Competitive Edge Academy

Nature of the Physical World and Measurement

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs

Total Marks : 150

10 x 1 = 10

1) Which of the following are equivalent?
(a) 6400 km and 6.4×10^8 cm (b) 2×10^4 cm and $2 \times 10^6 mm$ (c) 800 m and 80x10^{2}m (d) $100 \mu m$ and 1mm

2) Red light has a wavelength of 7000 $\mathring{A}$. In mm it is _____.
(a) $0.7 \mu m$ (b) $7 \mu m$ (c) $70 \mu m$ (d) $0.07 \mu m$

3) A speck of dust weight 1.6x10^{-10} kg. How many such particles would weigh 1.6 kg?
(a) 10^{-10} (b) 10^{10} (c) 10 (d) 10^{-1}

4) The force acting on a particle is found to be proportional to velocity. The constant of proportionality is measured in terms of _____.
(a) kg s^{-1} (b) kg s (c) kg m s^{-1} (d) kg m s^{-2}

5) The number of significant digits in 0.0006032 is _____.
(a) 8 (b) 7 (c) 4 (d) 2

6) The length of a body is measured as 3.51 m. If the accuracy is 0.01 m, then the percentage error in the measurement is _____.
(a) 351% (b) 1% (c) 0.28% (d) 0.035%

7) The dimensional formula for gravitational constant is _____.
(a) $M^1L^3T^{-2}$ (b) $M^{-1}L^3T^{-2}$ (c) $M^{-1}L^{-3}T^{-2}$ (d) $M^1L^{-3}T^2$

8) The velocity of a body is expressed as $v = (x/t) + yt$. The dimensional formula for x is _____.
(a) ML^0T^0 (b) M^0LT^0 (c) M^0L^0T (d) MLT^0

9) The dimensional formula for Planck's constant is _____.
(a) MLT (b) ML^3T^2 (c) ML^0T^4 (d) ML^2T^{-1}

10) _____ have the same dimensional formula.
(a) Force and momentum (b) Stress and strain (c) Density and linear density (d) Work and potential energy

29 x 2 = 58

11) What is the role of physics in technology?

12) Why is SI system considered superior to other system?

13) What is the need for measurement of physical quantities?

14) You are given a wire and a meter scale.How will you estimate the diameter of the wire?

15) Name four units to measure extremely small distances.

16) Convert using dimensional analysis.
(i) $\frac{18}{5} kmph$ into m s^{-1}
(ii) $\frac{5}{18} ms^{-1}$ into kmph
(iii) $13.6 \quad g \quad cm^{-3}$ into kg m^{-3}

17) What are random errors? how can we minimize these errors?

18) Show that has $\frac{1}{2} gt^2$ the same dimensions of distance.

19) What are the limitations of dimensional analysis?

20) Give the SI standard for (i) length, ii) mass and iii) time.

21) What is force?

22) What is Gravitational force?

23) What is electromagnetic force?

24) What are fundamental and derived quantities?

25) Define unit.

26) Define ampere.

27) What is Kelvin?

28) What is candela?

29) What is mole?

30) What is a light year?

31) What is Astronomical unit?

32) Write a note on Quartz clocks.

33) Write a note on Atomic clocks.

34) What is meant by instrumental error?

35) What is meant by fractional error?

36) What is meant by percentage error?

37) What are dimensional variable?

38) What are dimensional variables?

39) State the principle of homogeneity of dimensions.

12 x 3 = 36

40) How many astronomical units are there in 1 metre?

41) If mass of an electron is $9.11X10^{-31}$ kg how many electrons would weigh 1 kg?

42) In a submarinemitted with a SONAR, the delay between generation of a signal and reception of its echo after reflection from an ship is observed to be 73.0 seconds. If the speed of sound in water is 1450 ms^{-1} , then calculate the distance of the enemy ship.

43) State the number of significant figure in the following

(i) 600900

(ii) 5212.0

(iii) 6.323

(iv) 0.0631

(v) $2.64X10^{24}$

44) Find the value of π^2 correct to significant, if $\pi = 3.14$

45) 5.74 g of a substance occupies a volume of 1.2 cm^3 . Calculate its density applying the principle of significant figure.

46) The length, breadth and thickness of a rectangular plate are 4.234 m, 1.005 m and 2.01 cm respectively. Find the total area and volume of the plate to correct significant figure.

47) The length of a rod is measured as 25.0 cm using a scale having an accuracy of 0.1 cm. Determine the percentage error in length.

48) Obtain by dimensional analysis an expression for the surface tension of a liquid rising in a capillary tube. Assume that the surface tension T depends on mass m of the liquid, pressure P of the liquid and radius r of the capillary tube (Take the constant $k = \frac{1}{2}$).

49) The force F acting on a body moving in a circular path depends on mass m of the body, velocity v and radius r of the circular path. Obtain an expression for the force by dimensional analysis (Take the value if k=1).

50) A wave of length 0.60 cm is produced in air and travels with a velocity of 340 ms^{-1} . Will it be audiable to human ear?

Give data.

Wavelength of the wave produced λ =0.06 cm=$0.60x10^{-2}$ m.

Velocity of the sound wave ν =340 ms^{-1}.

51) Check the correction of the following equation by dimensional analysis:

(i) $F = \frac{mv^2}{r^2}$ where F is force, m is mass,v is velocity and r is radius.

(ii)$n = \frac{1}{2\pi}\sqrt{\frac{g}{l}}$ where n is frequency, g is acceleration due to gravity and l is length.

(iii) $\frac{1}{2}mv^2 = mgh^2$ where m is mass, v is velocity, g is acceleration due to gravity and h is height.

12 x 5 = 60

52) The velocity of sound in water is 1480 ms^{-1} . Find the frequency of sound wave such that its wavelength in water is the same as the wavelength in air of a sound wave of frequency 1000 Hz. (The velocity of sound in air is 340 $ms^{-1)}$.

Give data

Velocity of sound in water (v_1) = 1480 ms^{-1}

Frequency of sound wave in air (n) = 1000 Hz

Velocity of sound in air (v)=340 ms^{-1}

Wavelength of sound wave of frequency 1000 Hz in air (λ) = Wavelength of sound in water (λ_1)

53) The equation of a progressive wave travelling along the X-axis is given by y=10 sin p(2t-0.01x) where y and x are in and t in s. Calculate (i)amplitude, (ii) frequency and wavelength, (iii) wave velocity.

Given data.

The equation of a progressive wave travelling along X-axis is given by y=10 $\sin \pi(2t - 0.01x)$

x and y are expressed in metres.

Time in secs.

54) If the intensity is increased by a factor 60, by how many decibels the sound level is increased?

55) Two sound waves, originating from the same source, travel along different paths in air and then meet at a point. If the source vibrates at a frequency of 1.0 kHz and one path is 83 cm longer than the other, what will be the nature of interference? The speed of sound in air is 332 m s^{-1}.

Given data.

Frequency of the source (n) =1.0 kHz

Path difference between two interfering beams (x) = 83 cm=$83x10^{-2}$ m

Speed of sound in air =332 ms^{-1} .

56) In an experiment, the tuning fork and sonometer give 5 beats per second, when their lengths are 1 m and 1.05 m respectively. Calculate the frequency of the fork.

Give data.

Number of beats heard per second = 5 beats

Length of the vibrating segments l_1 and l_2=l_1= 1 m; l_2=1.05 m

57) A steel wire of length 1.2 m with a tension of 9.8 N is found to resonate in five segments at a frequency of 240 Hz. Find the mass of the string.

Give data.

Length of the steel wire (l) - 1.2 m

Tension in the wire (T) = 9.8 N

Frequency of vibration (n_5) = 240 Hz

58) How can a stretched string of length 114 cm be divided into three segments so that the fundamental frequency of the three segments be in the ratio of 1 : 3 : 4?

Give data.

Length of the stretched string=114 cm=114 x 10^{-2} m

Number of segment into which the stretched string is divided =3 segments

Ratio of the fundamental frequency of three segments =1 : 3 : 4

59) An open organ pipe has a fundamental frequency of 240 Hz. The first overtone of a closed organ pipe has the same frequency as the first overtone of the open pipe. How long is each pipe? Velocity of sound at room temperature is 350 ms^{-1}.

Given data.

Fundamental frequency of open organ pipe =240 Hz.

Frequency of first overtone of closed organ pipe= Frequency of first overtone of open organ pipe

Velocity of sound at room temperature = 350 ms^{-1} .

60) A tuning fork of frequency 800 Hz produces resonance in a resonance column apparatus. If successive resonances are produced at length 9.75 cm and 31.25 cm, calculate the velocity of sound in air.

Give data.

Frequency of the tuning fork (n) =800 Hz.

Length of the first resonating position (l_1)=9.75 cm =9.75 x 10^{-2} m.

Length of the second resonating position(l_2) = 31.25 x 10^{-2} m

61) A train standing at a signal of a railway station blows a whistle of frequency 256 Hz in air. Calculate the frequency of the sound as heard by a person standing on the platform when the train (i)approaches the platform with a speed of 40 ms^{-1} , (ii) recedes from the platform with the same speed.

Give data.

Frequency of the whistle sound of a stationary train (n)=256 Hz

Velocity with which the train = Velocity with which the train recedes approaches the platform from the platform

v_s = 40 ms-1

Velocity of sound in air (v) = 340 ms^{-1}

62) A whistle of frequency 480 Hz rotates in a circle of radius 1.25m at an angular speed of 16.0 rad s^{-1} . What is the lowest and highest frequency heard by a listener a long distance away at rest with respect to the centre of the circle. The velocity of sound is 340 $ms^{-1.}$

Given data.

Frequency of the whistle sound (n) = 480 Hz

Radius of the circle in which the whistle rotates (r) = 1.25 m

Angular velocity with which the whistle rotates (ω) = 16.0 rad s^{-1}

Velocity of sound in air = 340 ms^{-1}

63) Two tuning forks A and B when sounded together give 4 beats per second. The fork A is reTwo tuning forks A and B when sounded together give 4 beats per second. The fork A is resonance with a closed column of air of length 15 cm, while the second is in resonance with an open column of length 30.5 cm. Calculate their frequencies.

Give data.

Number of beats heard per second = 4 beats

Resonating length of fork A (l_1) = 15 cm = 15 x 10^{-2} m

Resonating length of fork A (l_2)= 30.5 cm = 30.5 x 10^{-2} m

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Competitive Edge Academy

Kinematics

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs

Total Marks : 150

20 x 1 = 20

1) A particle at rest starts moving in a horizontal straight line with uniform acceleration.The ratio of the distance covered during the fourth and the third second is

(a) $\frac{4}{3}$ (b) $\frac{26}{9}$ (c) $\frac{7}{5}$ (d) 2

2) The distance travelled by a body,falling freely from rest in first,second and third seconds are in the ratio

(a) 1:2:3 (b) 1:3:5 (c) 1:4:9 (d) 9:4:1

3) The displacement of the particle along a straight line at time t is given by,$x = a_0 + a_1 t + a_2 t^2$ wherea_0, a_1 anda_2 are constants.The acceleration of the particle is

(a) a_0 (b) a_1 (c) a_2 (d) $2a_2$

4) The acceleration of a moving body can be found from

(a) area under velocity-time graph (b) area under distance-time graph (c) slope of the velocity-time graph (d) slope of the distance-time graph

5) Which of the following is a vector quantity?

(a) Distance (b) Temperature (c) Mass (d) Momentum

6) An object is thrown along a direction inclined at an angle 45^0 with the horizontal.The horizontal range of the object is vertical height is

(a) vertical height (b) twice the vertical height (c) thrice the vertical height (d) four times the vertical height

7) Two guns are fired at angle θ and $(90-\theta)$ to the horizontal with some speed.the ratio of their times of flight is

(a) 1:1 (b) $\tan\theta : 1$ (c) $1 : \tan\theta$ (d) $\tan^2\theta : 1$

8) A stone is dropped from the window of a train moving along a horizontal straight track,the path of the stone as observed by an observer on ground is.

(a) straight line (b) parabola (c) circular (d) hyperbola

9) A gun fired two bullets at with same velocity 60^0 and 30^0 with horizontal.The bullets strike at the same horizontal distance.The ratio of maximum height for the two bullets is in the ratio

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

10) Newton's first law of motion gives the concept of

(a) energy (b) work (c) momentum (d) inertia

11) Inertia of a body has direct dependence of

(a) velocity (b) mass (c) area (d) volume

12) The working of a rocket is based on

(a) Newtons's first law of motion (b) Newtons's second law of motion (c) Newtons's third law of motion (d) Newtons's first and second law of motion

13) When three forces acting a point are in equilibrium

(a) each force is equal to vector the sum of the other two forces (b) each force is greater than to vector the sum of the other two forces (c) each force is greater than the difference of the other two forces (d) each force is equal to the product of the other two forces

14) For a particle revolving in a circular path,the acceleration of the particle is

(a) along the tangent (b) along the radius (c) along the circumference of the circle (d) zero

15) If a particle in a circle,covering equal angles in equal times,its velocity vector

(a) changes in magnitude only (b) remains constant (c) changes in direction only (d) changes in magnitude and direction

16) A particle moves along a circular path under the action of a force.The work done by the force is

(a) positive and non-zero (b) zero (c) negative and non-zero (d) none of the above

17) A cyclist of mass m is taking a circular turn of radius R on a frictional level road with a velocity v.In order that the cyclist does not skid,

(a) $\left(mv^2/2\right) > \mu mg$ (b) $\left(mv^2/r\right) > \mu mg$ (c) $\left(mv^2/r\right) < \mu mg$ (d) $(v/r) = mg$

18) If a force F is applied on a body and the body moves with velocity v,the power will be

(a) F.v (b) F/v (c) Fv^2 (d) F/v^2

19) For an elastic collision

(a) the kinetic energy first increases and then decreases (b) final kinetic energy never remains constant (c) final kinetic energy is less than the initial kinetic energy (d) initial kinetic energy is equal to the final kinetic energy

20) A bullet hits and gets embedded in a solid resting on a horizontal frictionless table.Which of the following is conserved?
(a) Momentum and kinetic energy (b) Kinetic energy alone (c) Momentum alone (d) Potential energy alone

26 x 2 = 52

21) Compute the (i)distance travelled and (ii)displacement made by the student when he travels of 4Km earthwards and then a further distance of 3 Km northwards.
22) What is the (i) distance travelled and (ii)displacement produced by a cyclist when he completes one revolution?
23) Differentiate between speed and velocity of a body.
24) What meant by retardation?
25) Derive the equation of motion for an uniformly accelerated body.
26) What is the significance of velocity-time graph?
27) What are scalar and vector quantities?
28) How will you represent a vector quantity?
29) What is the magnitude and direction of the resultant of two vectors acting along the same line in the same direction?
30) State: Parallelogram law of vectors and triangle law of vectors.
31) Obtain the expression for magnitude and direction of the resultant of two vectors when they are inclined at an angle, $'\theta'$ with each other.
32) State Newton's law of motion.
33) State and prove law of conservation of linear momentum.
34) Define impulse of a force.
35) What is centrifugal reaction?
36) Define acceleration. Give its unit and dimension
37) What is meant by uniform acceleration?
38) What is a unit vector?
39) What is scalar or product of two two vectors?
40) What is vector or cross product vector of two vectors?
41) Define angular acceleration. Give its unit and dimensional formula.
42) What is meant by uniform circular motion?
43) State Lami's theorem.
44) What is centripetal force?
45) Derive an expression for force acting on a body based on Newton's second law of motion.
46) Two blocks of mass 300 kg and 200 kg are moving toward each other along a horizontal frictionless surface with velocities of 50 ms^{-1} and 100 m s^{-1} respectively. Find the final velocity of each block if the collision is completely elastic. Given data. $m_A = 300 \quad kg \quad u_A = 50 \quad ms^{-1}\, m_B = 200 \quad kg$ $u_B = -100 \quad ms^{-1}$ $\therefore$ block B is moving towards block A. collision is perfectly elastic.

15 x 3 = 45

47) Determine the initial velocity and acceleration of particle travelling with uniform acceleration in a straight line if it travels 55m in the 8th second and 85m in the 13th second of its motion.
48) An aeroplane takes off at an angle of 45^0 to the horizontal. If the vertical component of its velocity is 300 kmph, calculate its actual velocity. What is the horizontal component of velocity?
49) A force is inclined at 60^0 to the horizontal. If the horizontal component of force is 40kg wt, calculate the vertical component.
50) A body is projected upwards with a velocity of 30ms^{-1} at an angle of 30^0 with the horizontal. Determine (a) the time of flight, (b) the range of the body and (c) the maximum height attained by the body.
51) The horizontal range of a projectile is $4\sqrt{3}$ times its maximum height. Find the angle of projection.
52) A body is projected at such an angle that the horizontal range is 3 times the greatest height. Find the angle of projection.
53) An elevator is required to lift in a body of mass 65kg. Find the acceleration of the elevator, which could cause a reaction of 800N on the floor.
54) A body whose mass is 6 kg is acted on by a force which changes its velocity from 3 ms^{-1} to 5 ms^{-1} . Find the impulse of the force. If the force is acted for 2 seconds, find the force in newton.
55) A cricket ball of mass 150g moving at 36ms^{-1} strikes a bat and returns back along the same line at 21ms^{-1} . What is the change in momentum produced? If the bat remains in contact with the ball for $\frac{1}{20}$ s, what is the average force exerted in newton.
56) Two forces of magnitude 12N and 8N are acting at a point. If the angle between the two forces is 60^0, determine the magnitude of the resultant force?
57) The sum of two forces inclined to each other at an angle is 18kgwt and their resultant which is perpendicular to the smaller forces is 12kgwt. Find the forces and the angle between them.
58) A weight of 20kN supported by two cords, one 3m long and the other 4m long with points of support 5m apart. Find the tensions T_1 and T_2 in the cords.
59) The following forces act at a point (i) 20N inclined at 30^0 towards North of East, (ii) 25N towards North, (iii) 30N inclined at 45^0towards North of West, (iv) 35n inclined at 40^0towards South of West. Find the magnitude and direction of the resultant force.
60) Find the magnitude of the two forces such that it they are at right angles, their resultant is $\sqrt{10}$. But if they act at 60^0 , their resultant is $\sqrt{13}$ N.
61) At what angle must a railway track with a bend of radius 880m be banked for the safe running of a train at a velocity of 44$ms^{-1?}$

13 x 5 = 65

62) A railway engine of mass 60 tonnes, is moving in an arc of radius 200m with a velocity of 36 kmph. Find the force exerted on the rails towards the centre of the circle.

63) A horse pulling a cart exerts a steady horizontal pull of 300N and walks at the rate of 4.5kmph.How much work is done by the horse in 5 minutes?

64) What is meant by banking of tracks?

65) Obtain an expression for the angle of lean when a cyclist takes a curved path.

66) A ball is thrown downward from a height of 30m with a velocity of $10ms^{-1}$ .Determine the velocity with which the ball strikes the ground by using law of conservation of energy.

67) What is the work done by a man in carrying a suitcase weighing 30 kg over his head, when he travels a distance 0f 10m in (i) vertical and (ii) horizontal directions?

68) Two masses of 2 kg and 5 kg are moving with equal kinetic energies. Find the ratio of magnitudes of respective linear moments.

69) A man weighing 60 kg runs up a flight of stairs 3m high in 4 s. Calculate the power developed by him.

70) What are the two types of collision? Explain them.

71) Obtain the expression for the velocities of the two bodies after collision in the case of the dimensional motion.

72) A motor boat moves at a steady speed of $8ms^{-1}$. If the water resistance to the motion of the boat is 2000N, calculate the power of the engine.

73) Two blocks of mass 300kg and 200kg are moving toward each other along a horizontal frictionless surface with velocities of 50 ms^{-1} and $100ms^{-1}$ respectively.Find the final velocity of each block if the collision is completely elastic.

74) Prove that in the case of one dimensional elastic collision between two bodies of equal masses, they interchange their velocities after collision.

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Competitive Edge Academy

Dynamics of Rotational Motion

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs

Total Marks : 150

11 x 1 = 11

1) The angular speed of minute arm in a watch is ___

(a) $\pi/21600 \quad rad \quad s^{-1}$ (b) $\pi/12 \quad rad \quad s^{-1}$ (c) $\pi/3600 \quad rad \quad s^{-1}$ (d) $\pi/1800 \quad rad \quad s^{-1}$

2) The moment of inertia of a body comes into play___

(a) in linear motion (b) in rotational motion (c) in projectile motion (d) in periodic motion

3) Rotational analogue of mass in linear motion is____

(a) weight (b) moment of inertia (c) torque (d) angular momentum

4) 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

5) a ring of radius r and mass m rotates about an axis passing through its centre and perpendicular to its plane with angular velocity ω. Its kinetic energy is ___

(a) $m \quad r \quad \omega^2$ (b) $\frac{1}{2}mr\omega^2$ (c) $I\omega^2$ (d) $\frac{1}{2}I\omega^2$

6) The moment of inertia of a disc having mass M and radius R, about an axis passing through its centre and perpendicular to its plane is__

(a) $\frac{1}{2}MR^2$ (b) MR^2 (c) $\frac{1}{4}MR^2$ (d) $\frac{5}{4}MR^2$

7) Angular momentum is the vector product of ___

(a) linear momentum and radius vector (b) moment of inertia and angular velocity (c) linear momentum and angular velocity (d) linear velocity and radius vector

8) The rate of change of angular momentum is equal to __

(a) force (b) angular acceleration (c) torque (d) moment of inertia

9) Angular momentum of the body is conserved___

(a) always (b) never (c) in the absence of external torque (d) in the presence of external torque

10) A man is sitting on a rotating stool with his arms outstretched. Suddenly he folds his armThe angular velocity ___

(a) decreases (b) increases (c) becomes zero (d) remains constant

11) An athlete diving off a high springboard can perform a variety of exercises in the air before entering the water below. Which one of the following parameters will remain constant during the fall. The athlete's ___

(a) linear momentum (b) moment of inertia (c) kinetic energy (d) angular momentum

9 x 2 = 18

12) Obtain an expression for position of centre of mass of two particle system.

13) Explain the motion of centre of mass of a system with an example.

14) What are the different types of equilibrium?

15) Show that the moment of inertia of a rigid body is twice the kinetic energy of rotation.

16) State and prove parallel axes theorem and perpendicular axes theorem.

17) Obtain an expression for the angular momentum of a rotating rigid body.

18) Derive the equations of rotational motion.

19) Explain the physical significance of moment of inertia.

20) What is meant by centre of mass of the body?

7 x 3 = 21

21) A person weighing 45 kg sits on one end of a seasaw while a boy of 15 kg sits on the other end. If they are separated by 4 m, how far from the boy is the center of mass situated. Neglect weight of the seasaw.

22) Four bodies of masses 1 kg, 2 kg, 3 kg, and 4 kg are at the vertices of a rectangle of sides a and b. If a=1m, and b=2m, find the location of the center of mass. (Assume that, 1 kg mass is at the origin of the system, 2 kg body is situated along the positive x-axis and 4 kg along the y-axis)

23) Assuming a dumbbell shape for the carbon monoxide(CO) molecule, find the distance of the center of mass of the molecule from the carbon atom in terms of the distance d between the carbon and the oxygen atom. The atomic mass of Carbon is 12 amu and for oxygen is 16 amu (1 amu = $1.67 \times 10^{-27} kg$)

24) Compute the rotational kinetic energy of a 2 kg wheel rotating at 6 revolutions per second if the radius of gyration of the wheel is 0.22 m.

25) What is the meant by centre of gravity of the body?

26) What is radius of gyration? Give its unit.

27) Define angular acceleration.

7 x 5 = 35

28) Three bodies of masses 2 kg, 4 kg, and 6 kg are located at the vertices of an equilateral triangle of side 0.5 m. Find the center of mass of this collection, giving its coordinates in terms of a system with its origin at the 2 kg body and with the 4 kg body located along the positive X axis.

29) A solid sphere of mass 50 g and diameter 2 cm rolls without sliding with a uniform velocity of 5 m s^{-1} along a straight line on a smooth horizontal table. Calculate its total kinetic energy. (Note: Total $E_K = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$)

30) The cover of a jar has a diameter of 8 cm. Two equal, but oppositely directed, forces of 20N act parallel to the rim of the lid to turn it. What is the magnitude of the applied torque?

31) Compare linear motion with rotational motion.

32) Obtain the 'x' and 'y' co-ordinate of the centre of mass of a body consisting of n particles.

33) Obtain an expression for radius of gyration and hence define radius of gyratica.

34) State the prove conservation of angular momentum

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Competitive Edge Academy

Gravitation and Space Science

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs Total Marks : 150

10 x 1 = 10

1) If the distance between two masses is doubled, the gravitational attraction between them
(a) is reduced to half (b) is reduced to a quarter (c) is double (d) becomes four-time

2) The acceleration due to gravity at a height (1/20)th the radius of the earth above the Earth's surface is 9ms^{-2}. Its value at a point at an equal distance below the surface of the earth is
(a) 0 (b) 9 ms^{-2} (c) 9.8 ms^{-2} (d) 9.5 ms^{-2}

3) The weight of a body at Earth's surface is W. At a depth halfway to the center of the Earth, it will be
(a) W (b) W/2 (c) W/4 (d) W/8

4) Force due to gravity is least at a latitude of
(a) 0° (b) 45° (c) 60° (d) 90°

5) If the earth stops rotating, the value of g at the equator will
(a) increase (b) decrease (c) remain same (d) become zero

6) The escape speed on earth is $11.2kms^{-1}$. Its value for a planet having double the radius and eight times the mass of the Earth is
(a) $11.2kms^{-1}$ (b) $5.6kms^{-1}$ (c) $22.4kms^{-1}$ (d) $44.8kms^{-1}$

7) If r represents the radius of orbit of satellite of mass m moving around a planet of mass M. The velocity of the satellite is given by
(a) $v^2 = \frac{GM}{r}$ (b) $v = \frac{GM}{r}$ (c) $v^2 = \frac{GMm}{r}$ (d) $v = \frac{Gm}{r}$

8) If the earth is at one-fourth of its present distance from the sun, the duration of the year will be
(a) one-fourth of the present year (b) half the present year (c) one-eighth the present year (d) one-sixth the present year

9) Which of the following objects do not belong to the solar system?
(a) Comets (b) Nebulae (c) Asteroids (d) Planets

10) According to Kepler's law, the radius vector sweeps out equal areas in equal intervals of time. The law is a consequence of the conservation of
(a) angular momentum (b) linear momentum (c) energy (d) all the above

30 x 2 = 60

11) Why is the gravitational force of attraction between the two bodies of ordinary masses not noticeable in everyday life?

12) State the universal law of gravitation.

13) Define gravitational constant. give its value, unit and dimensional formula.

14) What are the factors affecting the 'g' value?

15) Why a man can jump higher on the Moon than on the Earth?

16) The acceleration due to gravity varies with
(i) altitude and
(ii) depth.
Prove.

17) Discuss the variation of g with latitude due to the rotation of the Earth.

18) The acceleration due to gravity is minimum at equator and maximum at poles. Give the reason.

19) Define gravitational field intensity.

20) Define gravitational potential.

21) Define gravitational potential energy. Deduce an expression for it for a mass in the gravitational field of the Earth.

22) The moon has no atmosphere. Why?

23) What is escape speed? Obtain an expression for it.

24) What is orbital velocity? Obtain an expression for it.

25) What will happen to the orbiting satellite, if its velocity varies?

26) What are the called geo-stationary satellites?

27) Mention the special features of Newton's universal gravitation law.

28) What is acceleration due to gravity?

29) The radius of the earth is $6.38X10^6$ m. Its acceleration due to gravity is $9.8m/s^2$ Calculate the mass of the earth.

30) How does acceleration due to gravity vary with altitude and depth?

31) How does acceleration due to gravity vary with latitude?

32) What is meant by action at a distance?

33) Define gravitational potential difference.

34) What is escape speed?
35) What is a rocket?On what principle does it work?
36) What is the communication satellites?
37) Stae Stefan's law
38) What are comets?
39) Write a note on shape and size of Milky way galaxy.
40) What is meant by action at a distance?

14 x 3 = 42

41) Two spheres of masses 10 kg and 20 kg are 5 m apart. Calculate the force of attraction between the masses.
42) What will be the acceleration due to gravity on the surface of the moon, if its radius is $\frac{1}{4}$ th the radius of the Earth and its mass is $\frac{1}{80}$ th the mass of the earth? (Take g as 9.8 m s^{-2})
43) The acceleration due to gravity at the moon is 1.67 m s^{-2} . The mass of the earth is about 81 times more massive than the moon. What is the ratio of the radius of the Earth to that of the moon?
44) If the diameter of the Earth becomes two times its present value and its mass remains unchanged, then how would the weight of an object on the surface of the Earth be affected?
45) Assuming the Earth to be a sphere of uniform density, how much would a body weigh, one-fourth down to the centre of the Earth, if it weighed 205 N on the surface?
46) What is the value of acceleration due to gravity at an altitude of 500 km? The radius of the Earth is 6400 km.
47) What should be the angular velocity of the Earth, so that bodies lying on equator may appear weightless? Hoe many times this angular velocity is faster than the present angular velocity? (Given: g = 9.8 m s^{-2}; R = 6400 km)
48) Show that the orbital radius of a geo-stationary satellite is 36000 km.
49) Deduce the law of periods from the law of gravitation.
50) State and prove the law of areas based on conservation of angular momentum.
51) State Heliocentric theory.
52) State Geo-centric theory.
53) What is solar system?
54) What is albedo?

14 x 5 = 70

55) Calculate the speed with which a body has to be projected vertically from the Earth's surface, so that it escapes the Earth's gravitational influence. (R = 6.4 x 10^3 km ; g = 9.8 m s^{-2}).
56) Jupiter has a mass 318 times that of the Earth and its radius is 11.2 times the radius of the Earth. Calculate the escape speed of a body from Jupiter's surface. (Given : escape speed on Earth is 11.2 km s^{-1})
57) A satellite is revolving in circular orbit at a height of 1000 km from the surface of the Earth. Calculate the orbital velocity and time of revolution. The radius of the Earth is 6400 km and the mass of the Earth is 6 x 10^{24} kg.
58) An artificial satellite revolves around the Earth at a distance of 3400 km. Calculate its orbital velocity and period of revolution. Radius of the Earth = 6400 km; g = 9.8 m s^{-2} .
59) A satellite of 600 kg orbits the Earth at a height of 500 km from its surface. Calculate its (i) kinetic energy, (ii) potential energy and (iii) total energy (M = 6 x 10^{24} kg; R=6.4 x 10^6 m)
60) A satellite revolves in an orbit close to the surface of a planet density 6300 kg m^{-3} . Calculate the time period of the satellite. Take the radius of the planet as 6400 km.
61) Obtain an expression for the gravitational potential at a point.
62) A spaceship is launched into a circular orbit close to the Earth's surface. What additional velocity has to be imparted to the spaceship in the orbit to overcome the gravitational pull. (R = 6400 km, g = 9.8 m s^{-2})
63) Differentiate between inertial mass and gravitational mass.
64) Why do the astronauts feel weightlessness inside the orbiting space-craft?
65) State Kepler's laws of planetary motion.
66) What are asteroids?
67) What are constellation?
68) Write a note on Milky Way.

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Competitive Edge Academy

Mechanics of Solids and Fluids

11th Standard

Physics

Reg.No. :

Time : 03:00:00 Hrs

Total Marks : 150

23 x 1 = 23

1) If the length of the wire and mass suspended are double in a young's modulus experiment then young's modulus of the wire
(a) remains unchanged (b) becomes double (c) becomes four times (d) becomes sixteen times

2) For a perfect rigid body,young's modulus is.....
(a) zero (b) infinity (c) 1 (d) -1

3) Two wires of the same radii and material have their lengths in the ratio 1:2 If these are stretched by the same force,the strains produced in the two wires will be in the ratio.....
(a) 1:4 (b) 1:2 (c) 2:1 (d) 1:1

4) If the temperature of a liquid is raised then its surface tension is.....
(a) decreased (b) increased (c) does not change (d) equal to viscosity

5) The excess of pressure inside two soap bubbles of diameters in the ratio 2:1 is.....
(a) 1:4 (b) 2:1 (c) 1:2 (d) 4:1

6) A square of side l is dipped in a soap solution.When the frame is taken out,a soap film is formed.The force on the frame due to surface tension T of the soap solution is.....
(a) 8 Tl (b) 4 Tl (c) 10 Tl (d) 12 Tl

7) The rain drops falling from the sky neither hit us hard nor make holes on the ground because they move with.....
(a) constant acceleration (b) variable acceleration (c) variable speed (d) constant velocity

8) Two hail stones whose radii are in the ratio of 1:2 fall from a height of 50 km.Their terminal velocities are in the ratio of.....
(a) 1:9 (b) 9:1 (c) 4:1 (d) 1:4

9) Water flows through a horizontal pipe of varying cross-section at the rate of 0.m^3 s^{-1}.The velocity of water at a point where the area of cross-section of the pipe is 0.01 m^2 is.....
(a) 2 m s^{-1} (b) 20 m s^{-1} (c) 200 m s^{-1} (d) 0.2 m s^{-1}

10) An object entering Earth's atmosphere at a high velocity catches fire due to.....
(a) viscosity of air (b) the high heat content of atmosphere (c) pressure of certain gases (d) high force of g

11) According to Newton's law of viscous flow in fluids,_____
(a) $F = \eta A \frac{dv}{dx}$ (b) $F = \frac{\eta \frac{dv}{dx}}{A}$ (c) $F = \frac{\frac{\eta A}{dv}}{dx}$ (d) $F = \frac{A\frac{dv}{dx}}{\eta}$

12) Reynold's number is given by the formula_____
(a) $N_R = \frac{\eta \rho D}{V_c}$ (b) $N_R = \frac{\eta V_c D}{\rho}$ (c) $N_R = \frac{V_c \rho D}{\eta}$ (d) $N_R : V_c \rho D$

13) When liquid flows through a horizontal tube, Bernoulli's equation takes the form _____.
(a) $\frac{1}{2}v^2 + \frac{p}{\rho}$=constant (b) $\frac{p}{\rho} + gh$=constant (c) $gh + \frac{1}{2}mv^2$=constant (d) $p + gh + \frac{1}{2}v^2$=constant

14) The angle of contact of pure water with glass rod is _____
(a) 0° (b) 18° (c) 35° (d) 138°

15) The angle of contact of mercury with glass is _____
(a) 0° (b) 8° (c) 18° (d) 138°

16) The angle of contact of water and glass lies between _____
(a) 0° to 10° (b) 8° to 18° (c) 18° to 35° (d) 38° to 138°

17) A liquid in motion possesses_____
(a) pressure energy (b) kinetic energy (c) potential energy (d) All the above

18) The excess of pressure inside a bubble is_____
(a) $p = \frac{4T}{r}$ (b) $p = \frac{4r}{T}$ (c) $p = \frac{2T}{r}$ (d) $p = \frac{2r}{T}$

19) The unit of coefficient of viscosity(η) is_____
(a) Ns (b) Nsm (c) Nsm^{-1} (d) Nsm^{-2}

20) Hydraulic lift and hydraulic brake works on the principle of _____
(a) Hooke's law (b) Law of floatation (c) Pascal's law (d) Stoke's law

21) The unit of surface tension is_____
(a) N (b) Nm (c) Nm^{-1} (d) Nm^{-2}

22) According to Stoke's law,_____

(a) $F = 6\pi \quad a\eta v$ (b) $F = ma$ (c) $F = \eta A \frac{dv}{dx}$ (d) $F = \frac{mv^2}{r}$

23) Kinetic energy per unit mass is_____

(a) $\frac{1}{2}v^2$ (b) $\frac{1}{2}mv$ (c) $\frac{1}{2}\frac{v^2}{m}$ (d) $\frac{1}{2}mv^2$

24 x 2 = 48

24) State Hooke's law.

25) Explain the three moduli of elasticity.

26) Which is more elastic,rubber or steel?Support your answer.

27) State and prove Pascal's law without considering the effect of gravity.

28) Taking gravity into account, explain Pascal's law.

29) Explain the principle, construction and working of hydraulic brakes.

30) What is Reynold's number?

31) What is critical velocity of a liquid?

32) Why aeroplanes and cars have streamline shape?

33) Describe an experiment to determine viscosity of a liquid.

34) What is terminal velosity?

35) Explain Stok's law.

36) Derive an expression for terminal velocity of a small sphere through a viscous liquid.

37) Define Cohesive force and adhesive force.Give examples.

38) Define (i) molecular range, (ii) sphere of influence and (iii) surface tension.

39) A person standing near a speeding train has a danger of falling the train.Why?

40) Why a small bubble rises slowly through whereas the bigger bubble rises rapidly?

41) Define viscosity.

42) How do rainfall drops fall?Justify your answer using Stoke's law.

43) What are interatomic forces?

44) What is a fluid?

45) Define Young's Modulus.

46) Define Bulk Modulus.

47) Define Rigidity modulus or shear modulus.

25 x 3 = 75

48) A wire of diameter 2.5 mm is streched by a force of 980 N.If the young's modulus of the wire is $12.5X10^{10}$ N m^{-2}, find the percentage increase in the length of the wire.

49) Two wires are made of same material.The length of the first wire is half of the second wire and its diameter is double that of second wire.If equal loads are applied on both the wires,find the ratio of increase in their lengths.

50) The diameter of a brass rod is 4 mm.Calculate the stress and strain when it is stretched by 0.25% of its length.Find the force exerted.Given q=$9.2X10^{10}$ Nm^{-2} for brass.

51) Calculate the volume change of a solid copper cube,40 mm on each side,when subjected to a pressure of $2X10^7$ Pa.Bulk modulus of copper is $1.25X10^{11}$ N m^{-2} .

52) In a hydraulic lift,the piston P_2 has a diameter of 50 cm and that of P_1 is 10 cm.What is the force on P_2 when 1 N of force is applied P_1?

53) Calculate the mass of water flowing in 10 minutes through a tube of radius 10^{-2} m and length 1 m having a constant pressure of 0.2 m of water.Assume co-efficient of viscosity of water=$9X10^{-4}$ N s m^{-2} and g=9.8 ms $^{-2}$.

54) A liquid flows through a pipe of 10^{-3} m radius and 0.1 m length under a pressure of 10^3 pa.If the co-efficient of viscosity of the liquid is $1.25X10^{-3}$ N s m^{-2} ,calculate the rate of flow and the speed of the liquid coming out of the pipe.

55) For cylindrical pipes,Reynold's number is nearly 2000.If the diameter of a pipe is 2 cm and water flows through it,determine the velocity of the flow.Take h for water=10^{-3} N s m^{-2} .

56) Explain surface tension on the basis of molecular theory.

57) Establish the relation between surface tension and surface energy.

58) How do insects run on the surface of water?

59) In a poiseulle's flow experiment, the following are noted.

(i)Volume of liquid discharged per minute=$15X10^{-6}$ m^3

(ii)Head of liquid=0.30 m,

(iii)Length of tube=0.25 m

(iv)Diameter=$2X10^{-3}$ m,(v)Density of liquid = 2300 kg m^{-3}.

60) An air bubble of 0.01 m radius raises steadily at a speed of $5X10^{-3}$ m s^{-1} through a liquid of density 800 kg m^{-3} .Find the co-efficient of viscosity of the liquid.Neglect the density of air.

61) Why hot water is preferred to cold water washing clothes?

62) Derive an expression for the total energy per unit mass of a flowing liquid.

63) State and prove Bernoulli's theorem.

64) Why the blood pressure in humans is greater at the feet at the brain?

65) Why two holes are made to empty an oil tin?

66) State Hooke's law and describe an experiment to verify Hooke's law.

67) Explain the study of stress-strain relationship using a graph.

68) Determine the coefficient of viscosity of water by poiseuille's flow method.

69) Describe the construction and working of hydraulic lift.

70) Describe an experiment to determine the surface tension of liquid by capillary rise method.

71) Obtain the equation of continuity.

72) State the applications of Bernoulli's theorem.

10 x 5 = 50

73) calculate the viscous force on a ball of radius 1 mm moving through a liquid of viscosity 0.2 N sm^{-2} at a speed of 0.07 m s^{-1} .

74) A U-shaped wire is dipped in soap solutions.the thin soap formed between the wire and a slider supports a weight $1.5X10^{-2}$ N.If the length of the slider is 30 cm,calculate the surface tension of the film.

75) Calculate the force required to remove a flat circular plate of radius 0.02 m from the surface of water.Assume surface tension of water is 0.07 N m^{-1} .

76) Find the work done in blowing up a soap bubble from an initial surface area of $0.5X10^{-4}m^2$ to an area $1.1X10^{-4}$ m^2 .The surface tension of soap solution is 0.03 N m^{-1} .

77) Determine the height to which water will rise in a capillary tube of $0.5X10^{-3}$ m diameter.Given for wate, surface tension is 0.074 N m^{-1} .

78) A capillary tube of inner diameter 4 mm stands vertically in a bowl of mercury.The density of mercury is 13500 kg m^{-3} and its surface tension is 0.544 N m^{-1} .If the level of mercury in the tube is 2.33 mm below the level outside find the angle of contact of mercury with glass.

79) A capillary tube of inner radius $5X10^{-4}$ m is dipped in water of surface tension 0.075 N m^{-1}.To what height is the water raised by the capillary action above the water level outside.Calculate the weight of water column in the tube.

80) What amount of energy will be liberated if 1000 droplets of water; each of diameter 10^{-8} m, coalesce to form a big drop. Surface tension of water is 0.075 N m^{-1} .

81) Water flows through a horizontal pipe of varying cross-section. If the pressure of water equals $2x10^{-2}$ m of mercury where the velocity of flow is $32x10^{-2}$ m s^{-1} find the pressure at another point, where the velocity of flow is $40x10^{-2}$ m s^{-1} .

82) Obtain an expression for surface tension of a liquid, $T = \frac{hr\rho g}{2}$ by capillary rise method.

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Competitive Edge Academy

Oscillations

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 02:30:00 Hrs

Total Marks : 150

20 x 1 = 20

1) Which of the following is the necessary condition for SHM?
(a) Constant period (b) Constant acceleration (c) displacement and acceleration are proportional
(d) displacement and torque are proportional

2) The displacement of a particle executing SHM is given by.$x = 0.01 \quad sin(100pt + 0.05)$Its time period is .....
(a) 0.01 s (b) 0.02 s (c) 0.1 s (d) 0.02 s

3) If the displacement of a particle executing SHM is given by $y = 0.05 \quad sin(100t + \frac{\pi}{2}) \quad cm$. The maximum velocity of the particle is .....
(a) $0.5 \quad cms^{-1}$ (b) $0.05 \quad m \quad s^{-1}$ (c) $100 \quad m \quad s^{-1}$ (d) $50 \quad m \quad s^{-1}$

4) If the magnitude of displacement is equal to acceleration, then the time period is .....
(a) 1 s (b) $\pi \quad s$ (c) $2\pi \quad s$ (d) $4\pi \quad s$

5) A body of mass 2 g is executing SHM about a mean position with an amplitude 10 cm.if the maximum velocity is $100cm\ s^{-1}$ its velocity is $50\ cm\ s^{-1}$ at a distance of (in cm).
(a) $5\sqrt{2}$ (b) $50\sqrt{3}$ (c) $5\sqrt{3}$ (d) $10\sqrt{3}$

6) A linear harmonic oscillator has a total energy of 160 J. its .....
(a) maximum potential energy is 100 J (b) maximum kinetic energy is 160 J (c) minimum potential energy is 100 J
(d) maximum kinetic energy is 100 J

7) A force of 6.4 N stretches a vertical spring by 0.1 m The mass that must be suspended from the spring so that it oscillates with a period of $\frac{\pi}{4}s$ is.....
(a) $\frac{\pi}{4}kg$ (b) 1 kg (c) $\frac{1}{4}kg$ (d) 10 kg

8) The length of seconds pendulum at a place where $g = 9.8m\ s^{-2}$ is .....
(a) 0.25 m (b) 1 m (c) 0.99 m (d) 0.50 m

9) A particle executes SHM with an amplitude 4 cm. At what displacement from the mean position its energy is half kinetic and half potential?
(a) $2\sqrt{2}cm$ (b) $\sqrt{2} \quad cm$ (c) 2 cm (d) 1 cm

10) A particle executes SHM along a straight line with an amplitude 'a'.PE is maximum when the displacement is .....
(a) $\pm$ a (b) zero (c) $+ \quad \frac{a}{2}$ (d) $\frac{a}{\sqrt{2}}$

11) In the case of vibrating bodies, the path of vibration is always directed.....
(a) away from the equilibrium position (b) towards the extream position (c) towards the equilibrium position (d) None of the above

12) By definition of simple harmonic motion acceleration 'a' is equal to.....
(a) $\omega^2 y$ (b) $-\omega^2 y$ (c) $\frac{\omega^2}{y}$ (d) $\frac{\omega^2}{y}$

13) The restoring force that tends to bring back the particle to the mean position is given by.....
(a) F=ma (b) $F = m\omega^2 y$ (c) $F = -m\omega^2 y$ (d) $F = m\omega^2$

14) The velocity amplitude of the vibrating particle is.....
(a) $a\omega$ (b) $\frac{\omega}{a}$ (c) $a\omega^2$ (d) $\omega^2 a^2$

15) The restoring force of a system of mass m executing SHM is 4N. Its displacement is 0.04 m, then force constant is.....
(a) 100 Nm^{-1} (b) $\frac{1}{100} Nm^{-1}$ (c) 0.16 Nm^{-1} (d) 1000 Nm^{-1}

16) If two vibrating particles cross their respective mean positions at the same time in the opposite direction, then the phase difference between them is.....radian.
(a) 0 (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{2}$ (d) π

17) The time period T in terms of force constant 'k' is T=.....
(a) $\frac{1}{2\pi}\sqrt{\frac{m}{k}}$ (b) $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ (c) $2\pi\sqrt{\frac{m}{k}}$ (d) $2\pi\sqrt{\frac{k}{m}}$

18) The unit of torque constant is.....
(a) Nm (b) N/rad (c) Nm rad^{-1} (d) Nm^2 rad^{-1}

19) The period of angular harmonic oscillator is T=.....
(a) $\frac{1}{2\pi}\sqrt{\frac{m}{k}}$ (b) $2\pi\sqrt{\frac{C}{I}}$ (c) $2\pi\sqrt{\frac{I}{C}}$ (d) $\frac{1}{2\pi}\sqrt{\frac{C}{I}}$

20) The time period of a vertically loaded spring is T=.....

(a) $2\pi\sqrt{\frac{dl}{g}}$ (b) $2\pi\sqrt{\frac{g}{dl}}$ (c) $\frac{1}{2\pi}\sqrt{\frac{g}{dl}}$ (d) $\frac{1}{2\pi}\sqrt{\frac{dl}{g}}$

15 x 2 = 30

21) Define simple harmonic motion. What are the condition of SHM?

22) Show that the projection of uniform circular motion on the diameter of a circle is simple harmonic motion.

23) Explain (i)displacement, (ii) Velocity and (iii) acceleration in SHM using component method

24) Show graphically the variation of displacement, velocity and acceleration of a particle executing SHM.

25) What is the phase difference between (i) velocity and acceleration, (ii) acceleration and displacement of a particle executing SHM?

26) Define the terms (i) time period, (ii) frequency and (iii) angular frequency.

27) Define force constant. Give its unit and dimensional formula.

28) What is an epoch? Give its unit.

29) Distinguish between linear and angular harmonic oscillator.

30) What is a spring factor?

31) The bob of a simple pendulum is a hollow sphere filled with water. How does the period of oscillation change if the water begins to drain out of the sphere?

32) Why does the oscillation of a simple pendulum eventually stop?

33) What will happen to the time period of a simple pendulum if its length is doubled?

34) On what factors the natural frequency of a body depend on?

35) What are the advantages of resonance?

10 x 3 = 30

36) Obtain an equation for SHM of a particle of amplitude 0.5 m, frequency 50Hz. The initial phase is $\frac{\pi}{2}$. Find the displacement at t=0.

37) A particle executing SHM is represented by $y = 2\sin\left(2\pi\frac{t}{T} + \phi_0\right)$. At t=0, the displacement is $\sqrt{3}$ cm. Find the initial phase.

38) A body executes SHM with an amplitude 10 cm and periods 2 s. Calculate the velocity and acceleration of the body when the displacement is (i) zero and (ii) 6 cm.

39) A disc suspended by a wire, makes angular oscillations. When it is displaced through 30^o from the mean position, it produces a restoring torque of 4.6 Nm. If the moment of inertia of the disc is 0.082 kgm^2, calculate the frequency of angular oscillations.

40) A mass of 0.2 kg attached to one end of a spring produces an extension of 15 mm. The mass is pulled 10 mm downwards and set into vertical oscillations of amplitude 10 mm. Calculate (i) the period of oscillation, (ii) maximum kinetic energy.

41) What is forced vibration? Give an example.

42) What forces keep the simple pendulum in SHM?

43) Illustrate an example to show that resonance is disastrous sometimes?

44) Explain the oscillations of a mass attached to a horizontal spring. Hence deduce an expression for its time period.

45) If two springs are connected in parallel, what is its equivalent spring constant?

7 x 5 = 35

46) The equation of SHM is represented by$y = 0.25\sin\left(3014t + 0.35\right)$, where y and t are in mm and s respectively. Deduce (i) amplitude, (ii) frequency, (iii) angular frequency, (iv) period and (v) initial phase.

47) A particle executing SHM has angular frequency of $\pi rads^{-1}$and amplitude of 5 m. Deduced (i) time period, (ii) maximum velocity, (iii) maximum acceleration, (iv) velocity when the displacement is 3m.

48) A vertical U-tube of uniform cross section water to a height of 0.3 m. show that, if water in one of the limbs is depressed and then released, the oscillations of the water column in the tube are SHM. Calculate its time period also.

49) A bob of a simple pendulum oscillates with an amplitude of 4 cm and time period 1 s. Find (i) length of the pendulum and (ii) velocity of the bob in the mean position.

50) Compare the acceleration due to gravity at two places if the time for 100 oscillations of a simple pendulum are 8 minutes 2 seconds and 8 minutes 20 seconds respectively of two places.

51) A particle of mass 0.2 kg executes SHM of amplitude 2 cm and time period 6 s. Calculate (i) the total energy, (ii) kinetic and potential energy when displacement is 1cm from the mean position.

52) The length of a seconds pendulum in a clock is increased by 2%. How many seconds will it lose or gain in a day?

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Competitive Edge Academy

Wave Motion

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs

Total Marks : 150

17 x 1 = 17

1) In a longitudinal wave there is state of maximum compression at a point at an instant. The frequency of wave is 50 Hz. After what time the same point be in the state of maximum rarefaction.....

(a) 0.01 s (b) 0.002 s (c) 25 s (d) 50 s

2) Sound of frequency 256 Hz passes through a medium. The maximum displacement is 0.1 m. The maximum velocity is equal to.....

(a) 60π m s^{-1} (b) 51.2π m s^{-1} (c) 256 m s^{-1} (d) 512 m s^{-1}

3) Which of the following does not affect the velocity of sound?

(a) Temperature of the gas (b) Pressure of the gas (c) Mass of the gas (d) Specific heat capacities of the gas

4) When a wave passes from one medium to another, there is change of.....

(a) frequency and velocity (b) frequency and wavelength (c) wavelength and velocity (d) frequency, wavelength, and velocity

5) Sound waves from a point source are propagating in all directions. What will be the ratio of amplitude at a distance 9 m and 25 m from the source?

(a) 25 : 9 (b) 9 : 25 (c) 3 : 5 (d) 81 : 625

6) The intensity level of two sounds are 100 dB and 50 dB. Their ratio of intensities are.....

(a) 10^1 (b) 10^5 (c) 10^3 (d) 10^{10}

7) Number beats produced by two waves of y_1 = a sin 2000 πt, y_2 = a sin 2008 πt is.....

(a) 0 (b) 1 (c) 4 (d) 8

8) In order to increase the fundamental frequency of a stretched string from is 100 Hz to 400 Hz, the tension must be increased by.....

(a) 2 times (b) 4 times (c) 8 times (d) 16 times

9) The second overtone of an open pipe has the same frequency as the first overtone of a closed pipe of 2 m long. The length of the open pipe is,

(a) 2 m (b) 4 m (c) 0.5 m (d) 0.75 m

10) A source of sound of frequency 150 Hz is moving in a direction towards an observer with a velocity 110 m s^{-1} . If the velocity of sound is 330 m s^{-1} , the frequency of sound heard by the person is .....

(a) 225 Hz (b) 200 Hz (c) 150 Hz (d) 100 Hz

11) The velocity of transverse wave in a stretched string is given by .....

(a) $v = \sqrt{\frac{T}{m}}$ (b) $v = \sqrt{\frac{m}{T}}$ (c) $v = \sqrt{T.m}$ (d) $v = \sqrt{\frac{E}{P}}$

12) The velocity of longitudinal waves in an elastic medium is .....

(a) $v = \sqrt{\frac{T}{m}}$ (b) $v = \sqrt{\frac{E}{\rho}}$ (c) $v = \sqrt{\frac{q}{\rho}}$ (d) $v = \sqrt{\frac{k}{\rho}}$

13) The velocity of longitudinal wave in a solid rod is .....

(a) $v = \sqrt{\frac{q}{\rho}}$ (b) $v = \sqrt{\frac{k}{\rho}}$ (c) $v = \sqrt{\frac{E}{\rho}}$ (d) $v = \sqrt{\frac{T}{m}}$

14) The velocity of longitudinal wave in liquid is .....

(a) $v = \sqrt{\frac{T}{m}}$ (b) $v = \sqrt{\frac{E}{\rho}}$ (c) $v = \sqrt{\frac{q}{\rho}}$ (d) $v = \sqrt{\frac{k}{\rho}}$

15) ..... waves do not require any material medium for propagation.

(a) mechanical (b) electromagnetic (c) matter (d) water

16) Mechanical waves propagate through a medium which possesses .....

(a) elasticity only (b) inertia only (c) both (a) or (b) (d) neither (a) or (b)

17) Longitudinal waves can be propagated through .....

(a) liquids (b) gases (c) solids (d) any one of these

15 x 2 = 30

18) Define wave motion. Mention the properties of the medium in which a wave propagates.

19) Obtain an expression for the velocity of transverse wave in a stretched string, when it is vibrating in fundamental mode.

20) Derive the Newton-Laplace formula for the velocity of sound in gases.

21) Show that the velocity of sound increase by 0.61 ms^{-1} for every degree rise of temperature.

22) Sound travels faster on rainy days. Why?

23) On what factors does the intensity of sound depend?

24) What is an echo ? why an echo cannot be heard in a small room?

25) Obtain the equation for plane progressive wave
26) Write a short note on whispering gallery.
27) State the principle of superposition
28) What do you understand by decibel?
29) Define progressive wave.
30) What are longitudinal waves? Give few examples.
31) What are transverse waves? Give example
32) State the conditions under which mechanical and electromagnetic waves can be propagated through a medium.

15 x 3 = 45

33) In solids both longitudinal and transverse waves are possible, but transverse waves are not produced in gases. Why?
34) What are the characteristics of the wave motion?
35) .Distinguish between intensity and loudness of sound.
36) What are the essential conditions for the formation of beats?
37) How are stationary waves formed?
38) What are overtones or harmonics?
39) What is meant by end correction?
40) What are the properties of stationary waves?
41) Derive the equation of stationary wave and deduce the condition for nodes and antinodes.
42) Prove that in a pipe closed at one end, frequency of harmonics arein the ratio 1:3:5.
43) Illustrate with the example the formation of longitudinal waves.
44) Discuss the (i) effect of pressure, (ii) effect of density, (iii) effect of wind on the velocity of sound in gases.
45) The equation for a plane progressive wave is given by

$$y = a \quad sin \quad 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right)$$

Discuss the variation of (i) phase with time, (ii) phase with distance.

46) Demonstrate with the help of an experiment how sound waves are refracted. Discuss the application of refraction of sound.
47) Discuss the applications of Doppler effect.

9 x 5 = 45

48) Distinguish between transverse and longitudinal waves.
49) List out the differences between a progressive wave and a stationary wave
50) State the laws of transverse vibrations in stretched strings
51) What are beats? Show that the number of beats produced per second is equal to the difference in frequencies.
52) What are interference of sound waves? Describe an experiment to explain the phenomenon of interference of waves.
53) Explain how overtones are produced in an open pipe. show that all harmonics are present in the open pipe.
54) What is doppler effect?Derive the formula for the change in frequency
(i) When the source is approaching and receding from the observe and
(ii) When the source is stationary and observe is moving towards and away from the source
55) Describe the formation of stationary waves in a stretched string using sonometer and hence obtain expressions for fundamental frequency and overtones in stretched string.
56) How will you determine the velocity of sound in air at room temperature using resonance column apparatus.

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Competitive Edge Academy

Heat and Thermodynamics

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs

Total Marks : 150

11 x 1 = 11

1) Avogadro number is the number of molecules in_____

(a) One liter of a gas at NTP (b) One mole of a gas (c) One gram of a gas (d) 1 Kg of a gas

2) First law of thermodynamics is a consequence of the conservation of _____

(a) momentum (b) charge (c) mass (d) energy

3) At a given temperature, the ratio of the RMS velocity of hydrogen to the RMS velocity of oxygen is _____

(a) 4 (b) 1/4 (c) 16 (d) 8

4) The property of the system that does not change during an adiabatic change is _____

(a) temperature (b) volume (c) pressure (d) heat

5) For an ant moving on the horizontal surface, the number of degrees of freedom of the ant will be____

(a) 1 (b) 2 (c) 3 (d) 6

6) The translational kinetic energy of gas molecules for one mole of the gas is equal to_____

(a) $\frac{3}{2}RT$ (b) $\frac{2}{3}KT$ (c) $\frac{1}{2}RT$ (d) $\frac{3}{2}KT$

7) The internal energy of a perfect gas is ____

(a) partly kinetic and partly potential (b) wholly potential (c) wholly kinetic (d) depends on the ratio of two specific heats

8) A refrigerator with its power on is kept in a closed room. The temperature of the room will _____

(a) rise (b) fall (c) remains the same (d) depend on the area of the room

9) A beaker full of hot water is kept in a room. If it cools from 80^oC to 75^oC in t_1 minutes, from 75^oC to 70^oC in t_2 minutes and from 70^oC to 65^oC in t_3 minutes, then_____

(a) $t_1=t_2=t_3$ (b) $t_1<t_2=t_3$ (c) $t_1<t_2<t_3$ (d) $t_1>t_2>t_3$

10) Which of the following will radiate heat to the large extent?

(a) white polished surface (b) White rough surface (c) Black polished surface (d) Black rough surface

11) A block of ice in a room at normal temperature _____

(a) does not radiate (b) radiates less but absorbs more (c) radiates more than it absorbs (d) radiates as much as it absorbs

28 x 2 = 56

12) Derive an expression for the average kinetic energy of the molecule of gas.

13) Two different gases have exactly the same temperature. Do the molecules have the sane RMS speed?

14) What are degrees of freedom?

15) State the law of equipartition of energy and prove that for a diatomic gas, the ratio of the two specific heats at room temperature is $\frac{7}{5}$

16) A gas has two specific heats, whereas liquid and solid have only one. Why?

17) What are the postulates of Kinetic theory of gases?

18) Define molar specific heat at constant pressure.

19) Derive Meyer's relation.

20) What is an indicator diagram?

21) On driving a scooter for a long time the air pressure in the tyre slightly increases why?

22) Is it possible to increase the temperature of a gas without the addition of heat? Explain.

23) How is second law of thermodynamics different from first law of thermodynamics?

24) Define Clausius statement.

25) Give an example for a heat pump.

26) A heat engine with 100% effectively is only a theoretical possibility. Explain.

27) What is Coefficient of Performance? Derive the relation between COP and efficiency.

28) Why are ventilators provided in our houses?

29) Define temperature gradient.

30) Why does a piece of red glass when heated and taken out glow with green light?

31) Define steady state in thermal conduction of heat.

32) Define solar constant

33) Define absorptive power.

34) Define Stefan's law.

35) Explain Fery's concept of a perfect black body.

36) Write the application of Kirchoff's law
Application of Kirchoff's law.
37) Define isothermal process. Derive an expression for the work done during the process.
38) State Wien's displacement law.
39) What are the factors upon which coefficient of thermal conductivity depends?

22 x 3 = 66

40) A gas is suddenly compressed to 1/2 of its original volume.If the original temperature is 300 K, find the increase in temperature (Assume $\gamma = 1.5$)
41) A system absorbs 8.4 k J of heat and at the same time does 500 J of work. Calculate the change in internal energy of the system.
42) How many meters can a man weighing 60 kg, climb by using the energy from a slice of bread which produces a useful work of 4.2 x 10^5 J.(Efficiency of human body is 28%)
43) The wavelength with maximum energy emitted from a certain star in our galaxy is 1.449 x 10^{-5} cm.Calculate the temperature of the star.
44) The opposite faces of the top of an electric oven are at a difference of temperature of 100^0 C and the area of the top surface and its thickness is 300 cm^2 and 0.2 cm respectively.Find the quantity of heat that will flow through the top surface in one minute.$(K = 0.2Wm^{-1}K^{-1})$
45) The ratio of radiant energies radiated per unit surface area by two bodies is 16:1.The temperature of the hotter body is 100 K.Calculate the temperature of the other body.
46) A hot solid takes 10 minutes to cool from 60^0 C to 50^0 C.How much will further time it take to cool to 40^0 C if the room temperature is 20^0 C?
47) What is Avogadro's number?
48) Define temperature
49) Define specific heat capacity
50) Define molar specific heat capacity of a gas.
51) Define molar specific heat capacity of a gas at constant volume.
52) State Kelvin's statement of second law of thermodynamics.
53) State Kelvin's Planck's statement of second law of thermodynamics.
54) What is heat engine?
55) Define conduction.
56) What is radiation?
57) What is a perfect black body?
58) State Newton's law of cooling.
59) Why birds often swell their feathers in winter?
60) Define emissive power.
61) State Kirchoff's law.

12 x 5 = 60

62) Calculate the kinetic energy of translational motion of a molecule of a diatomic gas at 320K.
63) Calculate the RMS velocity of hydrogen molecules at NTP (One mole of hydrogen occupies 22.4 litres at NTP).
64) The RMS speed of dust particles in air at NTP is 2.2 x 10^{-2} m s^{-1} .find the average mass of the particles.
65) Find the number of molecules in 10 x10^{-6} m^3 of a gas at NTP, if the mass of each molecule is 4 x 10^{-26} kg and the RMS velocity is 400 m s^{-1} .
66) Calculate the molecular kinetic energy of translation of one mole of hydrogen at NTP.(R = 8.31 J mol^{-1} K^{-1}).
67) Find the work done by 1 mole of perfect gas when it expands isothermally to double its volume.The initial temperature of the gas is 0^0 C (R = 8.31 J mol^{-1} K^{-1})
68) A tyre pumped to a pressure of 3 atmosphere suddenly bursts.Calculate the fall in temperature if the temperature of air before expansion is 27^0 C and $\gamma = 1.4$
69) A certain volume of dry air at NTP is expanded into three times its volume, under (i) isothermal condition, (ii) adiabatic condition.Calculate in each case, the final pressure and final temperature,$(\gamma = 1.4)$
70) The surface temperature of a spherical hot body is 1000 K. Calculate the rate at which energy is radiated. (Given $\sigma = 5.67X10^{-8}$ $Wm^{-2}K^{-4}$)
71) Compare the rate of loss of heat from a black metal sphere at 227^0 C with the rate of loss of heat from the same sphere at 127^0 C.The temperature of the surroundings is 27^0 C.
72) Calculate the surface temperature of the Sun $\left(\lambda_m = 4753\mathring{A}\right)$.
73) An object is heated and then allowed to cool when its temperature is 70^0 C, its rate of cooling is 3^0 C per minute and when the temperature is 60^0 C, the rate of cooling is 2.5^0 C per minute.Determine the temperature of the surroundings.

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Competitive Edge Academy

Ray Optics

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs

Total Marks : 150

32 x 1 = 32

1) The number of images of an object held between two parallel mirrors.
(a) infinity (b) 1 (c) 3 (d) 0

2) Radius of curvature of concave mirror is 40 cm and the size of image is twice as that of object, then the object distance is .....
(a) 20 cm (b) 10 cm (c) 30 cm (d) 60 cm

3) A ray of light passes from a denser medium strikes a rarer medium at an angle of incidence i. The reflected and refracted rays are perpendicular to each other. The angle of reflection and refraction are r and r'. The critical angle is..... .
(a) $\tan^{-1}(\sin i)$ (b) $\sin^{-1}(\tan i)$ (c) $\tan^{-1}(\sin r)$ (d) $\sin^{-1}(\tan r')$

4) Light passes through a closed tube which contains a gas. If the gas inside the tube is gradually pumped out, the speed of light inside the tube ..... .
(a) increases (b) decreases (c) remains constant (d) first increases and then decreases

5) In Michelson's experiment, when the number of faces of rotating mirror increases, the velocity of light.....
(a) decreases (b) increases (c) does not change (d) varies according to the rotation

6) If the velocity of light in a medium is (2/3) times of the velocity of light in vacuum, then the refractive index of that medium is .....
(a) 3/2c (b) 2c/3 (c) 2/3 (d) 1.5

7) Two lenses of power +12 and -2 dioptre are placed in contact. The focal length of the combination id given by .....
(a) 8.33 cm (b) 12.5 cm (c) 16.6 cm (d) 10 cm

8) A converging lens is used to form an image on a screen. When the lower half of the lens is covered by an opaque screen then, ...
(a) half of the image will disappear (b) complete image will be formed (c) no image is formed (d) intensity of the image is high

9) Two small angled prism of refractive indices 1.6 and 1.8 produced same deviation, for an incident ray of light, the ratio of angle of prism .....
(a) 0.88 (b) 1.33 (c) 0.56 (d) 1.12

10) Rainbow is formed due to the phenomenon of .....
(a) refraction and absorption (b) dispersion and focussing (c) refraction and scattering (d) dispersion and total internal reflection

11) A ray of light has a ..... width and is represented in diagrams as straight lines.
(a) finite (b) infinite (c) zero (d) varying

12) A beam of light is a collection of .....
(a) lines (b) points (c) rays (d) dots

13) A search light emits a ..... beam of light.
(a) unparallel (b) parallel (c) curved (d) scattered

14) Light from a lamp is a ..... beam.
(a) Convergent (b) divergent (c) dispersed (d) parallel

15) Convex lens produces a ..... beam of light.
(a) convergent (b) divergent (c) dispersed (d) parallel

16) Mirrors in every day use are coated with ..... on the back side of the glass.
(a) silver (b) mercury (c) zinc (d) aluminium

17) The largest reflector in the world is a curved mirror. Its front surface is coated with .....
(a) silver (b) mercury (c) zinc (d) aluminium

18) The largest reflector in the world-the hale telescope is on the top of .....
(a) Mount San Antonio (b) Mount Abu (c) Mount Palomer (d) Mount Wilson

19) The angle between the incident ray and the normal is called .....
(a) angle of incidence (b) angle of reflection (c) angle of deviation (d) angle of emergence

20) The angle between the reflected ray and the normal is called .....
(a) angle of incidence (b) angle of reflection (c) angle of deviation (d) angle of emergence

21) The incident ray, the reflected ray and the normal drawn to the reflecting surface at the point of incidence .....
(a) all lie in same plane (b) all lie in different plane (c) are all mutually perpendicular to each other (d) are all inclined at 120°

22) According to the laws of reflection, angle of incidence is.....the angle reflection.
(a) greater (b) lesser (c) equal (d) twice

23) The angle of deviation of a ray by a plane mirror or a plane surface is.....the glancing angle.
(a) twice (b) trice (c) one half of (d) one third of

24) Image formed by the plane mirror is.....

(a) erect (b) real (c) virtual (d) None of these

25) When object is placed between two plane mirrors inclined at an angle,θ then the number of images formed is n=.....

(a) $\frac{90}{\theta}-1$ (b) $\frac{180}{\theta}-1$ (c) $\frac{270}{\theta}-1$ (d) $\frac{360}{\theta}-1$

26) The line joining the pole of the mirror and its centre of curvature is called the .....

(a) focal length (b) principal axis (c) radius of curvature (d) All the above

27) The distance between the pole and the centre of curvature of spherical mirror is called the.....

(a) centre of curvature (b) focal length (c) radius pf curvature (d) All the above

28) A ray passing through the centre of curvature, after reflection.....

(a) passes through its principal focus (b) appears to come from the principal focus (c) is rendered parallel to the principal axis (d) retraces its path

29) A light pipe is a bundle of.....

(a) plastic fibres (b) thin optical fibres (c) glass tubes (d) light discharging tubes

30) Light pipes are used in .....

(a) medical examination (b) optical examination (c) transmitting communication signals (d) All the above

31) In Michelson's method let n be the number of rotations made per second, then time taken by the mirror to rotate through 45° is.....

(a) $t=\frac{1}{8n}$ (b) $t=\frac{8}{n}$ (c) $t=\frac{n}{8}$ (d) $t=8n$

32) The general formula to find the velocity of light as per Michelson's method is.....

(a) c= 8 ND (b) c= 16 nD (c) c= NnD (d) c= 12nD

18 x 2 = 36

33) State the laws of reflection.

34) Show that the reflected ray turns by 2θ when mirror turns by θ.

35) Explain the image formation in plane mirrors.

36) What is the difference between the virtual images produced by
(i) plane mirror, (ii) concave mirror, (iii) convex mirror?

37) The surface of the sunglasses are curved, yet their power may be zero. Why?

38) Prove the mirror formula for reflection of light from a concave mirror producing (i) real image, (ii) virtual image.

39) With the help of ray diagram explain the phenomenon of total internal reflection. Give the relation between critical angle and refractive index.

40) Write a note on optical fibre.

41) Explain Michelson's method of determining the velocity of light.

42) Give the importance of velocity of light.

43) Derive lens maker's formula for a thin biconvex lens.

44) Define power of a lens. What is one dioptre?

45) What is total internal reflection?

46) State the conditions for total internal reflection to take place?

47) What is refraction?

48) What is a lens?

49) When several thin lenses of focal length f_1,f_2,f_3 .....are in contact, what is its effective focal length?Express the effective focal length in terms of its power?

50) What is the cause of the brilliance of diamonds? Explain.

11 x 3 = 33

51) Light of wavelength 5000 $\mathring{A}$ falls on a plane reflecting surface. Calculate the wavelength and frequency of reflected light. For what angle of incidence, the reflected ray is normal to the incident ray?
Given data.
Wavelength of light (λ_i)=5000 $\mathring{A}$= 5000×10^{-10} m

52) At what distance from a convex mirror of focal length 2.5 m should a boy stand, so that his image has a height equal to half the original height?
Given data.
Focal length of the given convex mirror = 2.5 m
The boy must stand at what distance so that his image has a height equal to half the original height.
$\Rightarrow h_2=\frac{1}{2}h_1$

53) Establish the relation $\frac{1}{F}=\frac{1}{f_1}+\frac{1}{f_2}$ of thin lenses in contact.

54) Derive the relation $\mu=\frac{sin\frac{A+D}{2}}{sin\frac{A}{2}}$.

55) Does a beam of white light disperse through a hollow prism?

56) Derive an equation for the dispersive power of a prism.

57) Describe a spectrometer.

58) Explain how will you determine the angle of the minimum deviation of a prism using the spectrometer.

59) Write a note on the formation of rainbows.

60) Show that the angle of deviation of a ray by a plane mirror or a plane surface is twice the glancing angle.

61) obtain the expression for magnification in the case of image formed by a convex and concave lens using (i) sign convention, (ii) using lens formula.

8 x 5 = 40

62) In a Michelson's experiment the distance travelled by the light between two reflections from the octagon rotating mirror is 4.8 km. Calculate the minimum speed of the mirror so that the image is formed at the non-rotating position.

Given data.

The distance travelled by the light between two reflections from the octagonal rotating mirror(D)=4.8 km=4.8×10^3 m

Velocity of light (C) = 3×10^8 ms^{-1}

63) If the refractive index of diamond be 2.5 and glass 1.5, then how faster does light travel in glass than in diamond?

Given data.

Refractive index of diamond = 2.5

Refractive index of glass = 1.5

64) An object of size 3 cm is kept at a distance of 14 cm from a concave lens of local length 21 cm. Find the position of the image produced by the lens?

Given data.

Size of the object (h_1)= 3 cm =3×10^{-2} m

Object distance from a concave lens (u) = 14 cm=14×10^{-2} m

Focal length of concave lens (f)= 21 cm = 21×10^{-2} m

65) What is the focal length of a thin lens if the lens is in contact with 2.0 dioptre lens to form a combination lens which has a focal length of -80 cm?

Given data.

One thin lens is in contact with another lens.

Let focal length of thin lens (I) = f_1

Let focal length of another lens (II) = f_2

Power of lens (II) = 2.0 dioptre

Focal length of the combination lens = -80 cm

F=-80×10^{-2}m

66) A ray passes through an equilateral prism such that the angle of incidence is equal to the angle of emergence and the later is equal to 3/4 of the angle of prism. Find the angle of deviation.

Given data.

Given prism is an equilateral prism

Angle of incidence = Angle of emergence

Angle of emergence = $\frac{3}{4}$ of the angle of prism

67) The refractive indices of flint glass of equilateral prism for 400 nm and 700 nm are 1.66 and 1.61 respectively. Calculate the difference in angle of minimum deviation.

Given data.

Given two prisms are equilateral prisms made of flint glass

$\Rightarrow$ Angle of the prism (A) = 60°

Refractive index of glass prism for light of wavelength 400 nm(μ_1)=1.66

Refractive index of glass prism for light of wavelength 700 nm(μ_2)=1.61

68) White light is incident on a small angled prism of angle 5°. Calculate the angular dispersion if the refractive indices of red and violet rays are 1.642 and 1.656 respectively.

Given data.

Angle of small angled prism = 5°

Refractive index of the small angled prism for red light (μ_r)=1.642

Refractive index of the small angled prism for violet light (μ_v)=1.656

69) A thin prism of refractive index 1.5 deviates a ray by a minimum angle of 5°. When it is kept immersed in oil of refractive index 1.25, what is the angle of minimum deviation?

Given data:

Refractive index of thin prism (μ_1)=1.5

Angle of minimum deviation (D_1)=5°

The prism is immersed in oil of refractive index (μ_2)=1.25

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Competitive Edge Academy

Magnetism

11th Standard

Physics

Reg.No. : | | | | | | |

Time : 03:00:00 Hrs

Total Marks : 150

23 x 1 = 23

1) Two magnetic poles kept separated by a distance d in vacuum experience a force of 10N. The force they would experience when kept inside a medium of relative permeability 2, separated by the same distance is

(a) 20 N (b) 10 N (c) 5 N (d) 40 N

2) The magnetic moment of a magnet is 5 A m^2 . If the pole strength is 25 A m, what is the length of the magnet?

(a) 10 cm (b) 20 cm (c) 25 cm (d) 1.25 cm

3) A long magnetic needle of length 2 *l*, magnetic moment M and pole strength m is broken into two at the middle. The magnetic moment and pole strength of each piece will be

(a) M, m (b) $\frac{M}{2}, \frac{m}{2}$ (c) $m, \frac{m}{2}$ (d) $\frac{m}{2}, m$

4) Two short magnets have equal pole strength but one is twice as long as the other. The shorter magnet is placed 20 cm in tan A position from the compass needle. The longer magnet must be placed on the other side of the magnetometer for zero deflection at a distance

(a) 20 cm (b) $20(2)^{\frac{1}{3}}\ cm$ (c) $20(2)^{\frac{2}{3}}\ cm$ (d) 20(2) cm

5) The direction of a magnet in tan B position of a deflection magnetometer is

(a) North-South (b) East-West (c) North-West (d) South-West

6) The relative permeability of a specimen is 10001 and magnetising field strength is 2500 Am^{-1} . The intensity of magnetisation is

(a) $0.5 \times 10^{-7}\ A\ m^{-1}$ (b) $2.5 \times 10^{-7}\ A\ m^{-1}$ (c) $2.5 \times 10^{7}\ A\ m^{-1}$ (d) $2.5 \times 10^{-1}\ A\ m^{-1}$

7) For which of the following substance, the magnetic susceptibility is independent of temperature?

(a) Diamagnetic (b) Paramagnetic (c) Ferromagnetic (d) Diamagnetic and paramagnetic

8) At curie point, a ferromagnetic material becomes

(a) non-magnetic (b) diamagnetic (c) paramagnetic (d) strongly ferromagnetic

9) Electromagnets are made of soft iron because soft iron has

(a) low susceptibility and low retentivity (b) high susceptibility and low retentivity (c) high susceptibility and high retentivity (d) low permeability and high retentivity

10) Who suggested that earth behaves as a gaint bar magnet?

(a) Maxwell (b) Hertz (c) Gilbert (d) Faraday

11) Who laid the foundation for magnetism?

(a) Newton (b) Gilbert (c) Malus (d) Huygens

12) The field at the surface of the earth is approximately equal to.....

(a) 10^{-8} T (b) 10^{-6} T (c) 10^{-4} T (d) 10^{-2} T

13) The chemical formula of mgnetite is.....

(a) Fe_3O_4 (b) $CuSO_4$ (c) Al_2O_3 (d) FeO_4

14) In 1100 BC, the property of the magnet was known to.....

(a) Chinese (b) Americans (c) Japanese (d) Russians

15) The direction of magnetic moment is from.....

(a) South pole to south pole (b) South pole to north pole (c) North pole to south pole (d) North pole to north pole

16) Pieces of iron or steel that acquires magneticproperties when it is rubbed with a magnet are called.....

(a) natural magnet (b) artificial magnet (c) electromagnet (d) bar magnet

17) Magnetic moment of the magnet (M)=.....

(a) lm (b) $\frac{lm}{2}$ (c) $2l$ (d) $m \times 2l$

18) Magnetic flux density is the other name is.....

(a) Magnetic moment (b) Magnetic field (c) Magnetic induction (d) Magnetic flux

19) If a magnetic pole of strength (m) placed at a point in a magnetic field experiences a force F, the magnetic induction at that point is.....

(a) $B = \frac{m}{F}$ (b) $B = \frac{F}{m}$ (c) $B = F \times m$ (d) $B = F - m$

20) The unit of magnetic flux is.....

(a) Ampere metre (b) Weber $metre^{-2}$ (c) Tesla (d) Weber

21) Magnetic induction at a point along the axial line due to magnetic dipole (B)=.....

(a) $B = \frac{\mu_\circ}{4\pi} \frac{2Md}{(d^2 - l^2)^2}$ (b) $B = \frac{4\pi}{\mu_\circ} \frac{2Md}{(d^2 - l^2)^2}$ (c) $B = \frac{\mu_\circ}{4\pi} \frac{2md}{(d^2 - l^2)^2}$ (d) $B = \frac{4\pi}{\mu_\circ} \frac{2md}{(d^2 - l^2)^2}$

22) Magnetic induction at a point along the equatorial line due to a short bar magnet(B)=.....

(a) $B = \frac{\mu_\circ}{4\pi}\frac{M}{d^3}$ (b) $B = \frac{\mu_\circ}{4\pi}\frac{2M}{d^3}$ (c) $B = \frac{4\pi}{\mu_\circ}\frac{M}{d^3}$ (d) $B = \frac{4\pi}{\mu_\circ}\frac{2M}{d^3}$

23) The Susceptibility (X_m) of bismuth is.....

(a) +0.00002 (b) 200,000 (c) -0.00017 (d) -00077

24 x 2 = 48

24) State Coulomb's inverse square law.

25) Find the torque experienced by a magnetic needle in a uniform magnetic field

26) State and prove tangent law

27) What is tan A position?How will you set up the deflection magnetometer in tan A position?

28) What is tan B position?How will you set up the deflection magnetometer in tan B position?

29) Define the term (i)magnetic permeability,(ii)intensity of magnetisation and (iii) magnetic susceptibility.

30) Distinguish between dia,para and ferro magnetic substances.Give one example for each.

31) Explain the hysteresis cycle.

32) What are poles of the magnet?

33) What is a natural magnet?

34) What is an artificial magnet?

35) What is a bar magnet?

36) Define magnetic moment. Give its unit.

37) What is called a magnetic field?

38) What is magnetic line of force?

39) What is magnetic flux? Give its unit.

40) What is magnetic flux density? Give its unit.

41) What is meant by non-uniform magnetic field?

42) Define unit pole.

43) What is meant by magnetising field or magnetic intensity? Give its unit.

44) Define relative permeability.

45) What is meant by remanance?

46) What is meant by coercivity?

47) What is meant by hysteresis?

5 x 3 = 15

48) Two like poles of unequal pole strength are placed 1 m apart. if a pole of strength 4A m is in equilibrium at a distance 0.2 m from one of the poles, calculate the ratio of the pole strengths of the two poles.

49) A magnet of pole strength $24.6 \times 10^{-2} Am$and the length 10 cm is placed at 30^0 with a magnetic field of 0.01 T. Find the torque acting on the magnet.
Given data.
Pole strength of the magnet (m)=$24.6 \times 10^{-2} Am$
Length of the magnet (2l)=10 cm=$10 \times 10^{-2} m$
Angle made by the magnet with the magnetic field(θ)=30^0
Magnetic induction B=0.01 T

50) The magnetic moment of a bar magnet of length 10 cm is $9.8 \times 10^{-1} Am^2$.Calculate the magnetic field at a point on its axis at a distance of 20 cm from its midpoint.

51) Two mutually perpendicular line are drawn on a table. Two small magnets of magnetic moments 0.108 and $0.192 Am^2$respectively are placed on these lines.If the distance of the point of intersection of these lines is 30 cm and 40 cm respectively from these magnets, find the resultant magnetic field at the point of intersection.

52) A magnetic intensity of $2 \times 10^3 A/m$produces a magnetic induction of $4\pi Wb/m^2$in a bar of iron. calculate the relative permeability and susceptibility.
Given data.
Magnetic intensity (H) $= 2 \times 10^3 A/m$
Magnetic induction(B) $= 4\pi Wb/m^2$

4 x 5 = 20

53) The force acting on each pole of a magnet placed in a uniform magnetic induction of 5×10^{-4} T is 6×10^{-3} N. if the length of the magnet is 8 cm, calculate the magnetic moment of the magnet.

54) Two magnetic poles, one of which is twice stronger than the other, repel one another with a force of $2 \times 10^{-5} N$, when kept separated at a distance of 20 cm in air. calculate the strength of each pole.

Given data.

Pole strength of one pole is twice stronger than the other

Let the pole strength of one pole =$m_1 = m$

Let the pole strength of another pole $m_2 = 2m$.

Force of repulsion between two pole $F = 2 \times 10^{-5} N$

Distance of separation between two poles(d) = 20 cm $= 20 \times 10^{-2} m$

55) The intensity of magnetization of an iron bar of mass 72 g, density.7200 $kg \quad m^{-1}$ Calculate the magnetic moment

Given data.

Mass of iron bar =72g

Density of iron bar $= 7200 \quad kgm^{-3}$

Intensity of magnetization $I = 0.72 \quad Am^{-1}$

56) A magnet of volume $25cm^3$has a magnetic moment of $12.5 \times 10^{-4} Am^2$.Calculate the intensity of magnetization

Given data.

Volume of the magnet $V = 25cm^3 = 25 \times 10^{-6} m^3$

Magnetic moment=$12.5 \times 10^{-4} Am^2$

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