Time : 200 Mins   Marks : 800

1. The first use of quantum theory to explain the structure of atom was made by
   a) Heisenberg   b) Bohr   c) Planck   d) Einstein

2. The refractive index of the material of a prism is $\sqrt{2}$ and its refracting angle is 30°, One of the refracting surfaces of the prism is made a mirror inwards. A beam of monochromatic light enters the prism from the mirrored surface if its angle of incidence of the prism is_____
   a) 30°   b) 45°   c) 60°   d) 0°

3. A glass slab (μ = 1.5) of thickness 6 cm is placed over a paper. What is the shift in the letters?
   a) 4 cm   b) 2 cm   c) 1 cm   d) None of these

4. The radius of germanium (Ge) nuclide is measured to be twice the radius of $_{4}^{9}Be$. The number of nucleons in Ge are:
   a) 74   b) 75   c) 72   d) 73

5. Out of the following options which one can be used to produce a propagating electromagnetic wave?
   a) Achargeless particle   b) An accelerating charge   c) Acharge moving at constant velocity
   d) A stationary charge

6. A uniform magnetic field acts right angles to the direction of motion of electrons. As a result, the electron moves in a circular path of radius 2 cm. If the speed of electrons is doubled, then the radius of the circular path will be_____
   a) 2.0 cm   b) 0.5 cm   c) 4.0 cm   d) 1.0 cm

7. What is an ideal gas?
   a) One that consists of molecules   b) A gas satisfying the assumptions of kinetic theory
   c) A gas having Maxwellian distribution of speed   d) A gas consisting of massless particles

8. The temperature of an ideal gas is increased from 120 K to 480 K. If at 120 K, the rms velocity of the gas molecules is v_{rms}, then at 480 K, it becomes
   a) $4v_{rms}$ b) $2\,v_{rms}$ c) $\dfrac{v_{rms}}{2}$ d) $\dfrac{v_{rms}}{4}$

9. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole, It: _____.
   a) will become rigid showing no movement   b) will stay in any position
   c) will stay in north-south direction only   d) will stay in east-west direction only

10. The frequency of a light wave in a material and wavelength is 5000 A The refractive index of material will be
    a) 1.40   b) 1.50   c) 3.00   d) 1.33

11. The unit of Stefan's constant σ is :
    a) Wm^2K^{-4} b) $Wm^{-2}K^{-4}$ c) $Wm^{-2}K^4$ d) $Wm^{-2}K^{-1}$

12. Forty electric bulbs are connected in series across 220 V supply. After one bulb is fused the remaining 39 are connected again in series across the same potential. the illumination will be :
    a) more with 40 bulbs than with 39 bulbs   b) more with 39 bulbs then with 40 bulbs   c) equal in both cases
    d) in ratio $40^2 : 39^2$

13. Assertion: The principle of superposition is not valid for gravitational forces.
    Reason: Gravitational forces are non-conservative.

14. If the vectors $\vec{P} = a\hat{i} + a\hat{j} + 3\hat{k}$ and $\vec{Q} = a\hat{i} - 2\hat{j} - \hat{k}$ are perpendicular to each other, then the positive value of a is:

a) 3   b) 2   c) 1   d) 0

15. Heat given to a system can be associated with

a) kinetic energy of random motion of molecules   b) kinetic energy of orderly motion of molecules

c) total kinetic energy of random and orderly motion of molecules

d) kinetic energy of random motion in some cases and kinetic energy of orderly motion in other

16. Two spheres of masses 2M and M are initially at rest at a distance R apart. Due to mutual force of attraction they approach each other. When they are at separation RI2 , the acceleration of the centre of mass of sphere would be:

a) Zero   b) g m/s^2 c) 3g m/s^2 d) 12gm/s^2

17. Earth is flattened at the poles and bulges at the equator. This is due to the fact that

a) the earth revolves around the sun in an elliptical orbit

b) the angular velocity of spinning about its axis is more at the equator

c) the centrifugal force is more at the equator than at poles   d) none of these

18. Assertion: An external force is required to keep a body in motion.

Reason: If the net external force is zero, a body at rest continues to remain at rest and a body in motion continues to move with a uniform velocity.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false.   d) If both assertion and reason are false

19. An astronomical refractive telescope has an objective of focal length 20 m and an eyepiece of focal length 2 cm. Which one of the following is not correct?

a) The length of the telescope tube is 20.02 m   b) The magnification is 1000

c) The image formed is inverted

d) An objective of a larger aperture will increase the brightness and reduce chromatic aberration of the image

20. An inductive circuit contains a resistance of 10 ohm and an inductance of 2.0 henry. If an ac voltage of 120 volt and frequency of 60 Hz is applied to this circuit, the current in the circuit would be nearly:

a) 0.32 amp   b) 0.16 amp   c) 048 amp   d) 0.80 amp

21. Which of the following statements is correct?

a) The distance between any two consecutive antinodes or no nodes is $\frac{\lambda}{4}$.

b) The distance between a node and adjoining is   c) In the open end is an node.

d) In the closed end is an antinode.

22. Who established that electric charge is quantised?

a) J,J.Thomson   b) William Crookes   c) R.A Millikan   d) Wilhelm Rontgen

23. A small roller coaster starts at point A with a speed u on a curved track as shown in the figure
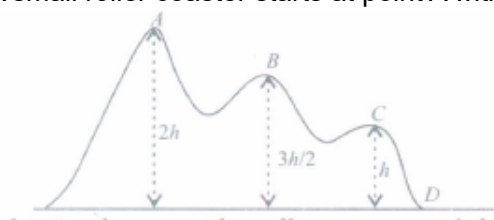
The friction between the roller coaster and the track is negligible and it always remains in contact with the track.

The speed of roller coaster at point D on the track will be

a) $(u^2 + gh)^{1/2}$ b) $(u^2 + 2gh)^{1/2}$ c) $(u^2 + 4gh)^{1/2}$ d) u

24. A ball moving with velocity 2 m/s collides head on with another stationary ball of double the mass. If the coefficient of restitution is 0.5, then their velocities (in m/s) after collision will be:
a) 0,1   b) 1,1   c) 1,0.5   d) 0,2

25. A carbon resistor of (47 ± 4.7) kΩ is to be marked with rings of different colours for its identification. The colour code sequence will be :
a) Yellow- Green - Violet- Gold   b) Yellow- Violet - Orange - Silver   c) Violet - Yellow- Orange - Silver
d) Green - Orange - Violet - Gold

26. A body is dropped from the roof of building. It passes the ceiling of the 15th storey at a speed of 20 m/s. If the height of each storey is 4 m. So, the number of storeys in the building is (g = 10 m/s^2 and neglect air resistance).
a) 20   b) 25   c) 30   d) 35

27. A physical quantity of the dimensions of length that can be formed out of c, G and $\dfrac{e^2}{4\pi\varepsilon_0}$ is : [c is velocity of light, G is universal constant of gravitation, e is charge]

a) $e^2 \left[G\dfrac{e^2}{4\pi\varepsilon_0} \right]^{1/2}$ b) $\dfrac{1}{c^2}\left[\dfrac{e^2}{G4\pi\varepsilon_0} \right]^{1/2}$ c) $\dfrac{1}{c^2}G\dfrac{e^2}{4\pi\varepsilon_0}$ d) $\dfrac{1}{c^2}\left[G\dfrac{e^2}{4\pi\varepsilon_0} \right]^{1/2}$

28. A force $\left(4\hat{i} + \hat{j} - 2\hat{k}\right)$ N acting on a body maintains its velocity at $\left(2\hat{i} + 2\hat{j} - 3\hat{k}\right)$ m s^{-1}. The power exerted is
a) 4 W   b) 5 W   c) 2 W   d) 2 W

29. The moment of inertia of a disc of mass M and radius R about an axis, which is tangential to the circumference of the disc and parallel to the diameter is:
a) $\dfrac{3}{2}MR^2$ b) $\dfrac{2}{3}MR^2$ c) $\dfrac{5}{2}MR^2$ d) $\dfrac{4}{5}MR^2$

30. A satellite is orbiting around the earth. By what percentage should we increase its velocity so as to enable it to escape away from the earth?
a) 41.4%   b) 50%   c) 82.8%   d) 100%

31. A tank of 2 x 2 x 3 is to be filled with water from a well of average depth 10 m. The work done will be:
a) 1176 x 10^3 J   b) 1276 x 10^3 J   c) 1476 x 10^3 J   d) 1576 x 10^3 J

32. If $|\vec{A} \times \vec{B}| = \sqrt{3\vec{A} \cdot \vec{B}}$ then the value of $|\vec{A} \times \vec{B}|$ is _____

a) $\left(A^2 + B^2 + \sqrt{3}AB \right)^{1/2}$ b) $\left(A^2 + B^2 + AB \right)^{1/2}$ c) $\left(A^2 + B^2 + \dfrac{AB}{\sqrt{3}} \right)^{1/2}$ d) A+B

33. The half life of a radioactive substance is 30 days. What is the time taken to disintegrate to 3/4th of its original mass?
a) 30 days   b) 15 days   c) 60 days   d) 90 days

34. If momenta of two particles of a system are given by: $\overrightarrow{P_1} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\overrightarrow{P_2} = -\hat{i} + 2\hat{j} + 3\hat{k}$, then the angle made by the direction of motion of the system with x-axis is:
a) $\cos^{-1}(1)$ b) $cos^{-1}(1)\sqrt{36/38}$ c) 45°   d) $cos^{-1}(1)\sqrt{1/38}$

35. When a wave travels in a medium the particles displacement is given by the equation; $y = 0.03\sin\pi(2t - 0.01x)$, where x and y are in metre and t in second. The wavelength of the wave is:
a) 200 m   b) 100 m   c) 20 m   d) 10 m

36. In a radioactive decay process, the negatively charged emitted β-particles are _____ .
    a) The electrons produced as a result of the decay of neutrons inside the nucleus
    b) The electrons produced as a result of collisions between atoms
    c) The electronics orbiting around the nucleus   d) The electrons present inside the nucleus

37. The distance between the two charges +q and -q of a dipole is r. On the axial line at a distance d from the centre of dipole, the intensity is proportional to:
    a) q/d^2 b) qr/d^2 c) q/d^3 d) qr/d^3

38. Assertion: Light year is the distance that light travels with velocity of 3×10^8 m s^{-1} in one year.
    Reason: Light year is the unit for measuring time.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b) If both assertion and reason are true but reason is not the correct explanation of assertion
    c) If assertion is true but reason is false.   d) If both assertion and reason are false

39. The correct relationship between the two current gains a and b in a transistor is _____ .
    a) $b = \frac{1+\alpha}{\beta}$ b) $\alpha = \frac{\beta}{1+\alpha}$ c) $\alpha = \frac{\beta}{1-\beta}$ d) $\beta = \frac{\alpha}{1+\alpha}$

40. In a double slit experiment, the distance between slits is increased ten times whereas their distance from screen is halved then the fringe width is
    a) becomes $\frac{1}{20}$ b) becomes $\frac{1}{90}$ c) it remains same   d) becomes

41. An observer moves towards a stationary source of sound with a speed 1/5th of the speed of sound. The wavelength and frequency of the sound emitted are 1 and f respectively. The apparent frequency and wavelength recorded by the observer are respectively.
    a) $0.8f, 0.81$ b) $1.2f, 1.21$ c) $1.2f, 1$ d) $f, 1.21$

42. A cricketer can throw a ball to a maximum horizontal distance of 100 m. The speed with which he throws the ball is: (to the nearest integer)
    a) 30ms^{-1} b) 42 ms^{-1} c) 32 ms^{-1} d) 35 ms^{-1} e) 40 ms^{-1}

43. A sound wave of wavelength λ, travels towards the right horizontally with a velocity V. It strikes and reflects from a vertical plane surface, travelling at a speed v towards the left. The number of positive crests striking in a time interval of three seconds on the wall is:
    a) $3(V+v)/\lambda$ b) $3(V-v)/\lambda$ c) $(V+v)/3\lambda$ d) $(V-v)/3\lambda$

44. Which of the following statements is false for a particle moving in a circle with a constant angular speed?
    a) The velocity vector is tangent to the circle   b) The acceleration vector is tangent to the circle
    c) The acceleration vector points to the centre of the circle
    d) The velocity and acceleration vectors are perpendicular to each other

45. The electric field inside a spherical shell of uniform surface charge density is:
    a) Zero   b) Constant, less than zero   c) Directly proportional to the distance from the centre
    d) None of the above

46. A particle moves along a circle of radius $\left(\frac{20}{\pi}\right)$m with constant tangential acceleration. If the velocity of the particle is 80 m/s at the end of the second revolution after motion has begun, the tangential acceleration is

    _____
    a) 40pm/s^2 b) 40m/s^2 c) 640pm/s^2 d) 160pm/s^2

47. The work done in an adiabatic change in a particular gas depends upon only:
    a) change in volume   b) change in pressure   c) change in temperature   d) none of these

48. A body of mass 2.0 kg makes an elastic collision with another body at rest and continues to move in the original direction but with one-fourth of its original speed u. What is the mass of other body and the speed of the two body center of mass?

a) 1.0 kg and $\dfrac{2}{3}v$ b) 1.2 kg and   c) 1.4 kg and $\dfrac{10}{17}v$ d) 1.5 kg and $\dfrac{4}{7}v$

49. A bus is moving on a straight road towards North with a uniform speed of 50 km/h. If the speed remains unchanged after turning through 90°, the increase in the velocity of bus in the turning process is _____
a) 70.7 km/h along South-West direction   b) zero   c) 50 km/h West   d) 70.7 km/h North-West direction

50. Let g be acceleration due to gravity on the surface of the earth and K_R be the rotational kinetic energy of the earth. Suppose the earth's radius decreases by 2%, keeping all other quantities same (even ω):
a) g decreases by 2% and K_R decreases by 4%   b) g decreases by 4% and K_R decreases by 2%
c) g increases by 4% and K_R decreases by 4%   d) g decreases by 4% and K_R increases by 4%

51. A P-N junction photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of radiation that can be absorbed by the material is nearly:
a) 10×10^{14} Hz   b) 5×10^{14} Hz   c) 1×10^{14} Hz   d) 20×10^{14} Hz

52. The mechanical advantage of a system of pulleys is 3. How much force need to be applied to raise a load of 60 kg through 50 cm?
a) 120 Kgf   b) 90 Kgf   c) 30 Kgf   d) 20 Kgf

53. A Diwali rocket is ejecting 0.05 kg of gases per second at a velocity of 400 m/sec. The accelerating force on the rocket is :
a) 20 dynes   b) 22 dynes   c) 20 N   d) 1000 N

54. A satellite is launched in a direction parallel to the surface of earth from a height 390 km with a speed 30.3 Mm hr^{-1}. Speed of the satellite as it reaches its maximum altitude of 3770 km, is:
a) 22.02 Mm hr^{-1} b) 22.20 Mm hr^{-1} c) 20.22 Mm hr^{-1} d) 22.82 Mm hr^{-1}

55. Which of the following measurements is most precise?
a) 5.00 mm   b) 5.00 cm   c) 5.00 m   d) 5.4 cm

56. A rope of length 8 m and linear density 0.5 kg/m is lying lengthwise on a horizontal smooth floor. It is pulled by a force of 12 N. The tension at the mid-point would be :
a) 12 N   b) 8 N   c) 6 N   d) 4 N

57. We combine two lenses, one is convex and other is concave having focal lengths f_1 and f_2 and their combined focal length is F. Combination of the lenses will behave like concave lens, if
a) $f_1 > f_2$ b) $f_1 = f_2$ c) $f_1 < f_2$ d) $f_1 \leq f_2$

58. A round uniform body of radius R, mass M and moment of inertia I rolls down (without slipping) an inclined plane making an angle θ with the horizontal. Then its acceleration is:

a) $\dfrac{g\sin\theta}{1 - MR^2/I}$ b) $\dfrac{g\sin\theta}{1 + I/MR^2}$ c) $\dfrac{g\sin\theta}{1 + MR^2/I}$ d) $\dfrac{g\sin\theta}{1 - I/MR^2}$

59. Cooking is difficult on hills becuase
a) atmospheric pressure is higher   b) atmospheric pressure is lower   c) boiling point of water is reduced
d) Both (b) and (c)

60. Assertion: Nuclear force between neutron-neutron, proton-neutron and proton-proton is approximately the same.
Reason: The nuclear force does not depend on the electric charge.
a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.   d) If both assertion and reason are false.

61. A synchronous relay satellite reflects TV signals and transmits TV programmes from one part of the world to the other because its:

    a) period of revolution is greater than the period of rotation of the earth about its axis

    b) period of revolution is less than the period of rotation of the earth about its axis

    c) period of revolution is equal to the period of rotation of the earth about its axis

    d) mass is less than the mass of the earth

62. A particle tied to a string of negligible weight and length l is swung in a horizontal circular path with constant angular velocity having time period T. If the string length is shortened by 1/2 while the particle is in motion, the time period is:

    a) 4T   b) 2T   c) $\frac{T}{2}$ d) $\frac{T}{4}$

63. A body is under the action of three forces $\vec{F_1}, \vec{F_2}$ and $\vec{F_3}$ In which case the body cannot undergo angular acceleration?

    a) $\vec{F_1}, \vec{F_2}$ and $\vec{F_3}$ are concurrent   b) $\vec{F_1} + \vec{F_2} + \vec{F_3}$ = 0

    c) $\vec{F_1}, \vec{F_2}$ is parallel to $\vec{F_3}$ but the three forces are not concurrent.

    d) $\vec{F_1}$ and $\vec{F_2}$ act at the same point but $\vec{F_3}$ acts at different point

64. Plutonium decays with half life of 24000 years. If plutonium is stored for 72000 years, the fraction of it that remains is

    a) 1/8   b) 1/3   c) 1/4   d) 1/2

65. A piece of paper wrapped tightly on a wooden rod is found to get charged quickly When held over a flame compared to a similar piece of wrapped on brass rod.This is because

    a) wood contains large no. of free electrons   b) wood is good conductor of heat

    c) wood is a bad conductor of heat   d) brass is a good conductor and wood is a bad conductor of heat

66. If a force $10\hat{i} + 15\hat{j} + 25\hat{k}$ acts on a system and gives an acceleration $2\hat{i} + 3\hat{j} - 5\hat{k}$ to the centre of mass of the system, the mass of the system is:

    a) 5 units   b) units   c) $5\sqrt{38}$ units   d) given data is not correct

67. At 0 K, which of the following properties of a gas will be zero?

    a) Kinetic energy   b) Potential energy   c) Density   d) Mass

68. Three containers of the same volume contain three different gases. The masses of the molecules are m_1, m_2, and m_3 and the number of molecules in their respective containers are N_1, N_2 and N_3. The gas pressure in the containers are p_1, p_2 and p_3 respectively. All the gases are now mixed and put in one of these containers. The pressure p of the mixture will be:

    a) $p < \left(p_1 + p_2 + p_3\right)$ b) $p = \frac{p_1 + p_2 + p_3}{3}$ c) $p = p_1 + p_2 + p_3$ d) $p > \left(p_1 + p_2 + p_3\right)$

69. In cosmic rays, 0.15 protons cm^{-2} s^{-1} are entering the earth's atmosphere. If the radius of the earth is 6400 km, the current received by the earth in the form of cosmic rays is nearly

    a) 0.12A   b) 1.2A   c) 12A   d) 120A

70. An air bubble of radius r in Water is at a depth h below the surface. If p is atmosphere pressure and d and T are the density and surface tension Of water respectively. The pressure inside bubble will be

    a) p + hdg - (4T/4)   b) p + hdg - (2T/r)   c) p + hdg - (2T/r)   d) p + hdg - (4T/r)

71. A student unable to answer a question on Newton's laws of motion attempts to pull himself up by tugging on his hair. He will not succeed:
    a) as the force exerted is small   b) the frictional force while gripping is smal
    c) Newton's law of inertia is not applicable to living beings   d) as the force applied is internal to the system

72. Tworacing cars of masses m_1 and m_2 are moving in circles of radii r_l and r_2 respectively. Their speeds are such that each makes a complete circle in the same duration of time t. The ratio of the angular speed of the first to the second car is :
    a) $m_1 : m_2$ b) $r_1 : r_2$ c) 1 : 1   d) $m_1 r_1 : m_2 r_2$

73. The frequency of tuning fork is 256 Hz. It will not resonate with a fork of frequency
    a) 768 Hz   b) 738 Hz   c) 512 Hz   d) 256 Hz

74. An artificial satellite moving in a circular orbit around the earth has a total energy E_0. Its potential energy is
    a) $-E_0$ b) E_0 c) $2E_0$ d) $-2E_0$

75. (A) Even when orbit of a satellite is elliptical, its plane of rotation passes through the centre of earth.
    (R) According to law of conservation of angular momentum plane of rotation of satellite always remain same.
    a) If both assertion and reason are true and reason is the correct explanation of assertion

    b) If both assertion and reason are true but reason is not the correct explanation of assertion
    c) If assertion is true but reason is false.   d) If both assertion and reason are false.

    e) If assertion is false but reason is true.

76. The centre of mass of a system of particles does not depend upon:
    a) masses of the particles   b) forces acting on the particles   c) position of the particles
    d) relative distances between the particles

77. The magnetic force per unit length on a wire carrying a current of 10 A and making an angle of 45° with the direction of a uniform magnetic field of 0.20 T is

    a) $2\sqrt{2}$N m^{-1} b) $\frac{2}{\sqrt{2}}$N m^{-1} c) $\frac{\sqrt{2}}{2}$N m^{-1} d) $4\sqrt{2}$N m^{-1}

78. Two containers A and B are partly filled with water and closed. The volume of A is twice that of B and it contains half the amount of water in B. If both are at the same temperature, the water vapour in the containers will have pressure in the ratio of:
    a) 1: 2   b) 1: 1   c) 2: 1   d) 4: 1

79. A force of 250N is required to lift a 75 kg mass through a pulley system. In order to lift the mass through 3 m, the rope has to be pulled through 12m. The efficiency of system is _____
    a) 50%   b) 75%   c) 33%   d) 90%

80. Which of the following statements is not correct?
    a) Whenever the amount of magnetic flux linked with a circuit changes, an emf is induced in the circuit.

    b) The induced emf lasts so long as the change in magnetic flux continues.

    c) The direction of induced emf is given by Lenz's law.

    d) Lenz's law is a consequence of the law of conservation of momentum.

81. Ionized hydrogen atoms and fα-particles with same momenta enters perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H : r_a$ will be_____
    a) 1: 2   b) 4: 1   c) 1: 4   d) 2: 1

82. Assertion: An ac generator is based on the self inductance of the coil.
    Reason: Self inductance involves two coils.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.   d) If both assertion and reason are false.

83. The displacement -time graph for a particle executing SHM is as shown in figure.
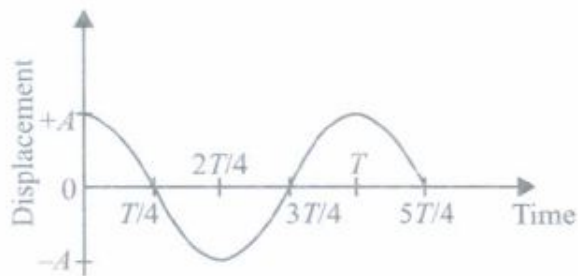
Which of the following statements is correct?

a) The velocity of the particle is maximum at $t = \dfrac{3}{4}T$ b) The velocity of the particle is maximum at $t = \dfrac{T}{2}$

c) The acceleration of the particle is maximum at $t = \dfrac{T}{2}$

d) The acceleration of the particle is maximum at $t = \dfrac{3}{4}T$

84. 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) $u^2/2g$

85. A rectangular block of glass ABCD has a refractive index 1.6. A pin is placed midway on the face AB When observed from the face AD, the pin shall
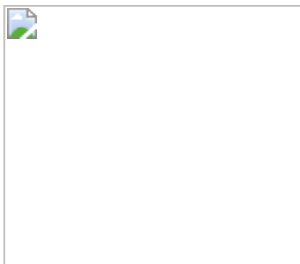

a) appear to be near A   b) appear to be near D.   c) appear to be at the centre of AD   d) not be seen at all.

86. A person is observing two trains one coming towards him and other leaving with the same velocity 4 m/s. If their whistling frequencies are 240 Hz each, then the number of beats per second heard by the person will be: (if velocity of sound is 320 m/s)
a) 3   b) 6   c) 9   d) zero

87. Which one of the following graphs represents the behaviour of an ideal gas?
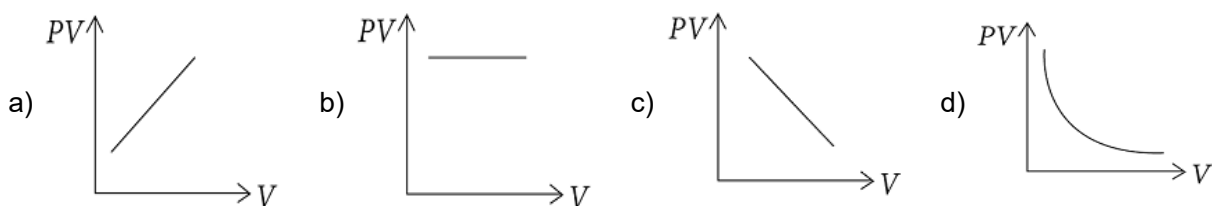
88. A simple pendulum is taken from the equator to the pole. Its period:

a) decreases   b) increases   c) remains the same   d) decreases and then increases   e) becomes infinity

89. Two bodies of mass I kg and 3 kg have position vectors $\hat{i} + 2\hat{j} + \hat{k}$ and $-3\hat{j} - 2\hat{j} + \hat{k}$ respectively. The centre of mass of this system has a position vector:

a) $-2\hat{i} - \hat{j} + \hat{k}$ b) $2\hat{i} - \hat{j} + 2\hat{k}$ c) $\hat{i} + \hat{j} + \hat{k}$ d) $-2\hat{i} + 2\hat{k}$

90. Choose the wrong option.

a)
Inertial mass. is a measure of difficulty of accelerating a body by an external force whereas the gravitational mass isrelevant in determining the gravitational force on it by an external mass.

b) That the gravitational mass and inertial mass are equal is an experimental result.

c)
That the acceleration due to the gravity on Earth is the same for all bodies and is due to the equality of gravitational mass and inertial mass.

d)
Gravitational mass of a particle like proton can depend on the presence of neighbouring heavy objects but the inertial mass cannot.

91. For photoelectric emission from certain metal the cutoff frequency is v. If radiation of frequency 2v impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is electron mass) :

a) $\sqrt{hv/(2m)}$ b) $\sqrt{hv/(m)}$ c) $\sqrt{2hv/(m)}$ d) $2\sqrt{hv/(m)}$

92. A particle is describing uniform circular motion. Its acceleration is:

a) along the radius of circular path pointing towards the centre   b) along the tangent to the circular path
c) along the radius of the circular path pointing away from the centre   d) zero

93. If the beams of electrons and protons move parallel to each other in the same direction, then they

a) attract each other   b) repel each other.   c) no relation.   d) neither attract nor repel

94. The total resistance in the parallel combination of three resistances 9 Ω, 7Ω and 5 Ω is

a) 1.22 Ω   b) 2.29 Ω   c) 4.22 Ω   d) 2.02 Ω

95. The ratio of the nuclear radii of the gold isotope $^{197}_{79}Au$ and silver isotope $^{197}_{47}Au$ is:

a) 1.23   b) 0.216   c) 2.13   d) 3.46

96. The figure shows the variation of photo current with anode potential for a photo-sensitive surface for threedifferent radiations. Let I$_a$, I$_b$ and I$_c$ be the intensities and v_a, v_b and v_c be the frequencies for the curves a, band e respectively. Then
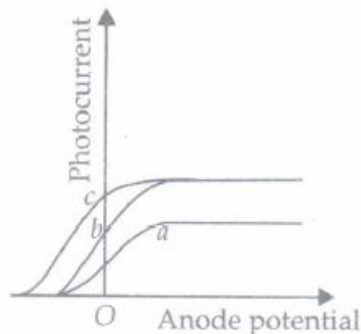
a) $v_a = v_b$ and I$_a \neq$ I$_b$ b) $v_a = v_c$ and I$_a$= I$_c$ c) $v_a = v_b$ and I$_a$= I$_b$ d) v_b=v_c and I$_b$= I$_c$

97. During a journey from earth to the moon and back, the greatest energy required from the space-ship rockets is to overcome:

a) The earth's gravity at take   b) The moon's gravity at lunar landing   c) The moon's gravity at lunar take off
d) The point where the pull of the earth and moon are equal but opposite

98. Coefficient of thermal conductivity has the dimensions:

a) $[MLT^{-3}K^{-1}]$ b) $[ML^3T^3K^2]$ c) $[ML^3T^{-3}K^{-2}]$ d) $[M^2L^3T^{-3}K^2]$

99. Unpolarised light is incident from air on a plane surface of a material of refractive index 'fl'. At a particular angle of incidence 'i', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation?
a) $i=\sin^{-1}(1/\mu)$ b) Reflected light is polarised with its electric vector perpendicular to the plane of incidence
c) Reflected light is polarised with its electric vector parallel to the plane of incidence   d) $i = \tan^{-1}(1/\mu)$

100. How much deep inside the earth (radius R) should a man go, so that his weight becomes one-fourth of that on the earth's surface?
a) $\frac{R}{4}$ b) $\frac{R}{2}$ c) $\frac{3R}{4}$ d) None of these

101. A stone projected up with a velocity u reaches a maximum height h. When it is at a height of 3h/4 from the ground, the ratio of KE and PE at that point is:
a) 3 : 1   b) 1 : 1   c) 1 : 3   d) 1 : 2

102. A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 m/s. To give an initial upward acceleration of 20 m/s^2, the amount of gas ejected per second to supply the needed thrust will be: (Take g =10 m/s^2)
a) 127.5 kg/s   b) 187.5 kg/s   c) 185.5 kg/s   d) 137.5 kg/s

103. The water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap at an instant when the first drop touches the ground. How far above the ground is the second drop at that instant? (Take g:10m/s^2)
a) 1.25m   b) 2.50m   c) 3.75m   d) 5.00m

104. Astronomical unit (AU) is the distance between earth and the sun, 1 AU is equal to
a) 1.496 x 10^{8}km   b) 9.46 x 10^{12}km   c) 3.084 x 10^{13}km   d) 4.596 x 10^{15}km

105. Aboat is moving with a velocity $3\hat{i}+4\hat{j}$ with respect to ground. The water in the river is moving with a velocity $3\hat{i}+4\hat{j}$ with respect to ground. The relative velocity of the boat with respect to water is:
a) $8\hat{j}$ b) $6\hat{i}-8\hat{j}$ c) $6\hat{i}+8\hat{j}$ d) $5\sqrt{2}$

106. A current of 21, passing through a conductor produces 80 J of heat in 10s. The resistance of the conductor in ohm is _____.
a) 0.5   b) 2   c) 4   d) 20

107. $x_1 = A\sin(\omega t - 0.1x)$ and $x_2 = A\sin\left(\omega t - 0.1x - \frac{\phi}{2}\right)$, resultant amplitude of combined wave is:

a) $2A\cos\frac{\phi}{4}$ b) $A/\sqrt{2\cos\phi/2}$ c) $2A\cos\frac{\phi}{2}$ d) $A\sqrt{2\left(1 + \cos\frac{\phi}{4}\right)}$

108. The velocity v of a particle at time t is given by $v = at + \frac{b}{t+c}$ where a, b and c are constant. The dimensions of a, b and c are respectively _____
a) L^2, T and LT^2 b) LT^2, LT and L   c) L, LT and T^2 d) LT^{-2}, L and T

109. A person holding a rifle (mass of person and rifle together is 100 kg) stands on a smooth surface and fires 10 shots horizontally, in 5 s. Each bullet has a mass of 10 g with a muzzle velocity of 800 ms^{-1}. The final velocity acquired by the person and the average force exerted on the person are _____
a) $-1.6\,\text{ms}^{-1}$; 8 N   b) $-0.08\,\text{ms}^{-1}$; 16 N   c) $-0.8\,\text{ms}^{-1}$; 8 N   d) $1.6\,\text{ms}^{-1}$; 16 N

110. Assertion: The basic of Laplace correction was that, exchange of heat between the region of compression and rarefaction in air is not possible.
Reason: Air is a bad conductor of heat and velocity of sound in air is large.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.   d) If both assertion and reason are false.

111. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of 2 m/s. The mass per unit length of water in the pipe is 100 kg/m. What is the power of the engine?
a) 400W   b) 200w   c) 100W   d) 800W

112. The frictional force between two surfaces is independent of:
a) nature of surface   b) size of the body   c) area of contact   d) mass of the body

113. A particle of mass 109 moves along a circle of radius 6.4 em with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8 x 10^{-4} J by the end of the second revolution after the beginning of the motion?
a) 0.1 m/s^2 b) 0.15m/s^2 c) 0.18 m/s^2 d) 0.2 m/s^2

114. A cube has a side of length 1.2 x 10^{-2} m. Its volume up to correct significant figures is
a) 1.7 x 10^{-6}m^3 b) 1.73 x 10^{-6}m^3 c) 1.78 x 10^{-6}m^3 d) 1.732 x 10^{-6}m^3

115. A body of mass 1 kg is moving in a vertical circular path of radius 1 m. The difference between the kinetic energies at the highest and lowest position is:
a) 20 J   b) 10 J   c) 4√5 J   d) 10(√5-1) J

116. The root mean square speeds of molecules of ideal gases at the same temperature are:
a) the same   b) inversely proportional to the square root of the molecular weight
c) directly proportional to the molecular weight   d) inversely proportional to the molecular weight

117. At a point on the right bisector of a magnetic dipole, the magnetic
a) potential varies as $\dfrac{1}{r^2}$ b) potential is zero at aU points on the right bisector.   c) field varies as r^3
d) field is perpendicular to the axis of dipole

118. Assertion: For a free falling object, the net external force is just the weight of the object.
Reason: In this case the downward acceleration of the object is equal of the acceleration due to gravity.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false   d) If both assertion and reason are false

119. A particle with total energy E is moving in a potential energy region U(x). Motion of the particle is restricted to the region when _____
a) $U(x) > E$ b) $U(x) < E$ c) U(x) = 0   d) $U(x) \leq E$

120. A ray of light is successively deflected from two plane mirrors inclined to each other at a certain angle. If the total deviation in the path of the rays reflected from the two mirrors be 300^0 , then what is the number of images formed ?
a) 30   b) 15   c) 11   d) 5

121. Stream-line flow is more likely for liquids with:
a) low density and low viscosity   b) high viscosity and high density   c) high viscosity and low density
d) low viscosity and high density

122. A ball of mass m strikes a rigid wall with speed u and rebounds with the same speed. The impulse imparted to the ball by the wall is
a) 2mu   b) mu   c) Zero   d) -2mu

123. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 Am^{-1}. The permeability of the material of the rod is: _____.

a) $2.4\ p \times 10^{-7}$ T mA^{-1} b) $2.4\ p \times 10^{-4}$ T mA^{-1} c) 8×10^{-5} T mA^{-1} d) $2.4\ p \times 10^{-5}$ T mA^{-1}

124. There are three copper wires of length and cross-sectional area (L, A), (2L, A/2) (L/2,2A).In which case is the resistance minimum?
a) It is the same in all three cases   b) Wire of cross-sectional area 2A   c) Wire of cross-sectional area A
d) Wire of cross-sectional area $\frac{1}{2}A$

125. Which of the following is not an inelastic collision?
a) A man jumps on a cart   b) A bullet embedded in a block   c) Collision of two glass balls
d) None of the above

126. A man has height of 6 m. He observes image of 2 m height erect, then mirror used is
a) concave   b) convex   c) plane   d) None of these

127. If the force acting on a body is inversely proportional to its speed, then its kinetic energy is
a) linearly related to time   b) inversely proportional to time   c) inversely proportional to the square of time
d) a constant

128. A block slides with a velocity of 10 mls on a rough horizontal surface. It comes to rest after covering a distance of 50 metres. If g is 10 m/sec^2, then the coefficient of dynamic friction between the block and the surface is:
a) 0.1   b) 1   c) 10   d) 5

129. A copper ball of radius rtravels with a uniform speed v in a viscous fluid. If the ball is changed with another ball of radius 2r, the new uniform speed will be:
a) v   b) 2v   c) 4v   d) 8v

130. The energy of second Bohr orbit of the hydrogen atom is - 328 kJ mol^{-1}, hence the energy of fourth Bohr orbit would be :
a) - 41 kJ/mol   b) -1312 kJ/mol   c) - 164kJ/mol   d) - 82 kJ/mol

131. An insulated container of gas has two chambers separated by an insulating partition. One of the chambers has volume V_1 and contains ideal gas at pressure p_1 and temperature T_1. The other chamber has volume V_2 and contains ideal gas pressure p_2 and temperature T_2. If the partition is removed without doing any work on the gas, the final equilibrium temperature of the gas in the container will be
a) $\dfrac{T_1T_2(p_1V_1+p_2V_2)}{p_1V_1T_2+p_2V_2T_1}$ b) $\dfrac{p_1V_1T_1+p_2V_2T_2}{p_1V_1+p_2V_2}$ c) $\dfrac{p_1V_1T_2+p_2V_2T_1}{p_1V_1+p_2V_2}$ d) $\dfrac{T_1T_2(p_1V_1+p_2V_2)}{p_1V_1T_1+p_2V_2T_2}$

132. A rectangular loop carrying a current i is situated near a long straight wire such that the wire is parallel to the one of the sides of the loop and is in the plane of the loop. If a steady current I is established in wire as shown in figure, the loop will
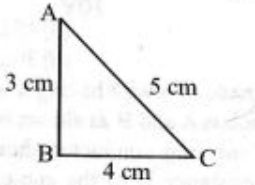

a) rotate about an axis parallel to the wire.   b) move away from the wire or towards right
c) move towards the wire   d) remain stationary.

133. (A) In order to stop a car in shortest distance on a horizontal road, one should apply the brakes hard enough to just preventing slipping.
(R) The coefficient of static friction is larger than the coefficient of kinetic friction.
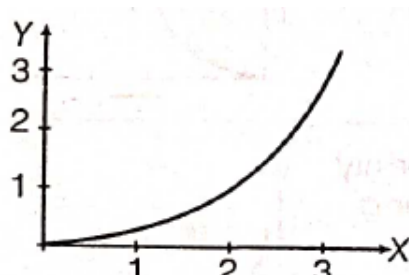a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.   d) If both assertion and reason are false.
e) If assertion is false but reason is true

134. (A) When a particle is thrown obliquely from the surface of the earth, it always moves in a parabolic path, provided the air drag is negligible.

(R) A projectile motion is a three dimensional motion.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.   d) If both assertion and reason are false.

e) If assertion is false but reason is true.

135. About 6% of the power of a 100 W light bulb is converted to visible radiation. The average intensity of visible radiation at a distance of 8 m is (Assume that the radiation is emitted isotropically and neglect reflection.

a) 3.5×10^{-3} W m^{-2} b) 5.1×10^{-3} W m^{-2} c) 7.2×10^{-3} W m^{-2} d) 2.3×10^{-3} W m^{-2}

136. A cable pulls a box with force of 5 kN and raises it at the rate of 2 m s^{-I}. What is the power of the engine providing tension to the cable?

a) 2 kW   b) 2.5 kW   c) 5 kW   d) None of these

137. A 12 cm wire is given a shape of a right-angled triangle ABC having sides 3 cm, 4 cm and 5 cm as shown in the figure. The resistance between two ends (AB, BC, CA) of the respective sides are measured one by one by a multimeter. The resistances will be in the ratio of _____.

a) 3:4:5   b) 9:16:25   c) 27:32:35   d) 21:24:25

138. A paramagnetic sample shows a net magnetisation of S Am^{-1} when placed in an external magnetic field of 0.6 T at a temperature of 4 K. When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16K, the magnetisation will be

a) $\frac{32}{3}$ Am^{-1} b) $\frac{2}{3}$ Am^{-1} c) 6 Am^{-1} d) 2.4 Am^{-1}

139. The force on a rocket moving with a velocity 300 m/s is 210 N. The rate of consumption of fuel of rocket is _____

a) 0.7 kg/s   b) 1.4 kg/s   c) 0.007 kg/s   d) 10.7 kg/s

140. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces _____

a) cannot be predicted   b) are equal to each other   c) are equal to each other in magnitude

d) are not equal to each other in magnitude

141. A particle of mass m is moving in a horizontal circle of radius r, under a centripetal force $F = k/r^2$, where k is a constant:

a) The potential energy of a particle is zero   b) The potential energy of a particle is $-\frac{k}{r}$

c) The total energy of a particle is $-\frac{k}{2r}$ d) The kinetic energy of a particle is $-\frac{k}{r}$

142. A man throws balls with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two balls are in the sky at any time? [Given g: 9.8 m/s^2]

a) Only with speed 19.6 m/s   b) More than 19.6 m/s   c) At least 9.8 m/s   d) Any speed less than 19.6 m/s

143. Which of the following principles a circus acrobat employs in his performance?

a) Conservation of energy   b) Conservation of linear momentum   c) Conservation of mass

d) Conservation of angular momentum

144. The refractive indices of water and glass with respect to air are 4/3 and 5/3, respectively. The refractive index of glass with respect to water will be

a) 1/3   b) 4/3   c) 5/4   d) 20/9

145. A heavy rope is suspended from a rigid sur-port. A wave pulse is set up at the lower end; then:

a) the pulse will travel with uniform speed   b) the pulse will travel with increasing speed

c) the pulse will travel with decreasing speed   d) the pulse cannot travel through the rope

146. A proton and an a-particle are accelerated through the same potential difference. The ratio of de Broglie wavelength λ_P to that of $\lambda\alpha$

a) $\sqrt{2} : 1$ b) $\sqrt{4} : 1$ c) $\sqrt{6} : 1$ d) $\sqrt{8} : 1$

147. In the question number 15, the work done by applied force is

a) 10 J   b) 50 J   c) 100 J   d) 150 J

148. The three initial and final positions of a man on the x-axis are given as

(i) (-3 m, 7 m) (ii) (7 m, -3 m) (iii) (-7m,3m)

Which pair gives the negative displacement?

a) (i)   b) (ii)   c) (iii)   d) (i) and (iii)

149. In a double slit experiment, the two slits are 1 mm apart and the screen is placed 1 m away. A monochromatic light of wavelength 500 nm is used. What will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single slit pattern?

a) 0.5 mm   b) 0.02 mm   c) 0.2 mm   d) 0.1 mm

150. The phase relationship between current and voltage in a pure resistive circuit is best represented by
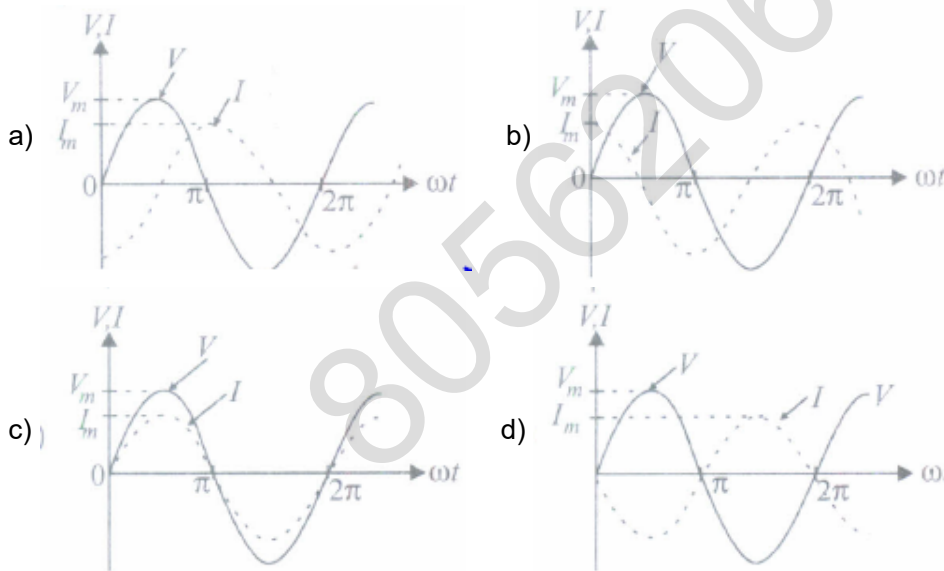
151. The sum of two vectors $\vec{A}$ and $\vec{B}$ is at right angles to their difference. Then:

a) A = B   b) A = 2B   c) B = 2A   d) $\vec{A}$ and $\vec{B}$ have the same direction

152. (A) Two similar trains are moving along the equatorial line with the same speed but in opposite direction. They will exert equal pressure on the rails.

(R) In uniform circular motion, the magnitude of acceleration remains constant but the direction continuously changes.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false.   d) If both assertion and reason are false.

e) If assertion is false but reason is true.

153. In order that a floating object be in a stable equilibrium, its centre of buoyancy should be:
a) vertically above its centre of gravity   b) vertically below its centre of gravity

c) horizontally in line with its centre of gravity   d) may be anywhere

154. Two masses 2 kg and 3 kg are attached to the ends of the string passed over a pulley fixed at the top. The tension and acceleration in the string in terms of 'g' are:

a) $\left(\dfrac{7g}{8}, \dfrac{g}{8}\right)$ b) $\left(\dfrac{21g}{8}, \dfrac{g}{8}\right)$ c) $\left(\dfrac{21g}{8}, \dfrac{g}{5}\right)$ d) $\left(\dfrac{12g}{8}, \dfrac{g}{5}\right)$

155. A beam of monochromatic light is refracted from vacuum into a medium of refractive index 1.5. The wavelength of refracted light will be___
a) dependent on intensity of refracted light   b) same   c) smaller   d) larger

156. The speed of a wave on a string is 150 m/s when the tension is 120 N. The percentage increase in the tension in order to raise the wave speed by 20% is:
a) 44%   b) 40%   c) 20%   d) 10%

157. In the figure represents a parabola. Identify the physical quantities representing X and Y for constant acceleration.

a) X = time, Y = Velocity   b) X = Velocity, Y = Time   c) X = time, Y = displacement
d) X = time, Y = accleration

158. Mechanical waves on the surface of a liquid are:
a) transverse   b) longitudinal   c) torsional   d) both transverse and longitudinal (or ripples)

159. Curie law XT = constant, relating magnetic susceptibility (X) and absolute temperature (T) of magnetic substance is obeyed by
a) all magnetic substances.   b) paramagnetic substances.   c) diamagnetic substances.
d) ferromagnetic substances.

160. The speed of a projectile at its maximum height is √3/2 times its initial speed. If the range of the projectile is P times the maximum height attained by it, P is equal to:
a) $\dfrac{4}{3}$ b) 2√3   c) 4√3   d) $\dfrac{3}{4}$

161. A ball of mass m and radius r is released in a viscous liquid.The value of its terminal velocity proportional to
a) 1/r only   b) m/r   c) $\sqrt{(m/r)}$ d) m only

162. A uniform force of $3\hat{i} + \hat{j}$ newton acts on a particle of mass 2 kg. Hence the particle is displaced from position $2\hat{i} + \hat{k}$ metre to position $4\hat{i} + 3\hat{j} - \hat{k}$ metre. The work done by the force on the particle is:
a) 9 J   b) 6 J   c) 13 J   d) 15 J

163. A plano convex lens is made of material ofrefractive index 1.6. The radius of curvature of the curved surface is 60 cm. The focal length of the lens is___
a) 50 cm   b) 100 cm   c) 200 cm   d) 400 cm

164. The unit of intensity of electric field is
a) N/m   b) C/N   c) N/C   d) J/N

165. A force of 100 N need to be applied parallel to a smooth inclined plane just to hold a body on it. The angle of inclination of the inclined plane is 30°. How much horizontal force need to be applied to do the same?
a) 115 N   b) 50 N   c) 87 N   d) 100 N

166. The velocity of sound in any gas depends upon:
a) wavelength of sound   b) density and elasticity of gas   c) intensity of sound waves
d) amplitude and frequency of sound

167. The radius of gyration of an uniform rod of length l about an axis passing through one of its ends and perpendicular to its length is
a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{3}$ c) $\frac{1}{\sqrt{3}}$ d) $\frac{1}{2}$

168. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is:
a) 1   b) 4   c) 0.5   d) 2

169. Match the Column I with Column II.

Column-I		Column-II	
(A)	For translational equilibrium	(p)	Mk^2
(B)	For rotational equilibrium	(q)	Angular acceleration
(C)	Moment of inertia of a body	(r)	$\sum \vec{F} = 0$
(D)	Torque is required to produce	(s)	$\sum \vec{\tau} = 0$

a) A - p, B - q, C - r, D - s   b) A - q, B - r, C - s, D - P   c) A - r, B - q, C - p, D - s   d) A - r, B - s, C - p, D - q

170. The position vector of a particle is $\vec{r} = (a\ cos\ \omega\ t)\hat{i} + (a\ sin\ \omega\ t)\hat{j}$. The velocity of the particle is:
a) Parallel to the position vector   b) Perpendicular to the position vector   c) Directed towards the origin
d) Directed away from the origin

171. Dimensions of stress are _____
a) $\left[ML^{-1}T^{-2}\right]$ b) $\left[MLT^{-2}\right]$ c) $\left[ML^2T^{-2}\right]$ d) $\left[ML^0T^{-2}\right]$

172. A spherical body falling through a viscous liquid of infinite extent ultimately attains a constant value, when:
a) upthrust + weight = viscous drag   b) weight + viscous drag = upthrust   c) viscous drag + upthrust = weight
d) viscous drag + upthrust > weight

173. If a block moving up at θ=30° with a velocity 5m/s, stops after 0.5sec, then μ is
a) 0.5   b) 1.25   c) 0.6   d) none of the above

174. A ball is projected from the ground at angle 0 with the horizontal. After 1 second it is moving at angle 45° with the horizontal and after 2 seconds it is moving horizontally. What is the velocity of projection of the ball?
a) 10√3 ms^{-1} b) 20√3 ms^{-1} c) 10√5 ms^{-1} d) 2]0√2 ms^{-1}

175. A cubical region of space is filled with some uniform electric and magnetic fields. An electron enters the cube across one of its faces with velocity v and a positron enters via opposite face with velocity -v. At this instant
a) the electric forces on both the particles cause identical accelerations.
b) the magnetic forces on both the particles cause equal accelerations.
c) Only electron gains or looses energy   d) the motion of the centre of mass (CM) is determined by E alone

176. The change in the entropy of I mole of an ideal gas which went through an isothermal process from an initial state (P_1, V_1, T) to the final state (P_2, V_2, T) is equal to:
a) zero   b) R ln T   c) R ln $\frac{V_1}{V_2}$ d) R ln $\frac{V_2}{V_1}$

177. An ideal refrigerator has a freezer at a temperature of -13°C. The coefficient of performance of the engine is 5. The temperature of the air (to which heat is rejected) will be :

a) 325° C   b) 325° K   c) 39° C   d) 320° C

178. (A) Angle between two vectors $\hat{j} + \hat{k}$ and $\hat{j}$ is 45°.

(R) Vector $\hat{j} + \hat{k}$ is equally inclined to both Y and Z axes and angle between $\hat{j}$ and $\hat{k}$ is 90°.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false.   d) If both assertion and reason are false.
e) If assertion is false but reason is true.

179. The speeds of air-flow on the upper and lower surfaces of a wing of an aeroplane are v_1 and v_2 respectively. If A is the cross-sectional area of the wing and 'ρ' is the density of air, then the upward lift is:

a) $\frac{1}{2}\rho A(v_1\text{-}v_2)$ b) $\frac{1}{2}\rho A(v_1\text{+}v_2)$ c) $\frac{1}{2}\rho A\left(v_1^2 - v_2^2\right)$ d) $\frac{1}{2}\rho A\left(v_1^2 + v_2^2\right)$

180. The intermediate image formed by the objective of a compound microscope is
a) real, inverted and magnified   b) real, erect and magnified   c) virtual, erect and magnified
d) virtual, inverted and magnified

181. (A) First law of thermodynamics does not forbid flow of heat from lower temperature to higher temperature.
(R) Heat supplied to a system always equal to the increase in its internal energy.
a) If both assertion and reason are true and reason is the correct explanation of assertion

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false   d) If both assertion and reason are false

e) If assertion is false but reason is true

182. If the Pressure of a gas contained in a vessel is increased by 0.4% when heated through 1^0C, the initial temperature has been:
a) 2500 K   b) 250 K   c) 250^0C   d) 25^0C

183. Which of the following is unitless quantity?
a) Pressure gradient   b) Displacement gradient   c) Force gradient   d) Velocity gradient

184. Average density of the earth:
a) is directly proportional to g   b) is inversely proportional to g   c) does not depend on g

d) a complex function of g

185. Assertion: A number 2.746 rounded off to three Significant figures is 2.75, while the number 2.743 would be 2.74.
Reason : In rounding off the uncertain digits, the preceding digit is raised by 1 if the insignificant digit to be dropped is more than 5 and is left unchanged if the latter is less than 5.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false.   d) If both assertion and reason are false

186. The diode used in the circuit shown in the figure has a constant voltage drop of 0.5 V at all currents and a maximum power rating of 100 milliwatt. What should be the value of the resistor R, connected in series with the diode, for obtaining maximum current i?
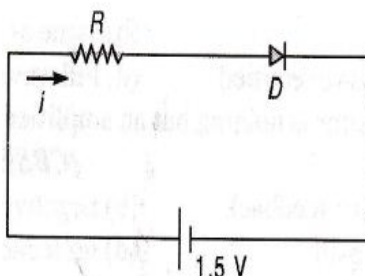
a) 200 W   b) 6.67 W   c) 5 W   d) 15 W

187. A sliding rod AB of resistance R is shown in the figure. Here magnetic field B is constant and is out of the paper. Parallel wires have no resistance and the rod is moving with constant velocity v. The current in the sliding rod AB when switch S is closed at time t = 0 is
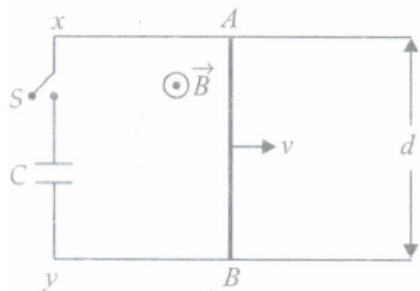
a) $\dfrac{vBd}{R}e^{-t/C}$ b) $\dfrac{vBd}{R}e^{-t/RC}$ c) $\dfrac{vBd}{R}e^{RtC}$ d) $\dfrac{vBd}{R}e^{t/RC}$

188. Three waves of amplitudes $12\mu m$, $4\mu m$ and $9\mu m$ but of same frequency arrive at a point in a medium with the successive phase difference of $(\pi/2)$. Then, the resultant amplitude in μm is :
   a) 4   b) 7   c) 5   d) 25

189. In reflection over a spherical mirror, ray parallel to principal axis, after reflection from mirror pass through
   a) focus   b) centre of curvature   c) pole of mirror   d) any point

190. For ordinary terrestrial experiments the observer in an inertial frame in the following cases, is:
   a) a child revolving in a giant wheel
   b) a driver in a sports car moving with a constant high speed of 200 km/hr on a straight road
   c) the pilot of an aeroplane which is taking-off   d) a cyclist negotiating a sharp curve

191. The variation of decay rate of two radioactive samples A and B with time is shown in figure.
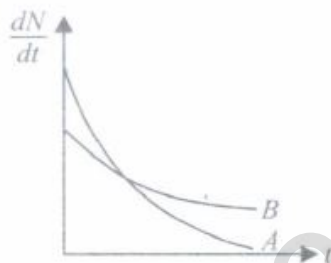
   Which of the following statements is/are true?
   a) Decay constant of A is greater than that of B, hence A always decays faster than B.
   b) Decay constant of A is greater than that of B, but it does not always decays faster than B.
   c)
   Decay constant of B is smaller than that of A but still its decay rate becomes equal to that of A at a later instant.
   d) Both (b) and (c).

192. In order to increase the magnifying power of a microscope
   a) The focal powers of the objective and the eye piece should be large
   b) Objective should have small focal length and the eyepiece should have large focal lenght.
   c) Both should have large focal lengths
   d) The objective should have large focal length and eyepiece should have small focal length

193. The flow of liquid is laminar or stream-line is determined by:
   a) rate of flow of liquid   b) density of fluid   c) radius of the tube   d) coefficient of viscosity of liquid

194. A body of mass M hits normally a rigid wall with velocity v and bounces back with the same velocity. The impulse experienced by the body is _____
   a) MV   b) 1.5MV   c) 2MV   d) zero

195. Efficiency of a Carnot engine is 50% when temperature of outlet is 500 K In order to increase efficiency up to 60% keeping temperature of intake the same what is temperature of outlet:

a) 200 K   b) 400 K   c) 600 K   d) 800 K

196. A projectile goes farthest from the earth when the angle of projection is:

a) 0°   b) 45°   c) 90°   d) 180°

197. For diatomic gas, which of the following statements is correct?

a) $C_v = \dfrac{3R}{2}$ b) $C_p = \dfrac{7R}{2}$ c) $C_p = \dfrac{5R}{2}$ d) $C_p - C_v = 2R$

198. An object placed at 20 cm in front of a concave mirror produces three times magnified real image. What is the focal length of the concave mirror?

a) 15 cm   b) 6.6 cm   c) 10 cm   d) 7.5 cm

199. In adiabatic expansion of a gas:

a) its pressure increases   b) its temperature falls   c) its density increases   d) its thermal energy increases

200. A stone is projected from level ground with speed u and at an angle θ with horizontal. Some how the acceleration due to gravity (g) becomes double (that is 2g) immediately after the stone reaches the maximum height and remains same thereafter. Assume direction of acceleration due to gravity always vertically downwards. The horizontal range of particle is

a) $\dfrac{3}{4}\dfrac{u^2 \sin 2\theta}{g}$ b) $\dfrac{u^2 \sin 2\theta}{2g}\left(1 + \dfrac{1}{\sqrt{2}}\right)$ c) $\dfrac{u^2}{g}\sin 2\theta$ d) $\dfrac{u^2 \sin 2\theta}{2g}\left(2 + \dfrac{1}{\sqrt{2}}\right)$