newton's Law of cooling

(3) Wien's Law (4) Kirchhoff 's Law

50. Water is used as a coolant in automobile radiators owing to its high :

(1) Viscosity (2) Surface tension

(3) Latent heat (4) Specific heat capacity

Space For Rough Work

51. A Thermodynamic process in which the system is insulated from the surroundings and no heat flows between the system and the surroundings is an :

(1) Isothermal Process (2) Adiabatic Process

(3) Isochoric Process (4) Isobaric Process

52. The Temperature of the sink of a Carnot engine is 27°C and its efficiency is 25%. The temperature of the source is :

(1) 227°C (2) 27°C (3) 327°C (4) 127°C

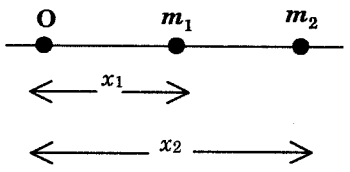
53. The moment of Inertia of a rod of mass '*M*' length '*l*' about an axis perpendicular to it through one end is :

(1) $\frac{Ml^2}{12}$ (2) $\frac{Ml^2}{2}$ (3) $\frac{Ml^2}{3}$ (4) $\frac{Ml^2}{4}$

54. A constant torque of 3.14 Nm is exerted on a pivoted wheel. If the angular acceleration of the wheel is 4π rad/s^2 then the moment of Inertia of the wheel is :

(1) 0.25 kg m^2 (2) 2.5 kg m^2 (3) 4.5 kg m^2 (4) 25 kg m^2

55. In the diagram shown below, m_1 and m_2 are the masses of two particles and x_1 and x_2 are the respective distances from the origin *o*. The centre of mass of the system is :



(1) $\frac{m_1x_2 + m_2x_1}{m_1 + m_2}$ (2) $\frac{m_1 + x_2}{2}$ (3) $\frac{m_1x_1 + m_2x_2}{m_1 + m_2}$ (4) $\frac{m_1m_2 + x_1x_2}{m_1 + m_2}$

Space For Rough Work

56. Consider earth to be a sphere of mass 'M' and radius 'R'. The acceleration due to gravity at a depth 'd' below the earth's surface (g_d) is :

(1) $g_d = g\left\{1 - \frac{d}{R}\right\}$ (2) $g_d = g\left\{1 - \frac{2d}{R}\right\}$

(3) $g_d = g$ (4) $g_d = g\left\{1 + \frac{d}{R}\right\}$

57. An orbiting satellite has :

(1) Only kinetic energy

(2) Only potential energy

(3) Kinetic and potential energy

(4) Zero energy

58. The escape velocity of a body on the surface of earth is 11.2 km/sec. If the earth's mass increases to twice its present value and the radius of the earth becomes half, the escape velocity would become :

(1) 5.6 km/sec (2) 11.2 km/sec

(3) 44.8 km/sec (4) 22.4 km/sec

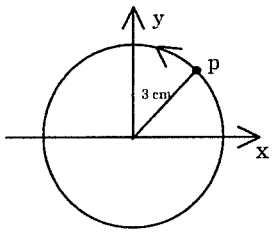
59. $x(t) = A\cos(wt + \Phi)$ is the equation of simple harmonic motion. In this equation 'Φ' is called :

(1) Phase constant (2) Frequency

(3) Amplitude (4) Displacement

Space For Rough Work

60. The figure shows circular motion of a reference particle to represent simple harmonic motion. The amplitude of simple harmonic motion is :



(1) 2 cm (2) 3 cm (3) 4 cm (4) 3 m

61. In the case of a traveling wave, the reflection at a rigid boundary will take place with a phase change of :

(1) $\frac{\pi}{2}$ radian (2) $\frac{\pi}{4}$ radian

(3) π radian (4) $\frac{\pi}{6}$ radian

62. For a stretched string of length 'L', fixed at both ends, the frequency of the fundamental mode of vibration is (V is the velocity of travelling waves in the string) :

(1) $\frac{V}{2L}$ (2) $\frac{V}{L}$ (3) $\frac{V}{4L}$ (4) $\frac{V}{3L}$

63. If υ_1 and υ_2 are the frequencies of two tuning forks then the beat frequency is :

(1) $\frac{\upsilon_1}{\upsilon_2}$ (2) $\upsilon_1 + \upsilon_2$ (3) $\frac{\upsilon_2}{\upsilon_1}$ (4) $\upsilon_1 - \upsilon_2$

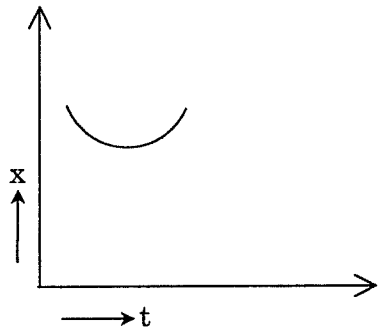
Space For Rough Work

64. The dimension of impulse is :

(1) MLT^{-1} (2) ML^2T^{-1} (3) $ML^{-1}T^{-1}$ (4) MT^{-1}

65. Position – time graph for motion with Zero acceleration is :

(1)



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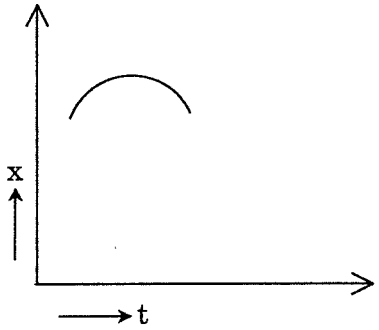

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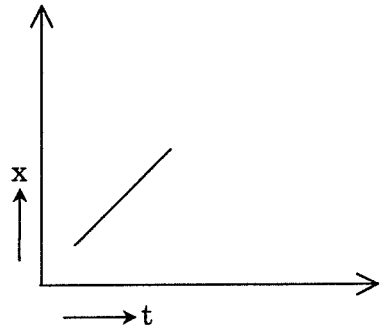

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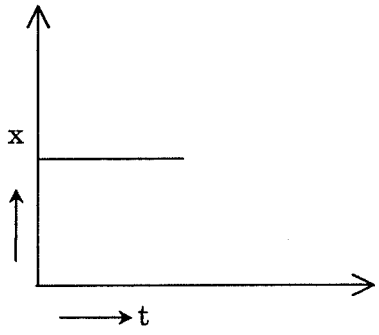

66. A car moving with a speed of 50 km/hr can be stopped by brakes, over a distance of 6 m. If the same car is moving at a speed of 100 km/hr, the stopping distance is :

(1) 12 m (2) 18 m (3) 6 m (4) 24 m

Space For Rough Work

67. If a projectile is launched with velocity V_o, making an angle θ with x axis, then its time of flight T is :

(1) $T = \frac{V_o^2 \sin 2\theta}{g}$ (2) $T = \frac{V_o^2 \sin^2 \theta}{2g}$

(3) $T = \frac{V_o^2}{g}$ (4) $T = \frac{2V_o \sin \theta}{g}$

68. The acceleration of an object moving in a circle of radius 'R' with uniform speed 'v' is :

(1) $\frac{v^2}{R}$ (2) $\frac{v^2}{2R}$

(3) $\frac{2v^2}{R}$ (4) $\frac{3v^2}{2R}$

69. A batsman hits back a ball straight in the direction of the bowler without changing its initial speed of 12m/s. If the mass of the ball is 0.15 kg the impulse imparted to the ball is :

(1) 36 NS (2) 3.6 NS

(3) 0.36 NS (4) 0.036 NS

70. A cubical block rests on an inclined plane of coefficient of friction $\mu = 1/\sqrt{3}$. What should be the angle of inclination so that the block just slides down the inclined plane?

(1) 30° (2) 60° (3) 45° (4) 90°

Space For Rough Work

71. If μ_s is coefficient of static friction, the maximum speed V_{max} with which a vehicle can negotiate an unbanked curved track having radius R and inclined at an angle θ with respect to horizontal plane is :

(1) $V_{max} = \sqrt{Rg \tan\theta}$ (2) $V_{max} = \sqrt{\mu_s Rg}$

(3) $\sqrt{Rg}$ (4) $\sqrt{\tan\theta / Rg}$

72. If two bodies stick together after collision and move as a single body, the collision is said to be :

(1) Perfectly inelastic (2) Elastic

(3) Inelastic (4) Perfectly elastic

73. For a moving particle (mass m, velocity V) having a momentum P, which one of the following correctly describes the kinetic energy of the particle :

(1) $\frac{P^2}{2m}$ (2) $\frac{P}{2m}$ (3) $\frac{V^2}{2m}$ (4) $\frac{V}{2m}$

74. A gardener pushes a lawn roller through a distance 20 m. If he applies a force of 20 kgwt in a direction inclined at 60° to the ground, the work done by him is :

(1) 1960 J (2) 196 J (3) 1.96 J (4) 196 KJ

75. S.I. unit of power is :

(1) Joule (2) erg

(3) Newton (4) Watt

Space For Rough Work

Space for Rough Work

SEAL