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MONTHLY TEST, NOVEMBER - 2018

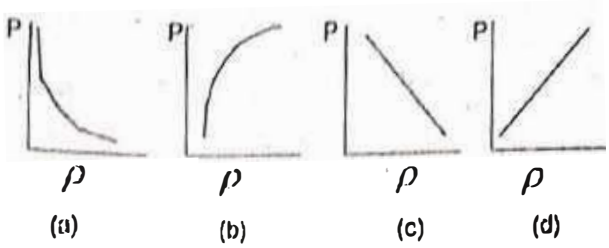
STANDARD - XI
PHYSICS
PART - I

Time : 1. 30 Hrs. Marks : 50

10 X 1 = 10

I. Choose the best answer:

1. An ideal gas is maintained at constant pressure. If the temperatire of the ideal gas increases from 100k to 1000k then V_{rms} speed of the gas.
   a) Increases by $\sqrt{10}$ times b) Increases by 10 times
   c) remains same d) Increases by 7 times
2. The degrees of freedom for diatomic molecule at normal temperature is
   a) 5 b) 3 c) 7 d) 6
3. Which of the following shows the correct relationship between the pressure and density of an ideal gas at constant temperature?



(a) (b) (c) (d)

4. If S_p and S_v denote the specific heats of nitrogen gas per unit mass at constant pressure and constant volume respectively, there
   a) $S_p - S_v = 28\ R$ b) $S_p - S_v = \frac{R}{28}$ c) $S_p - S_v = \frac{R}{14}$ d) $S_p - S_v = R$
5. The length of a seconds pendulum on the surface of the Earth is 0.9m. The length of the same pendulum on the surface of planet X such that the acceleration of the planet X is n times greater than the earth is
   a) 0.9 n m b) $\frac{0.9}{n}$ m c) $0.9n^2$m d) $\frac{0.9}{n^2}$m
6. When a damped harmonic oscillator completes 100 oscillations, its amplitude is reduced to $\frac{1}{3}$ of its initial value. What will be its amplitude when it completes 200 oscillations?
   a) $\frac{1}{5}$ b) $\frac{2}{3}$ c) $\frac{1}{6}$ d) $\frac{1}{9}$
7. Two springs of force constants 1 Nm^{-1} and 2 Nm^{-1} are connected in series. The effective spring constant is
   a) 3 Nm^{-1} b) 1 Nm^{-1} c) $\frac{2}{3}$ Nm^{-1} d) $\frac{5}{3}$ Nm^{-1}
8. A simple harmonic oscillation is represented by the equation $y = 0.3 \sin (40\ \pi t + 1.1)$. The time period of the oscillation is
   a) 20 s b) 2 s c) 0.05 s d) 0.5 s
9. The speed of the sound wave in a steel rod whose Youngs modulus $Y = 2 \times 10^{11}\ Nm^{-2}$ and $P = 8000\ kgm^{-3}$.
   a) 5000 ms^{-1} b) 2500 ms^{-1} c) 2000 ms^{-1} d) 500 ms^{-1}
10. A mobile phone tower transmits a wave signal of wavelength 0.333 m. The frequency of the signal is
    a) 3000 MH_z b) 9000 MH_z c) 900 MH_z d) 300 MH_z

PART – II

Answer any five questions. Question No. 16 is compulsory: 5 X 2 = 10

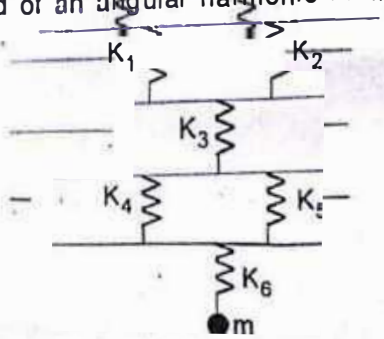
11. State Avogadro's law.
12. Define the degrees of freedom of a system?

13. An oxygen molecule travelling in air at 300 k and 1 atm, and the diameter of the oxygen molecule is 1.2×10^{-10}m. Calculate the mean free path of oxygen molecule.
14. All oscillatory motion are periodic whereas all periodic motions need not be oscillatory. Justify.
15. What are the factors that do not affect the time period of the simple pendulum.
16. Why soldiers are not allowed to march on a bridge?
17. What is transverse wave?
18. What is persistence of hearing?

PART – III

Answer any FIVE Questions. Question No. 21 is compulsory. **5 X 3 = 15**

19. State any six postulates of kinetic theory of gases.
20. Find the adiabatic component γ for mixture of μ_1 moles of monoatomic gas and μ_2 moles of a diatomic gas at normal temperature.
21. A gas is at temperature 80°C and pressure 5×10^{-10} Nm^{-2}. What is the number of molecules per m^3 if Boltzmann's constant is 1.38×10^{-22} Jk^{-1}.
22. Find the phase difference between the displacement and velocity, velocity and acceleration and displacement and acceleration for a simpe harmonic motion.
23. Derive the expression for the time period of an angular harmonic motion.
24. Calculate the equivalent spring constant for the system given.



25. Discuss the effect of temperature on the velocity of sound wave in air.
26. Write the characteristics of progressive wave.

PART – IV

Answer all the questions: **3 X 5 = 15**

27. a) Derive the expression for the pressure exerted by a gas in a container.

(OR)

b) Discuss Maxwell – Boltzmann's speed distribution function.

28. a) Derive the expression for the time period for the vertical oscillation of a loaded spring.

(OR)

b) i) What is velocity of a simple harmonic motion?'

ii) The velocities of a particle which undergoes simple harmonic motion is V_1 at x_1 and V_2 at x_2. Show that the ratio of time period (T) and amplitiude (A) is $\frac{T}{A} = 2\pi \sqrt{\frac{x_2^2 - x_1^2}{V_1^2 x_2^2 - V_2^2 x_1^2}}$

29. a) Derive the expression for the velocity of a transverse wave in a stretched string.

(OR)

b) i) Derive Laplace's equation for the velocity of sand waves in air.

ii) The speed of a wave in a certain medium is 900 m/s. If 3000 waves pass over a certain point of the medium in 2 minutes, then compute its wavelength.

Test No. 2

ONE MARK SPECIAL TEST, 2018 – 19

STANDARD - XI

PHYSICS

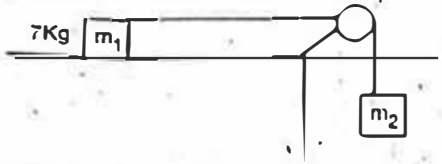
(Units – 3, 4, 5)

Time : 1 Hr. Marks : 50

Answer all the questions:

Choose the correct answer: 50 X 1 = 50

1. Two masses m_1 and m_2 are experiencing the same force where $m_1 < m_2$. The ratio of their accelerations is
   a) 1 b) less than 1 c) greater than 1 d) all the three cases
2. Impulse is equal to
   a) change of momentum b) rate of change of force
   c) rate of change of momentum d) change of force
3. Inertia of a body has direct dependence on
   a) velocity b) mass c) acceleration d) force
4. Force acting on the particle moving with constant speed is
   a) always zero b) need not be zero
   c) always non zero d) cannot be concluded
5. When the object is moving at constant velocity on the rough surface,
   a) net force on the subject is zero b) no force acts on the subject
   c) only external force acts on the object. d) only kinetic friction acts on the object.
6. Find the minimum mass m_2 required just to move mass m_1 when the coefficient of static friction between the mass m_1 and the table is 0.9.



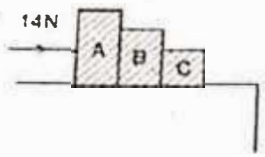
   a) 7.8 Kg b) 5.8 Kg
   c) 13.3 Kg d) 6.3 Kg
7. A block of mass 10 Kg placed on the rough horizontal surface having coefficient of friction $\mu = 0.5$, if a horizontal force of 100N acting on it then acceleration of the block will be ($g = 10\ ms^{-2}$)
   a) 10 ms^{-2} b) 5 ms^{-2} c) 15 ms^{-2} d) 0.5 ms^{-2}
8. A wooden box is lying an inclined plane. What is the coefficient of friction if the box starts sliding when the angle of inclination is 45^o?
   a) 1 b) 0.5 c) $\frac{1}{\sqrt{3}}$ d) $\frac{\sqrt{3}}{2}$
9. A block of mass 10 Kg is suspended through two light spring balances as shown in figure
   a) Both scales will read 10 Kg b) Both scales will read 5 Kg
   c) The upper scale will read 10 Kg and the lower will read 5 Kg.
   d) The readings may be anything but their sum will be 10 Kg.

10. A football player kicks a 0.8 Kg ball and imparts it a velocity 12ms-1 with a kicking force 576 N. The contact time of the foot with the ball is
    a) 0.012s b) $\frac{1}{60}s$ c) $\frac{1}{600}s$ d) 0.01s
11. An object slides in an inclined plane of inclined angle θ with the horizontal and of length s from rest. The speed when it reaches the bottom of the inclined plane is
    a) $\sqrt{2sg\sin\theta}$ b) $\sqrt{\frac{2s}{g}\sin\theta}$ c) $\sqrt{\frac{2g}{s}\sin\theta}$ d) zero
12. The static friction depends on
    i) the nature of the surfaces in contact ii) the area of the contact
    iii) the normal force exerted by the surface
    a) all are true b) i) and ii) are true and iii) is false
    c) ii) and iii) are true and i) is false d) i) and iii) are true and ii) is false

13. A urn with velocity 50 ms^{-1} on the circular road of radius of curvature 10m. Calculate the centrifugal force experienced by a person of mass 60 Kg inside the car.
a) 25000 N b) 10000 N c) 15000 N d) 5000 N

14. The condition for a vehicle to skid while negotiating a curve is
a) $u_s \geq \frac{v^2}{rg}$ b) $u_s \geq \frac{rg}{v^2}$ c) $u_s \leq \frac{v^2}{rg}$ d) $u_s \leq \frac{rg}{v^2}$

15. Three blocks A, B and C of masses 4, 2 and 1 Kg respectively are in contact on a frictionless surface, as shown. If a force of 14 N is applied on to 4 Kg block, then the contact force between A and B is



a) 6 N b) 8 N
c) 14 N d) 2 N

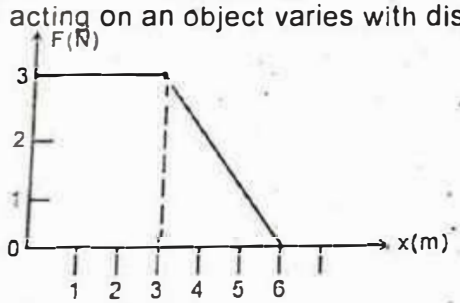
16. A ball of mass 0.25 Kg attached to the end of a string of length 1.96 m is moving in a horizontal circle. The string will break if the tension is more than 25 N. What is the maximum speed with which the ball can be moved?
a) 3 ms^{-1} b) 3.92 ms^{-1} c) 14 ms^{-1} d) 5 ms^{-1}

17. Calculate the work done by a force of 30 N in lifting a load of 2 Kg to a height of 10 m. (g= 10ms^{-2})
a) 600 J b) 300J c) 150 J d) 6J

18. A uniform force of $(2\hat{i}+\hat{j})$ N acts on a body of mass 1 Kg. The body displaces from position $(3\hat{j}+\hat{k})$ m to $(5\hat{i}+3\hat{j})$ m. The work done by the force on the body is
a) 9 J b) 6 J c) 10 J d) 12 J

19. An object of mass 1 Kg is sliding from the top to bottom in the frictionless inclined plane of inclination angle $\theta = 30^o$ and the length of inclined plane is 10 m. The workdone by the gravitional force and the normal force on the object are respectively as (assume g=10ms^{-2}).
a) zero, zero b) zero, 5J c) 5J, 50J d) 50J, zero

20. A force F acting on an object varies with distance x as shown in the figure.



The force is in newton and x in metre. The work done by the force in moving the object from x=0 to x = 6 m is
a) 18.0 J b) 13.5 J c) 4.5 J d) 9.0 J

21. A body of mass 3 Kg is under a constant force that causes a displacement s in metres in it, given by the relation $S = \frac{1}{3}t^2$, where t is in seconds. Work done by the force in 2s is
a) $\frac{8}{3}J$ b) $\frac{5}{19}J$ c) $\frac{19}{5}J$ d) $\frac{3}{8}J$

22. A body of mass of 1 Kg is thrown upwards with a velocity 20ms^{-1}. If momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction? (g = 10 ms^{-2})
a) 30 J b) 40 J c) 10 J d) 20 J

23. The potential energy of a system increases, if work is done
a) upon the system by a conservative force
b) upon the system by a non- conservative force
c) by the system against a conservative force
d) by the system against a non-conservative force

On

24. 1 electron volt = ?
a) 1.6×10^{-12}erg b) 4.44×10^{-10}Kwh c) 4.186×10^{-19}cal d) 10^{16}J

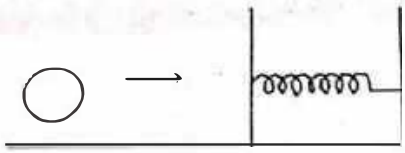
25. A ball of mass 2 Kg and another of mass 4 Kg are dropped from a tall building of height 80m. After a fall of 40m each towards Earth, their respective kinetic energies will be in the ratio
a) $\sqrt{2}:1$ b) $1:\sqrt{2}$ c) 2:1 d) 1:2

26. A bomb of mass 30 Kg at rest explodes into two pieces of mass 18 Kg and 12 Kg. The velocity of 18 Kg mass is 6ms-1. The Kinetic energy of the other mass is
a) 524 J b) 256 J c) 486 J d) 324 J

27. If the kinetic energy of a body is increased by 300% then the percentage change in momentum will be
a) 100% b) 150% c) 17.32% d) 73.2%

28. If the potential energy of a particle is $\alpha - \frac{\beta}{2}x^2$, then force experienced by the particle is
a) $F=\frac{\beta}{2}x^2$ b) $F=\beta x$ c) $F=-\beta x$ d) $F=-\frac{\beta x^2}{2}$

29. A mass of 0.5 Kg moving with a speed of 1.5 ms^{-1} on a horizontal smooth surface, collides with a nearly weightless spring of force constant k= 50 Nm^{-1}. The maximum compression of the spring would be



a) 0.12m b) 1.5m c) 0.5m d) 0.15m

30. A ball moving with velocity 2ms^{-1} collides head on with another stationary ball of double the mass. If the coefficient of restitution is 0.5 then their velocities (in ms^{-1}) after collision will be
a) 0.2 b) 0,1 c) 1,1 d) 1,0.5

31. A stone is thrown at an angle of 65^0 with the horizontal with kinetic energy K. The kinetic energy at the highest point is
a) $\frac{K}{2}$ b) $\frac{K}{\sqrt{2}}$ c) $\frac{K}{4}$ d) zero

32. An engine exerts a force $\vec{F}=(20\vec{i}-3\vec{j}+5\vec{k})N$ and moves with velocity $\vec{V}=(6\vec{i}+20\vec{j}-3\vec{k})ms^{-1}$. The power of the engine (in watt) is
a) 45 b) 75 c) 20 d) 10

33. A man moves on a straight horizontal road with a block of mass 2kg in hand. If he covers a distance of 40m with an acceleration of 0.5ms^{-2}, find the work done by the man on the block during the motion
a) 40 J b) 20 J c) 10 J d) 8J

34. The centre of mass of a system of particles does not depend upon
a) position of particles b) relative distance between particles
c) masses of particle d) force acting on particle

35. Two bodies of mass 1 Kg and 3 Kg have position vectors $(\vec{i}+2\vec{j}+\vec{k})$ and $(-3\vec{i}-2\vec{j}+\vec{k})$ respectively. The centre of mass of this system has a position vector
a) $(-2\vec{i}-\vec{j}+\vec{k})$ b) $(2\vec{i}-\vec{j}-2\vec{k})$ c) $(-\vec{i}+\vec{j}+\vec{k})$ d) $(-2\vec{i}+2\vec{k})$

36. Three masses are placed on the x-axis 300 g at origin, 500g at x = 40 cm and 400g at x=70cm. The distance of the centre of mass from the origin is
a) 50 cm b) 30 cm c) 40 cm d) 45cm

37. A projectile of mass 6 Kg, in its course of motion explodes on its own into two equal fragments. One falls at half of the range R of the projectile. Where will the other fragment fall?
a) 3 R b) 4 R c) 3/2 R d) 5/2 R

38. A particle is moving with a constant velocity along a line parallel to positive x-axis. The magnitude of its angular momentum with respect to the origin is
a) zero b) increasing with x c) decreasing with x d) remaining constant

39. Rotational analogue of mass in linear motion is
a) weight b) moment of inertia c) torque d) angular momentum

40. The moment of inertia of a body does not depend on
a) the angular velocity of the body b) the mass of the body
c) the axis of rotation of the body d) the distribution of mass in the body

41. Match the column A with column B.

Column A	Column B
i) $K = \frac{l}{\sqrt{12}}$	a) Circular ring about the axis passing through the centre and perpendicular to the plane.
ii) K= 0.707 R	b) Uniform rod about the axis passing through the centre.
iii) K= R	c) Uniform rod about the axis passing through one end.
iv) $K = \frac{l}{\sqrt{3}}$	d) Uniform disc about the axis passing through the centre

Correct match is
a) i) a ii) c iii) d iv) b
b) i) b ii) c iii) a iv) d
c) i) b ii) d iii) a iv) c
d) i) c ii) d iii) b iv) a

42. A rope is wound around a hollow cylinder of mass 3 Kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force 30 N?
a) 0.25 rad s^{-2} b) 25 rad s^{-2} c) 5ms^{-2} d) 25 ms^{-2}

43. When a mass is rotating in a plane about a fixed point, its angular momentum is directed along
a) a line perpendicular to the plane of rotation b) a line parallel to the plane of rotation
c) the radius d) tangent to the path

44. A round object of mass M and radius R rolls down without slipping along an inclined plane. The frictional force
a) dissipates kinetic energy as heat b) decreases the rotational motion
c) decreases the rotational and translational motion
d) converts translational energy into rotational energy.

45. Two bodies have their moments of inertia I and 2I respectively about their axes of rotation. If their kinetic energies of rotation are equal, their angular momentum will be in the ratio
a) 1:2 b) $\sqrt{2}:1$ c) $1:\sqrt{2}$ d) 2:1

46. The ratio of the radii of gyration of a circular disc about a tangential axis in the plane of the disc and of a circular ring of the same radius about a tangential axis in the plane of the ring is
a) 2:1 b) 2:3 c) $\sqrt{5}:\sqrt{6}$ d) $1:\sqrt{2}$

47. A round disc of moment of inertia I_2 about its axis perpendicular to its plane and passing through its centre is placed over another disc of the moment of inertia I_1 rotating with an angular velocity ω about the same axis. The final angular velocity of the combination of the discs is
a) ω b) $\frac{I_1\omega}{I_1+I_2}$ c) $\frac{(I_1+I_2)\omega}{I_1}$ d) $\frac{I_2\omega}{I_1+I_2}$

48. Arrange ring, hollow sphere, solid sphere and disc in the descending order of their radii of gyration . Assume that all are having same radius R
a) Solid sphere, hollow sphere, disc, ring b) Ring, hollow sphere, disc, solid sphere
c) Hollow sphere, solid sphere, ring, disc d) Disc, ring, hollow sphere, solid sphere

49. The ratio of $\frac{K^2}{R^2}$ values of a ring about the axis passing through the centre lying on the plane along diameter and a disc of same radius and mass about the axis passing through the centre and perpendicular to the plane is
a) 1 b) 1/2 c) 2 d) 1/3

50. The ratio of the acceleration for a solid sphere (mass m and radius R) rolling down an incline of angle θ without slipping down the incline without rolling is
a) 5:7 b) 2:3 c) 2: 5 d) 7:5

Test No. 3

ONE MARK SPECIAL TEST, 2018 – 19

STANDARD - XI

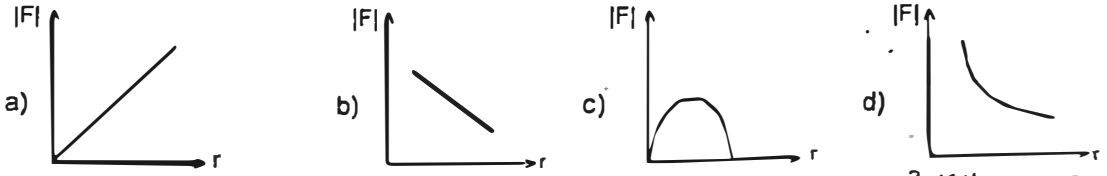
Time : 1.00 Hr. **PHYSICS** **Marks : 50**

(Units – 6, 7, 8)

Answer all the questions:

Choose the correct answer: **50 X 1 = 50**

1. Choose the correct statement (s)
   a) Ptolemy proposed geocentric theory and found that the orbits of the planets are elliptical
   b) Kepler proposed heliocentric theory and found that the orbits of the planets are elliptical
   c) Nicholar copernicus proposed heliocentric theory and found that the orbits of the planets are circular
   d) (b) and (c)
2. Kepler's law of period states that $T^2 \alpha a^3$, here 'a' represents
   a) semi-major axis b) average of semi major axis and semi minor axis
   c) semi minor axis d) the difference of semi major axis and semi minor axis
3. Which graph correctly represent the variation of gravitational force with distance?



4. The acceleration experienced by a mass at the surface of earth is 9.8 ms^{-2}. If the same mass is at a distance 60R (R is the Earth's radius), the acceleration experienced by the same mass is
   a) $\frac{9.8}{60R}\ ms^{-2}$ b) $\frac{9.8}{60}\ ms^2$ c) $\frac{9.8}{3600}\ ms^{-2}$ d) $\frac{(9.8)}{3600\ R}\ ms^{-2}$
5. The orbital size of Earth is r_o. Suppose there existed a planet that went around the sun twice as fast as the Earth. The orbital size as compared to that of the Earth is
   a) $\frac{r_o}{2}$ b) $\frac{r_o}{(4)^{1/3}}$ c) $\frac{r_o}{2\sqrt{2}}$ d) $\frac{r_o}{(2)^{1/3}}$
6. If the potential energy at infinity is zero, the total energy of an orbiting satellite is equal to the
   a) potential energy b) kinetic energy
   c) negative of potential energy d) negative of kinetic energy
7. Escape velocity of a body from the Earth depends on the
   a) height of location from where the body is launched
   b) mass of the body which is to be projected
   c) direction of projection d) all of these
8. A comet orbits the Sun in highly elliptical orbit. Which are constant through out its orbit?
   a) linear speed and angular momentum b) angular momentum and kinetic energy
   c) linear momentum and total energy d) angular momentum and total energy
9. The weight of a body on the surface of Earth is 63N. What is its weight at a height equal to half the radius of Earth?
   a) 28N b) 31.5N c) 15.75N d) 22 N
10. If a person moves from Chennai to Trichy, his weight
    a) decreases b) increases c) remains same d) increases and then decreases
11. The time period of a satellite orbiting Earth in a circular orbit is independent of
    a) the radius of the orbit b) the mass of the satellite
    c) both the mass and radius of the orbit d) neither the mass nor the radius of its orbit
12. The gravitational potential energy of the Moon with respect to Earth is
    a) always positive b) always negative c) can be positive or negative d) always zero

13. The work done by the Sun's gravitational force on the Earth is
a) always zero b) always positive c) always negative d) can be positive or negative

14. If the distance between the Earth and Sun were to be halved from the present value, the number of days the year would be
a) 129 b) 183 c) 258 d) 91

15. According to Kepler's third law $T^2 = Kr^3$. If masses of sun and a planet are M and m, respectively then as per Newton's law of gravitational force of attraction $F = \frac{GMm}{r^2}$, here G is gravitational constant. The relation between G and K is described as
a) $GMK = 4\pi^2$ b) $K = G$ c) $K = \frac{1}{G}$ d) $GK = 4\pi^2$

16. A remote sensing satellite of Earth revolves in a circular orbit at a height of 0.25×10^6 m above the surface of Earth. If Earth's radius in 6.38×10^6 m and $g = 9.8\ ms^{-2}$, then the orbital speed of the satellite is
a) $6.67\ kms^{-1}$ b) $7.76\ kms^{-1}$ c) $8.56\ kms^{-1}$ d) $9.13\ kms^{-1}$

17. A geo stationary satellite is orbiting the Earth at a height of 5R above the surface of the Earth, R being the radius of the Earth. The time period of another satellite in hours at a height of 2R from the surface of the Earth is
a) 5 b) 10 c) $6\sqrt{2}$ d) $5\sqrt{2}$

18. A steel wire of length ℓ and cross sectional area A stretches by the same amount as a copper wire of length 2ℓ and cross-sectional area 2A under a given load. If Y is the Youngs modulus of steel, then the Young's modulus of copper is
a) Y b) 2Y c) $\frac{Y}{2}$ d) 4Y

19. A wire of length L and radius r is clamped rigidly at one end. When the other end of the wire is pulled by a force f, its length increases by ℓ. Another wire of the same material of length 2L and radius 2r, is pulled by a force 2f. The increase in length of this wire is equal to
a) 2ℓ b) ℓ c) 4ℓ d) $\frac{\ell}{2}$

20. When detergents are dissolved in water
a) the angle of contact becomes smaller and the capillary rise will increase
b) the angle of contact becomes greater and the capillary rise will increase
c) no change in angle of contact but the detergent will rise more height
d) no change in angle of contact and no change in the rise of height also

21. Viscosity of gases ———— with temperature, and the viscosity of liquids ———— with temperature.
a) increases, increases b) decreases, decreases
c) increases, decreases d) decreases, increases

22. A square frame of length ℓ is immersed in a soap solution. When the frame is taken out a thin film is formed within the frame. The force on the frame due to soap film is (T is surface tension)
a) $8T\ell$ b) $4T\ell$ c) $12T\ell$ d) $16T\ell$

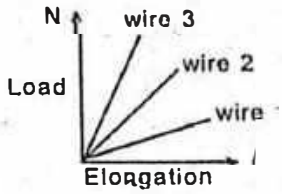
23. In a horizontal pipe of non uniform cross section, water flows with a velocity of $1\ ms^{-1}$ at a point where the diameter of the pipe is 20 cm. The velocity of water at the point where diameter is 16 cm is
a) $0.8\ ms^{-1}$ b) $2\ ms^{-1}$ c) $2.5\ ms^{-1}$ d) $1{:}5\ ms^{-1}$

24. If the temperature of the wire is increased, then the Young's modulus will
a) remain the same b) decrease c) increase rapidly d) increase by very small amount

25. A small sphere of radius 2 cm falls from rest in a viscous liquid. Heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity is proportional to
a) 2^2 b) 2^3 c) 2^4 d) 2^5

26. Consider two wires X and Y. The radius of wire X is 2 times the radius of Y. If they are stretched by the same load then stress on Y is
a) four times that on X b) equal to that on X c) two times that on X d) half that on X

27. The load – elongation graph of three wires of the same material are shown in figure. Which of the following wire is the thickest?
a) wire 1 b) wire 2
c) wire 3 d) all of them have same thickness



28. Two wires are made of same material and have the same volume. The area of cross sections of the first and the second wires are A and 2A respectively. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second wire by the same amount?
a) 2F b) 4F c) 8F d) 16F

29. The bulk modulus of a spherical object is B. If it is subjected to uniform pressure P, the fractional decrease in radius is
a) $\frac{B}{3p}$ b) $\frac{3p}{B}$ c) $\frac{p}{3B}$ d) $\frac{3B}{p}$

30. The Young's modulus of a wire is Y. The elastic potential energy stored in the wire per unit volume is
a) $U = \frac{1}{2} \times \text{stress} \times (\text{strain})^2$ b) $U = \frac{1}{2} \times Y \times (\text{strain})^2$
c) $U = \frac{1}{2} \times (\text{stress})^2 \times \text{strain}$ d) $U = \frac{1}{2} \times Y^2 \times \text{strain}$

31. A certain number of spherical drops of liquid of radius r coalesec to form a single drop of radius 10r and volume 5×10^{-22} m^3. If the radius $r = 0.5 \times 10^{-8}$ m and surface tension of the liquid $T = 0.075$ Nm^{-1}, find the energy released
a) 2.7×10^{-14} J b) 3.02×10^{-14} J c) 2.97×10^{-14} J d) 2.02×10^{-14} J

32. The following four wires are made of the same material. Which of the these will have the largest extension when the same tension is applied
a) length = 100 cm, diameter = 2 mm b) length = 50 cm, diameter = 1mm
c) length = 150 cm, diameter = 1.5 mm d) length = 200 cm, diameter = 1 mm

33. A black body at 1227°C emits radiations with maximum intensity at a wavelength of 5000A°. The temperature of the body is increased by 1000°C, the maximum intensity will be observed at
a) 4000A° b) 5000A° c) 6000A° d) 3000A°

34. Unit of Stefan's constant is
a) $wm^{-2} k^{-4}$ b) $wm^2 k^{-2}$ c) $wm^2 k^{-4}$ d) $wm^{-2} k^{-1}$

35. A body cools from a temperature 3T to 2T in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end if next 10 minutes will be
a) $\frac{3}{4}$ T b) $\frac{4}{3}$ T c) $\frac{3}{2}$ T d) $\frac{7}{4}$ T

36. The equation of state for 5g of oxygen at a pressure P and temperature T, when occupying a volume V, will be (R is a gas constant)
a) PV = 5RT b) $PV = \frac{5}{2}$ RT c) $PV = \frac{5}{16}$ RT d) $PV = \frac{5}{32}$ RT

37. Two ends of a metal rod are maintained at temperatures 100°C and 110°C. The rate of heat flow in the rod is found to be 4.0 Js^{-1}. If the ends are maintained at temperatures 200°C and 210°C, the rate of heat flow will be
a) 16.8 Js^{-1} b) 8.0 Js^{-1} c) 4.0 Js^{-1} d) 44.0 Js^{-1}

38. The internal energy change in a system that has absorbed 2 Kcal heat and done 500 J of work is
a) 6400 J b) 7900 J c) 5400 J d) 8900 J

39. A monoatomic gas at pressure p_1 and volume v_1 is compressed adiabatically to $\frac{1}{8}$ th its original volume. What is the final pressure of the gas?
a) 32 p_1 b) 16 p_1 c) p_1 d) 64 p_1

40. In hot summer after a bath, the body's
a) internal energy decreases b) internal energy increases
c) heat decreases d) no change in internal energy and heat

41. When food is cooked in a vessel by keeping the lid closed, after some time the steam pushes the lid outward. By considering the steam as a thermodynamic system, then in the cooking process
a) Q > 0, W > 0 b) Q < O, W > O c) Q > O, W < O d) Q < O, W < O

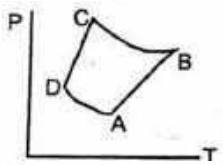
42. In an isochoric process, we have
a) Q = O b) W = O c) ΔU = O d) T = O

43. An ideal refrigerator has a freezer at temperature – 12°C. The coefficient of performance of the engine is 5. The temperature of the air (to which the heat ejected) is
a) 50°C b) 45.2°C c) 40.2°C d) 37.5°C

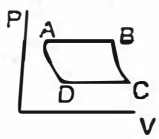
44. A distant star emits radiation with maximum intensity at 350 nm. The temperature of the star is
a) 9044 K b) 5000 K c) 7260 K d) 8280 K.

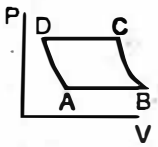
45. A hot cup of coffee is kept on the table. After sometime it attains a thermal equilibrium with the surroundings. By considering the air molecules in the room as a thermodynamic system, which of the following is true?
a) $\Delta U > O, Q = O$ b) $\Delta U > O, W < O$ c) $\Delta U > O, Q > O$ d) $\Delta U = O, Q > O$

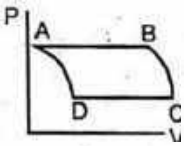
46. The V – T diagram of an ideal gas which goes through a reversible cycle A → B → C → D is shown below. (process D → A and B → C are adiabatic)

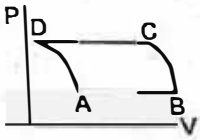


The corresponding PV diagram for the process is

a) 

b) 

c) 

d) 

47. When you exercise in the morning, by considering your body as thermodynamic system, which of the following is true?
a) $\Delta U > O, W > O$ b) $\Delta U < O, W > O$ c) $\Delta U < O, W < O$ d) $\Delta U = O, W > O$

48. Which of the following circular rods (given radius r_o and length ℓ_o) each made of the same material and whose ends are maintained at the same temperature will conduct most heat?
a) $r = 2r_o; \ell = 2\ell_o$ b) $r = 2r_o; \ell = \ell_o$ c) $r = r_o; \ell = 2\ell_o$ d) $r = r_o; \ell = \ell_o$

49. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is U_1, at wavelength 500 nm is U_2 and that at 1000 nm is U_3. Wien's constant, $b = 2.88 \times 10^6$ nmk. Which of the following is correct?
a) $U_1 > U_2$ b) $U_1 = 0$ c) $U_3 = 0$ d) $U_2 > U_1$

50. The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_p and C_v respectively. If $\gamma = \frac{C_p}{C_v}$ and R is the universal gas constant, then C_v is equal to

a) $\frac{1+\gamma}{1-\gamma}$ b) $\frac{\gamma - 1}{R}$ c) γR d) $\frac{R}{\gamma - 1}$

Test No. 4

ONE MARK SPECIAL TEST, 2018 – 19

STANDARD - XI

Time : 1.00 Hr. **PHYSICS** **Marks : 50**

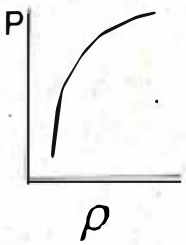
(Units – 9, 10, 11)

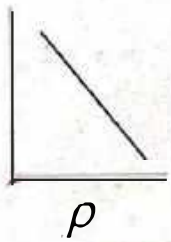
Answer all the questions:

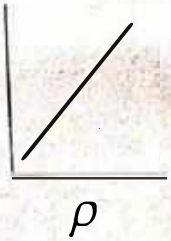
Choose the correct answer: **50 X 1 = 50**

1. Which is not correct with respect to postulates of kinetic theory of gases? No Full stops at the end of options
   a) The molecules donot exert any force of attraction or repulsion on each other except during collision
   b) The molecules possess both potential and kinetic energies.
   c) The molecules obey Newton's laws of motion.
   d) The molecules impart certain momentum to the walls of the container during collisions.
2. The pressure exerted by a gas does not depend on
   a) mean square speed of the molecule b) mass of the molecule
   c) Number density d) area of the wall of the container
3. The average kinetic energy of each molecule of a gas depends on
   a) temperature of the gas b) mass of the molecule c) both (a) and (b) d) size of the molecule
4. The rms speed of a molecule is ---- the average speed.
   a) 0.28 times b) $\frac{1}{0.28}$ times c) 0.92 times d) $\frac{1}{0.92}$ times
5. The rms speed of a hydrogen molecule at a particular temperature is 1936 ms^{-1}. The rms speed of oxygen molecule at that temperature is
   a) 968 ms^{-1} b) 242 ms^{-1} c) 484 ms^{-1} d) 1936 ms^{-1}
6. A sample of ideal gas is at equilibrium. Which of the following quantity is zero?
   a) rms speed b) average speed c) average velocity d) most probable speed
7. An ideal gas is maintained at constant pressure. If the temperature of an ideal gas increases from 100 K to 1000 K then the rms speed of the gas molecules
   a) increases by $\sqrt{10}$ times b) increases by 10 times
   c) remains same d) becomes $\frac{1}{10}$ times
8. The average translational kinetic energy of gas molecules depends on
   a) number of moles and T b) only on T c) P and T d) P only
9. If the internal energy of an ideal gas U and volume V are doubled then the pressure
   a) doubles b) halves c) quadruples d) remains same
10. A particle of mass m moving with speed u in a direction which makes 60^o with respect to x axis. It undergoes elastic collision with the wall. The change in momentum is
    a) – mu b) zero c) – 2mu d) – 0.732 mu
11. For a given gas molecule at a fixed temperature, the area under the Maxwell – Boltzmann distribution curve is equal to
    a) $\frac{PV}{KT}$ b) $\frac{KT}{PV}$ c) $\frac{P}{NKT}$ d) PV
12. The adiabatic component γ for a mixture of 1 mole of monoatomic gas and 2 moles of a diatomic gas at normal temperature is
    a) $\frac{11}{15}$ b) $\frac{17}{13}$ c) $\frac{11}{9}$ d) $\frac{19}{13}$
13. If S_p and S_v denote the specific heats of nitrogen gas per unit mass at constant pressure and constant volume respectively, then
    a) $S_p - S_v = 28R$ b) $S_p - S_v = \frac{R}{28}$ c) $S_p - S_v = \frac{R}{14}$ d) $S_p - S_v = R$
14. Which of the following shows the correct relationship between the pressure and density of an ideal gas at constant temperature?

a) 

b) 

c) 

d) 

15 A container has one mole of monoatomic ideal gas. Each molecule has 3 degrees of freedom. What is the ratio of $\gamma = \frac{C_p}{C_v}$?

a) 3 b) $\frac{4}{3}$ c) $\frac{7}{3}$ d) $\frac{5}{3}$

16. The temperature at which the rms velocity of a gas triples its value at STP is

a) 719 K b) 2457 K c) 1438 K d) 273 K

17 The mean free path of a gas molecule is λ at a certain pressure and temperature. If the pressure and temperature are doubled, the mean free path of the molecule is

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

18. Two bodies A and B whose masses are in the ratio 1:2 are suspended from two separate massless springs of force constants K_A and K_B respectively. If the two bodies oscillate vertically such that their maximum velocities are in the ratio 1:2, the ratio of amplitude A to that of B is

a) $\sqrt{\frac{K_B}{2K_A}}$ b) $\sqrt{\frac{K_B}{8K_A}}$ c) $\sqrt{\frac{2K_B}{K_A}}$ d) $\sqrt{\frac{8K_B}{K_A}}$

19 An ideal spring of spring constant K, is suspended from the ceiling of a room and a block of mass M is fastened to its lower end. If the block is released when the spring is unstretched, then the maximum extension in the spring is

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

20. If the inertial mass and gravitational mass of the simple pendulum of length ℓ are not equal, then the time period of the simple pendulum is

a) $T = 2\pi\sqrt{\frac{m_i\ell}{m_g g}}$ b) $T = 2\pi\sqrt{\frac{m_g\ell}{m_i g}}$ c) $T = 2\pi\frac{m_g}{m_i}\sqrt{\frac{\ell}{g}}$ d) $T = 2\pi\frac{m_i}{m_g}\sqrt{\frac{\ell}{g}}$

21. A pendulum hung in a very high building oscillates to and for motion freely like a simple harmonic oscillator. If the acceleration of the bob is 16 ms^{-2} at a distance of 4m from the mean position, then the time period is

a) 2s b) 1 s c) 2π s d) π s

22. A simple pendulum is suspended from the roof of a school bus which moves in a horizontal direction with an acceleration a, then the time period is

a) $T\alpha\frac{1}{g^2 - a^2}$ b) $T\alpha\frac{1}{\sqrt{g^2 + a^2}}$ c) $T\alpha\sqrt{g^2 + a^2}$ d) $T\alpha(g^2 + a^2)$

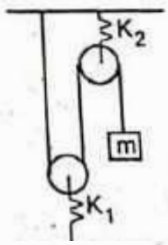
23. In a simple harmonic oscillation, the acceleration against displacement for one complete oscillation will be

a) an ellipse b) a circle c) a parabola d) a straight line

24. A particle executing SHM crosses point A and B with the same velocity. Having taken 2s in passing from A to B, it returns to B after 2s. The time period is

a) 12 s b) 8s c) 6s d) 4s

25 The time period for small vertical oscillations of block of mass m when the masses of the pulleys are negligible and spring constant k_1 and k_2 is



a) $T = 4\pi\sqrt{\left(\frac{1}{k_1} + \frac{1}{k_2}\right)m}$ b) $T = 2\pi\sqrt{m\left(\frac{1}{k_1} + \frac{1}{k_2}\right)}$

c) $T = 4\pi\sqrt{m(k_1 + k_2)}$ d) $T = 2\pi\sqrt{m(k_1 + k_2)}$

26. A hollow sphere is filled with water. It is hung by a long thread. As the water flows out of a hole at the bottom, the period of oscillation will

a) first increase and then decrease b) first decrease and then increase

c) increase continuously d) decrease continuously

27. A simple pendulum has a time period T_1. When its point of suspension is moved vertically upwards according as $y = kt^2$, where y is vertical distance covered and $k = 1\ ms^{-2}$, its time period becomes T_2. Then $\frac{T_1^2}{T_2^2}$ is ($g = 10\ ms^{-2}$)

a) $\frac{5}{6}$ b) $\frac{11}{10}$ c) $\frac{6}{5}$ d) $\frac{5}{4}$

28. The displacement of a particle executing SHM is $y = 0.05 \sin (100\ t + \frac{\pi}{2})$ cm. The velocity amplitude is

a) 0.5 cm s^{-1} b) 0.05 ms^{-1} c) 5 ms^{-1} d) 50 ms^{-1}

29. 6.4 N force produces 0.1 m extension in a spring suspended vertically. The mass to be suspended in the spring so that it oscillates vertically with a time period of $\frac{\pi}{4}$ s is

a) $\frac{\pi}{4}$ kg b) $\frac{1}{4}$ kg c) 4 kg d) 1 kg

30. The total energy of a harmonic oscillator is E and its force constant is k. The relation between the amplitude (A) of the oscillator and total energy is

a) $A = \sqrt{2EK}$ b) $A = \sqrt{\frac{K}{2E}}$ c) $A = \sqrt{\frac{E}{2K}}$ d) $A = \sqrt{\frac{2E}{K}}$

31. A spring of spring constant k is cut into two pieces, one piece with length ℓ_1 and the other with length ℓ_2 such that $\ell_1 : \ell_2$ is 1:3. The ratio of spring constants $k_1 : k_2$ will be

a) 1:4 b) 4:1 c) 3:1 d) 1:3

32. If the length of the pendulum is increased by 44% from its original length, the percentage increase in time period of the pendulum is

a) 20% b) 12% c) 18% d) 22%

33. Which of the following represents a wave

a) $(x - vt)^3$ b) x (x + vt) c) $\frac{1}{x + vt}$ d) sin (x + vt)

34. The displacement y of a wave travelling in the x direction is given by $y = 2 \times 10^{-3}$ sin $(3006 - 2x + \frac{\pi}{4})$, where x and y are measured in metres and t in second. The speed of the wave is

a) 150 ms^{-1} b) 300 ms^{-1} c) 450 ms^{-1} d) 600 ms^{-1}

35. An air column in a pipe which is closed at one end, will be in resonance with the vibrating body of frequency 83 Hz. The length of the air column is

a) 1.5 m b) 0.5 m c) 1.0 m d) 2.0 m

36. A transverse wave moves from a medium A to a medium B. In medium A, the velocity of the transverse wave is 500 ms^{-1} and the wavelength is 5 m. The frequency and the wavelength of the wave in medium B when its velocity is 600 ms^{-1}, respectively are

a) 120 Hz and 5 m b) 100 Hz and 5 m c) 120 Hz and 6 m d) 100 Hz and 6 m

37. A spring balance has a scale that reads from 0 to 50 kg. The length of the scale is 20 cm. A body suspended from this balance, when displaced and released, oscillates with a period 0.628s. The mass of the body suspended is

a) 12.50 kg b) 24.50 kg c) 6.25 kg d) 12.50 kg

38. A transverse wave on a string is described by $y = 3.0 \sin (36\ t + 0.018x + \frac{\pi}{4})$, where x,y are measured in metre and t in second. The velocity of the wave is

a) 18 ms^{-1} b) 9 ms^{-1} c) 20 ms^{-1} d) 36 ms^{-1}

39. The transverse displacement of a string clamped at its both ends is given by $y = 0.002 \sin (300\ t - 2x + \frac{\pi}{4})$, where x and y are measured in metres and t in second. The linear density of the string is 2×10^{-2} kg/m. The tension in the string is

a) 450 N b) 300 N c) 200 N d) 600 N

40. Two wires are vibrating simultaneously in their fundamental notes. The tensions, densities, lengths and diameter of two wires are in the ratio 8:1, 1:2, x:y and 4:1 respectively. If the note of the higher pitch has a frequency of 360 Hz and the number of beats produced persecond is 10, then the value of x:y is
a) 36:35 b) 35:36 c) 1:1 d) 1:2

41. A student tunes his guitar by striking a 120 Hertz with a tuning fork, and simultaneously plays 4^{th} string on his guitar. By keen observation, he hears the amplitude of the combined sound oscillating thrice per second. Which of the following frequencies is the most likely the frequencies of the 4^{th} string on his guitar?
a) 30 b) 117 c) 110 d) 120

42. A person standing between two parallel hills fires a gun and hears the fist echo after t_1, sec and the second echo after t_2 sec. The distance between the two hills is
a) $\frac{v(t_1 - t_2)}{2}$ b) $\frac{v\, t_1 t_2}{2}$ c) $v\,(t_1 + t_2)$ d) $\frac{v\,(t_1 + t_2)}{2}$

43. A man sitting on a swing which is moving to an angle of 60° from the vertical is blowing a whistle which has a frequency of 2.0 KHz. The whistle is 2.0 m from the fixed support point of the swing. A sound detector which detects the whistle sound is kept infront of the string. The maximum frequency the sound detector detected is
a) 1.974 KHz b) 9.74 KHz c) 2.027 KHz d) 1.011 KHz

44. An organ pipe A closed at one end is allowed to vibrate in its first harmonic and another pipe B open at both ends is allowed to vibrate in its third harmonic. Both A and B are in resonance with a given tuning fork. The ratio of the length of A and B is
a) $\frac{8}{3}$ b) $\frac{3}{8}$ c) $\frac{1}{6}$ d) $\frac{1}{3}$

45. A rail engine and a car are travelling parallel and in the opposite directions with a velocities 40 ms^{-1} and 20 ms^{-1} respectively. The rail engine blows a sound with a frequency 500 Hz and the velocity of sound in air is 340 ms^{-1}. The apparent frequency of the sound heard by a man sitting in the car while both are approaching is
a) 550 Hz b) 800 Hz c) 600 Hz d) 750 Hz

46. Let $y = \frac{1}{1 + x^2}$ at $t = 0$ s be the amplitude of the wave propagating in the positive x direction.

At $t = 2$s, the amplitude of the wave propagating becomes $y = \frac{1}{1 + (x - 2)^2}$. Assume that the shape of the wave does not change during propagation. The velocity of the wave is
a) 0.5 ms^{-1} b) 1.0 ms^{-1} c) 1.5 ms^{-1} d) 2.0 ms^{-1}

47. A stretched string vibrates in its fundamental frequency of 512 Hz. Another string of same material is stretched four times and the length and diameter of the string is double the previous one. The fundamental frequency of the second string is
a) 512 Hz b) 256 Hz c) 128 Hz d) 1024 Hz

48. A source of unknown frequency gives 4 beats s^{-1}, when sounded with a source of known frequency gives 5 beats per when sounded sounded with a source of frequency 513Hz. The unknown frequency is
a) 254 Hz b) 246 Hz c) 240 Hz d) 260 Hz

49. A transverse wave is represented by $y = A \sin(\omega t - kx)$. For what value of the wavelength is the wave velocity equal to the maximum particle velocity?
a) A b) $\frac{\pi A}{2}$ c) πA d) $2\pi A$

50. Two vibrating tuning forks produce progressive waves given by $y_1 = 4 \sin 500\,\pi t$ and $y_2 = 2 \sin 506\,\pi t$. Number of beats produced per minute is
a) 3 b) 360 c) 180 d) 60

BYJU'S The Learning App

Test No. 5

ONE MARK SPECIAL TEST, 2018 – 19

STANDARD - XI

Time : 1 Hr. — PHYSICS — Marks : 60

(FULL PORTIONS)

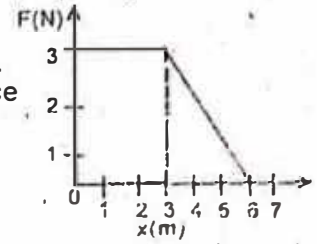
Answer all the questions:

Choose the correct answer: 50 X 1 = 50

1. A particle of mass m_1 is moving with a velocity V_1 and another particle of mass m_2 is moving with a velocity V_2. Both of them have the same momentum but their kinetic energies are E_1 and E_2 respectively. If $m_1 > m_2$, then

   a) $\frac{E_1}{E_2} = \frac{m_1}{m_2}$ b) $E_1 > E_2$ c) $E_1 = E_2$ d) $E_1 < E_2$

2. A force F acting on an object varies with distance x as shown below. The force is in Newton and x is in metres. The work done by the force in moving the object from x = 0 to x = 6 m is

   a) 18.0J b) 13.5 J
   c) 4.5 J d) 9.0J

3. An engineexerts a force $\vec{F} = (20\hat{i} - 3\hat{j} - 5\hat{k})$ N and moves with velocity $\vec{V} = (6\hat{i} + 20\hat{j} - 3\hat{k})$ ms^{-1} The power of the engine (in watt) is

   a) 45 b) 75 c) 20 d) 10

4. The potential energy of a system increases, if work is done

   a) upon the sytem by a conservative force b) upon the system by a non conservative force
   c) by the system against a conservative force d) by the system against a non conservative force

5. The magnitude of the Sun's gravitational field as experienced by Earth is

   a) same over the year b) decreases in the month of January and increases in the month of July
   c) decreases in the month of July and increases in the month of January
   d) increases during day time and decreases during night time

6. The radii of circular orbits of two satellites A and B of the Earth, are 2R and R respectively. If the speed of satellite A is 2V, then the speed of satellite B will be

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

7. A body of mass m is placed on Earth's surface which is taken from Earth's surface to a height $h = 2R$ then the change in the gravitational potential energy is

   a) $\frac{2}{3}$ mgR b) $\frac{1}{3}$ mgR c) $\frac{1}{2}$ d) mgR

8. The density of a newly discovered planet is twice that of Earth. The acceleration due to gravity at the surface of the planet is equal to that at the surface of the Earth. If the radius of the Earth is R, the radius of the planet would be a) 4R b) $\frac{R}{2}$ c) 2R d) $\frac{1}{4}$ R

9. The ratio of escape velocity at Earth (V_e) to the escape velocity of a planet (V_p) whose radius and mean density are twice as that of Earth is a) 1:4 b) $1:\sqrt{2}$ c) 1:2 d) $1:2\sqrt{2}$

10. In dimension of critical velocity V_c, of liquid flowing through a tube are expressed as (η^x, ρ^y, r^z), where η, ρ and r are the coefficient of viscosity of liquid, density of the liquid and radius of the tube respectively, then the values of x,y and z are given by

    a) 1,1,1 b) 1, – 1, – 1 c) –1, – 1, 1 d) – 1, – 1, – 1

11. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length?

    a) $\frac{\sqrt{hG}}{C^2}$ b) $\sqrt{\frac{hC}{G}}$ c) $\sqrt{\frac{GC}{h^{\frac{1}{2}}}}$ d) $\frac{\sqrt{hG}}{C^2}$

12. Which two of the following five physical parameters have the same dimensions?

    i) Energy density ii) Refractive index
    iii) Dielectric constant iv) Young's modulus v) Magnetic field
    a) (i) and (v) b) (ii) and (iv) c) (iii) and (v) d) (i) and (iv)

13. A student calculates g by performing simple pendulum experiment. If the maximum percentage errors in measuring length and time period are respectively e_1 and e_2. The percentage error occur in g is

a) $e_1 + 2e_2$ b) $2(e_1 + e_2)$ c) $\frac{e_1 + e_2}{2}$ d) $2e_1 + e_2$

14. A drum of radius R and mass M, rolls down without slipping along an inclined plane of angle θ. The frictional force

a) decreases the rotational and translational motion b) dissipates energy as heat
c) decreases the rotational motion d) converts translational energy to rotational energy

15. The ratio of the radii of gyration of a circular disc about a tangential axis in the plane of the disc and of a circular ring of the same radius about a tangential axis in the plane of the ring is

a) 2:1 b $\sqrt{5} : \sqrt{6}$ c) 2:3 d) $1 : \sqrt{2}$

16. A ball rolls without slipping. The radius of gyration of the ball about an axis passing through its centre of mass is k. If radius of the ball is R, then the fraction of total energy associated with its rotational energy will be

a) $\frac{K^2 + R^2}{R^2}$ b) $\frac{K^2 + 1}{R^2}$ c) $\frac{K^2}{K^2 + R^2}$ d) $\frac{R^2}{K^2 + R^2}$

17. Consider a point P at the contact point of a wheel on the ground which rolls on the ground without slipping, then the value of the displacement of point P when the wheel completes half of the rotation (if radius of wheel is 1 m) is

a) 2m b) $\sqrt{\pi^2 + 4}$ m c) π m d) $\sqrt{\pi^2 + 2}$ m

18. A solid sphere of mass M and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation ($E_{sphere} / E_{cylinder}$) will be

a) 1:5 b) 1:4 c) 3:1 d) 2:3

19. A disc and a solid sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of the two objects gets to the bottom of the plane first?

a) Both reach at the same time b) Depends on their masses
c) Disc d) Solid sphere

20. Two discs of same moment of inertia are rotating about their regular axis passing through centre and perpendicular to the plane of disc with angular velocity ω_1 and ω_2. They are brought into contact face to face coinciding the axis of rotation. The expression for loss of energy during this process is

a) $\frac{1}{4} I (\omega_1 - \omega_2)^2$ b) $I (\omega_1 - \omega_2)^2$ c) $\frac{1}{8} I (\omega_1 - \omega_2)^2$ d) $\frac{1}{2} I (\omega_1 - \omega_2)^2$

21. The centrifugal force appears to exist

a) only in inertial frames b) only in rotating frames
c) in any accelerated frame d) both in inertial and non inertial frames

22. Consider a circular leveled road of radius 10 m having coefficient of static friction 0.81. Three cars, A, B and C are travelling with speed 8 ms^{-1}, 11 ms^{-1} and 10 ms^{-1} respectively. The car/cars that will skid is / are (Take g = 10 ms^{-2})

a) all the cars b) cars B and C c) cars A and C d) none will skid

23. A block of mass m slides down the plane inclined at an angle 60° with an acceleration $\frac{g}{2}$. The coefficient of kinetic friction is

a) 1 b) 0.5 c) 0.732 d) 0.414

24. If a particle executes uniform circular motion in the x-y plane in clockwise direction, then the angular velocity is in

a) + y direction b) + z direction c) – z direction d) – x direction

25. Two objects of masses m_1 and m_2 fall from the heights h_1 and h_2 respectively. The ratio of the magnitudes of their momenta when they hit the ground is

a) $\sqrt{\frac{h_1}{h_2}}$ b) $\sqrt{\frac{m_1 h_1}{m_2 h_2}}$ c) $\frac{m_1}{m_2}\sqrt{\frac{h_1}{h_2}}$ d) $\sqrt{\frac{m_2 h_2}{m_1 h_1}}$

26. An object of mass m is thrown with initial speed u at an angle $\frac{\pi}{2}$ with the horizontal from Earth's surface. Another object of mass 2 m is thrown with the same initial speed at the same angle with the horizontal from a planet where $g_P = \frac{g_0}{4}$. If the range in Earth is R_E, the range in the planet is R_P. Then,

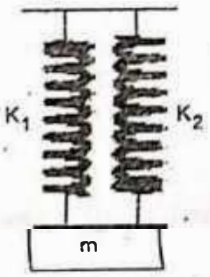
a) $R_E = R_P$ b) $R_P = 2R_E$ c) $R_P = 4R_E$ d) $R_P = \frac{R_E}{2}$

27. When the object is moving at constant velocity on the rough surface
a) net force on the object is zero b) no force acts on the object
c) only external force acts on the object d) only kinetic friction acts on the object

28. A particle executing simple harmonic motion has a kinetic energy $K_0 \cos^2 \omega t$. The maximum value of the potential energy and total energy are respectively

a) K_0 and K_0 b) $\frac{K_0}{2}$ and K_0 c) K_0 and $2K_0$ d) 0 and $2K_0$

29. A mass is suspended separately by two different springs in sucessive order, then the time period is T_1 and T_2 respectively. If it is connected by both spring as shown in the figure, then, the time period T_0, so that the correct relation is



a) $T_0^{-2} = T_1^{-2} + T_2^{-2}$ b) $T_0^2 = T_1^2 + T_2 2$

c) $T_0^{-1} = T_1^{-1} + T^{-1}$ d) $T_0 = T_1 + T_2$

30. Which of the following statements is true for the speed 'V' and the acceleration 'a' of a particle executing simple harmonic motion?
a) Value of a is zero, whatever may be the value of V b) When V is zero, a is zero
c) When V is maximum, a is zero d) When V is maximum, a is maximum

31. A simple pendulum performs simple harmonic motion about x = 0 with an amplitude a and time period T. The speed of the pendulum at $x = \frac{a}{2}$ will be

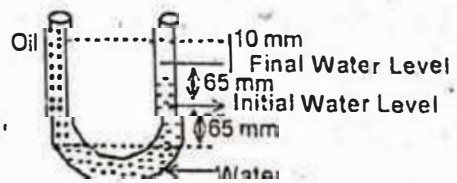
a) $\frac{\pi a}{T}$ b) $\frac{3\pi^2 a}{T}$ c) $\frac{\pi a\sqrt{3}}{2T}$ d) $\frac{\pi a\sqrt{3}}{T}$

32. Which of the following is not scalar?
a) Stress b) Viscosity c) Surface tension d) Pressure

33. The wettability of a surface by a liquid depends primarily on
a) viscosity b) surface tension
c) density d) angle of contact between the surface and the liquid

34. Two pistons of a hydraulic lift have diameters of 60 cm and 5 cm. What is the force exerted by the larger piston when 50N is placed on the smallar piston?
a) 7200N b) 6000N c) 8400N d) 5000N

35. A U-tube with both ends open to the atmosphere, is partially filled with water. Oil, which is immiscible with water is poured into oneside until it stands at a distance of 10mm above the water level on the otherside. Meanwhile, the water rises by 65 mm from its original level. (See the diagram). The density of the oil is



a) 425 Kgm^{-3} b) 800 Kgm^{-3} c) 928 kgm^{-3} d) 650 Kgm^{-3}

36. 2.4×10^{-4}J of work is done to increase the area of a film of soap bubble from 50 cm^2 to 100 cm^2. The surface tension of the soap solution is
a) 4.8×10^{-2} Nm^{-1} b) 2.4×10^{-2} Nm^{-1} c) 3.6×10^{-2} Nm^{-1} d) 1.2×10^{-2} Nm^{-1}

37. A certain number of spherical drops of a liquid each of radius 'r' coalesce to form a single drop of radius 3r and volume 'V'. If 'T' is the surface tension of the liquid then, energy released is

a) $\frac{8}{3}\frac{VT}{r}$ b) $4\frac{VT}{r}$ c) $2\frac{VT}{r}$ d) $\frac{4}{3}\frac{VT}{r}$

38 Rate of heat flow through a cylindrical rod is H_1. Temperatures of ends of rod are T_1 and T_2 $(T_1 > T_2)$. If all the dimensions of rod becomes double and the temperature difference remains same and rate of heat flow becomes H_2. Then

a) $H_2 = H_1$ b) $H_2 = 4H_1$ c) $H_2 = 2H_1$ d) $H_2 = \frac{H_1}{4}$

39 A black body at 227°C radiates heat at the rate of 7 Cal $cm^{-2}s^{-1}$. At a temperature of 727°C, the rate of heat radiated in the same units will be

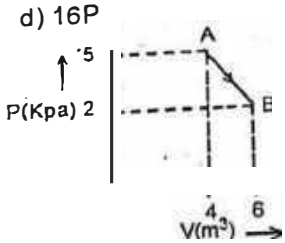
a) 50 b) 112 c) 80 d) 60

40 A mono atomic gas at a pressure P, having a volume V expands isothermally to a volume 2V and then adiabatically to a volume 16V. The final pressure of the gas is (take $\gamma = \frac{5}{3}$).

a) 64P b) 32P c) $\frac{P}{64}$ d) 16P

41. One mole of an ideal di atomic gas undergoes a transition from A to B along the path AB as shown in the figure. The change in internal energy of the gas during the transition is

a) – 20 KJ b) – 20 J
c) – 12 KJ d) – 6KJ



42 A Carnot engine whose sink is at 300k has an efficiency of 40%. By how much should the temperature of source be increased so as to increase its efficiency by 50% of original efficiency?

a) 275 K b) 225k c) 380k d) 250k

43 Which of the following processess in reversible?

a) Transfer of heat by radiation b) Transfer of heat by conduction
c) Isothermal compression d) Electrical heating of a wire

44. The molecules of a given mass of a gas have rms velocity of 200 ms^{-1} at 27°C and 1.0 x 10^5 Nm^{-2} pressure. When the temperature and pressure of the gas are, respectively, 127°C and 0.05 x 10^5 Nm^{-2}, the rms velocity of its molocules in ms^{-1} is

a) $\frac{100\sqrt{2}}{3}$ b) $\frac{100}{3}$ c) $100\sqrt{2}$ d) $\frac{400}{\sqrt{3}}$

45. A given sampie of an ideal gas occupies a volume V at a pressure P and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas?

a) $\frac{Pm}{(KT)}$ b) $\frac{P}{(KTV)}$ c) mkT d) $\frac{P}{(KT)}$

46. The ascending order of rms velocity for hydrogen (H), oxygen (0), Nitrogen (N) and carbondi oxide (CO_2) molecules at a given temperature is

a) CO_2, H, O, N b) H,O,N,CO_2 c) CO_2, O, N, H d) O, N, CO_2, H

47. A transverse wave propagating along x-axis is represented by

$y(x,t) = 8.0 \sin(0.5\pi x - 4\pi t - \frac{\pi}{4})$ where x is in metres at t is in seconds. The speed of the wave is - a) 4π ms^{-1} b) 0.5π ms^{-1} c) $4ms^{-1}$ d) $8ms^{-1}$

48. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be

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

49. A wave in a string has amplitude of 2 cm. The wave travels in the +ve direction of x-axis with a speed of 128 ms^{-1} and it is noted that 5 complete waves fit in 4m length of the string. The equation describing the wave is

a) y = (0.02) sin (15.7x – 2010t) m b) y = (0.02) sin (15.7x + 2010t) m
c) y = (0.02) sin 7.85x – 1005t) m d) y = (0.02) sin (7.85 + 10005t) m

50. Two cars moving in opposite directions approach each other with speed of 22ms^{-1} and 16.5 ms^{-1} respectively. The driver of the fist car blows a horn having a frequency 400 Hz. The frequency heard by the driver of the second car is (velocity of sound = 340 ms^{-1}

a) 361 Hz b) 411 Hz c) 448 Hz d) 350 Hz

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