



CLASS XI

SAMPLE PAPER

PHYSICS

NUMERICALS

1. A sound wave has a frequency of 1500Hz and wavelength 25cm. How long will it take to travel 3 km?
2. Two objects of masses m_1 and m_2 exerts a force F on each other when they are separated by a distance 'r'. What happens when
 - (i) Mass m_1 becomes doubled.
 - (ii) The distance between them becomes $r/2$
3. A ball is dropped from the top of a tower 100m high and at the same time another ball is projected vertically upwards from the ground with a velocity of 25m/sec. Calculate where and when the two stones will meet.
4. What will be the work done to increase the speed of a bike from 18km/h to 54 km/hr if the mass of the car is 100kg?
5. Prove that the kinetic energy of a body moving with speed v is equal to $1/2mv^2$
6. If in an office, 10 tubes of 40W, 5 fans of 75W and 2 ACs of 1500W are used for 8 hours a day. Calculate the energy consumed per day in commercial units of energy.
7. How long will it take a force of 10N to stop a mass of 2.5kg which is moving at 20m/s?
(A.) 5 sec
8. A 16g mass moving in the +x direction at 30cm/s while a 4g mass moving -x direction at 50cm/s . They collide head on and stick together .Find their velocity after collision.
(A.) 14m/s

9. A resultant force of 20N gives a body of mass m an acceleration of 8m/s^2 and a body of mass m' an acceleration of 24m/s^2 . What acceleration will this force cause the two masses to acquire if fastened together.
(A.) 6m/s
10. Calculate the force required to move a car from rest to a velocity of 30 m/s in 10 sec . the mass of the car is 1500kg .
(A.) 4500N
11. How much momentum will a dumb bell of mass 10kg transfer to the floor if it falls from a height of 80cm ? Take it's downwards acc. to be 10m/s^2 .
(A.) Acc. = 4m/s^2 , momentum = 40m/s
12. A child hears an echo from a cliff 4sec after the sound from a powerful cracker is produced. How far away is the cliff from the child ?(Take the velocity of sound in air as 330m/s .)
13. A bat can hear sound at frequency up to 120kHz . Determine the wavelength of the sound in air at this frequency. Take speed = 330m/s
14. A 1 kg hammer with a velocity of 50m/s strikes a 200gm of iron nail driving it into a block of wood. If half of the energy of the hammer goes into heating the nail , what will be rise in its temperature?
15. A man is standing at the top of a high tower 100m . he throws a ball vertically upwards with a velocity of 20ms^{-1} . After what time will the ball pass him going downward . how long after its release will the ball reach the ground .
16. A rifle of mass 3kg fires a bullet of mass 0.03kg . The bullet leaves the barrel of the rifle at a velocity of 100m/s . If the bullet takes 0.0035 sec to move through its barrel , calculate the force experienced by the rifle due to its recoil. Interpret the $-ve$ sign in the answer.
17. A certain household consumes 650 units of electricity in a month. How much is this electricity in joules?
(A.) $2.34 \times 10^9\text{ j}$
18. Calculate the amount of work done by the brakes of the car in reducing the speed of the car from 20m/s to 10m/s ?
(A.) 150kJ
19. When a golf ball is lowered into a measuring cylinder containing water , the water level rises by 30cm^3 when the ball is completely submerged . If the mass of the ball in the air is 33g , find its density
(A.) 1.1g/cm^3
20. A floating boat displaces water weighing 6000N .
(i) What is the buoyant force on the boat
(ii) What is the weight of the boat.
(A.)(i) 6000N

(ii) 6000N

21. A man weighs 600N on the earth . What is his mass? ($g=10\text{m/s}^2$) If he were taken to the moon , his weight would be 100N . What is his mass on the moon? What is the acceleration due to gravity on the moon ?

(A.) 60kg , 60kg , 1.66m/s^2

22. Calculate the acceleration due to gravity on the surface of the satellite having a mass of $7.4 * 10^{22}$ kg and a radius of $1.74 * 10^6$ m .($G = 6.7 * 10^{-11}$ Nm^2/kg^2)

(A.) 1.63m/s^2

23. What is the vertical distance traveled by a projectile in time 't' when thrown parallel to the ground ? Does it depend upon the speed with which the object is thrown?

(A.) $1/2gt^2$, No.

24. A sphere of mass 40kg is attracted by a second sphere of mass 60kg , with a force equal to $4 * 10^{-5}$ N .If $G = 6 * 10^{-11}$ Nm^2/kg^2 Calculate the distance between them .($g= 10\text{m/s}^2$)

(A.) 6cm

25. Two protons are placed at a distance of 10^{-15} m. Calculate the gravitational force of attraction between them. Mass of the proton = $1.67 * 10^{-27}$ Nm^2/Kg^2

(A) $3.56 * 10^{22}$ N

26. Two objects of masses 1 Kg and 2 Kg are placed at a distance of 1 m from each other. Assuming that only gravitational force is acting on them, find the ratio of the acceleration of the two bodies.

(A.) 2:1

27. A car is traveling at a speed of 36 Km/hr. A force acts upon the car so that it acquires a velocity of 90km/hr in 6 sec. Calculate the work done and the force applied on the car.

28. Two children at opposite ends of the iron pipe. One strikes an end of the pipe with a stone. Find the ratio of the times taken by the sound waves in air and in iron to reach the other child.

(A.) 14:9

29. A longitudinal wave is produced in a toy slinky. The wave travels at the speed of 30cm/s and the frequency of the wave is 20hz. What is the minimum separation between the consecutive separation of the slinky?

(A.) 1.5cm

30. A source of wave produces 40 crests and 40troughs in 0.4 sec. Find the frequency of the wave.

(A.) 100 Hz

31. A stone is dropped into a well, 44.1 metres deep. The sound of the splash is heard 3.13 sec after the stone is dropped. Find the velocity of sound in air.

(A.) 33.2m/s

32. A horse exerts a pull on a cart 300N so that the horse cart system moves with a uniform speed 18km/hr on a level road. Calculate the power developed by the horse in watt & also find its equivalent in horsepower. (A.) 1500W; 2HP (approx)
33. A boy pulls a toy with a force of 50 N through a string which makes an angle of 30 degree with the horizontal so as to move the toy by a distance of 1m horizontally . If the were inclined making an angle of 45 degree with the horizontal , how much pull would he apply along the string in order to move it the same distance of 1m?
(A.) 61N
34. A ball is dropped from the jumping board of the swimming pool , which is at the height of 20m . A second ball is thrown from the same board after one second with initial velocity u . Both balls hit the water together. What was the initial velocity with which second Ball was thrown ? do they hit water with the same velocity ? Explain your answer.
(A.)-15sec, no, the second ball hits with greater velocity
35. A helicopter is on a mission to drop food for people stranded on the boat . It is at a height of 20m and moving with a steady constant velocity of 2m/s when it spots the nearest end of the boat immediately below it . It drops the packet then . If the length of the boat is 5m, will the people in boats receive the packets
(A.)Yes
36. A coconut is hanging on a tree at a height of 15m from the ground. A boy launches a projectile vertically upwards with a velocity of 20m/s . After what time will the projectile pass the coconut .
(A.) 1s
37. The volume of a 500gm sealed tin is 350 cm^3 . What is the density of the packet tin? Will the packet float or sink in Water if its density is 1 gm/cm^3 ? What will be the mass of the water displaced by this tin ?
(A.) $d = 1.43 \text{ g cm}^3$; weight of water = 350gm
38. A circular cycle track has circumference of 314m with AB as one of its diameter . A cyclist travels from A to B along the circular path with a velocity of a constant magnitude 15.7 m/s . Find :
(a) The distance moved by the cyclist
(b) The displacement of the cyclist if AB represents north south directions.
(c) The average velocity of the cyclist .
39. Two cars weighing 1500 kg are made to collide with a wall. The initial & final velocities of the car are - 15.0 m/s & 2.6 m/s respectively. If the collision lasts for 0.15 s, then find impulsive force exerted on the car.
40. Which would require a greater force, accelerating 10g mass at 5 m/s^2 , or a 20 g mass at 2 m/s^2 ?
41. An 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40000N & the track offers a friction force of 5000 N. Calculate.

- a) The net accelerating force.
b) The acceleration of the train.
c) The force of wagon 1 on wagon 2.
42. A stone is dropped from the top of a building of height 19.6m. Calculate its velocity just before touching the ground.
43. What is the force of gravitation between the earth and the sun, given that the mass of the earth= 6×10^{24} kg and of the sun= 2×10^{30} kg. The average distance between them is 1.5×10^{11} m
44. The mass of Seema is 45kg. What will be her weight on the surface of the earth? What will be her weight on the surface of the moon?
45. A woman starts from her home at 9:00 a.m., walks with a speed of 5km/hr on straight road up to her office 2.5km away, stays at the office up to 5:00 p.m. at what speed should she travel so as to reach home by 7:30 p.m.
(A.) 25km/hr
46. A ball is dropped from the top of a tower 100m high and at the same time another ball is projected vertically upwards from the ground with a velocity of 25m/sec. Calculate where and when the two stones will meet.
47. A ball of mass 2kg is kept on a tower of height 30m. Find its potential energy at this point. If it is allowed to fall freely, find its kinetic energy when it just touches the ground?
48. A body of mass 5 kg is kept on a table. If it is displaced by a force of 10N by 2 m on the table on the same horizontal line, find the work done by the gravitational force.
49. A man of mass 50kg climbs a tower of height 45m in 5 seconds with the help of a rope. Find the power of the man
50. If in an office, 10 tubes of 40W, 5 fans of 75W and 2 ACs of 1500W are used for 8 hours a day. Calculate the energy consumed per day in commercial units of energy.
51. What will be the work done to increase the speed of a bike from 18km/h to 54 km/hr if the mass of the car is 100kg?
52. A sound wave has a frequency of 1500Hz and wavelength 25cm. How long will it take to travel 3 km?
53. An elephant weighs 60KN and each of its feet has an area of 0.07 m^2 in contact with the ground. What is the pressure the elephant exerts on the ground if
(i) It stands on all four feet
(ii) It balances on two feet.
(A.)(i) $2.1 \times 10^5 \text{ N/m}^2$
(ii) $4.2 \times 10^5 \text{ N/m}^2$

54. What is the mass & weight of a body of 10kg at (i)pole (ii)equator (iii)centre of earth

(A.)(i)98N

(ii) $10(g - R\omega^2)$

$=10[9.8 - 6.4 * 10^6 * (2\pi/24*60*6)^2]$

(iii)zero

55. The leaning tower of Pisa is 45m high . A mass of 4kg is dropped from the top . Calculate

1.) P.E. at top

2.) K.E. just before hitting the ground

3.) The velocity just before hitting the ground

(A.)1.) 1800J

2.) 1800J

3.) 30m/s

56. A bullet moving with the velocity of 100m/s is just able to pierce a block of wood 2cm thick .What velocity should the bullet have if it is required to pierce an block of wood 18cm thick of the same kind of wood ?

(A.) 300m/s

57. A source of sound produces sound waves of wavelength 0.80m in air. The same source of sound produces waves of wavelength 4m in water. If the velocity of sound in air = 332m/s , find the velocity of sound in water ?

(A.) 1660m/s

58. The smoke from the gin barrel is seen 2sec before the explosion is heard . If the velocity of sound in the air is 340m/s . Calculate the distance of the observer from the gun . State the approximation used.

(A.) 680m

59. If observer standing between two cliffs fires a gun .He hears one echo after 1.5 sec and the after 3.5sec. If the velocity of sound be 350m/s. Find:

(i) The distance of the observer from the first cliff,

(ii) The distance between two hills .

(A.) (i)247.5m , (ii)825m

60. A source is producing 15 waves in 3 sec. The distance between a crest and trough is 10 cm. Find

(a.)frequency, (b.)Wavelength and (c.)Velocity of the wave.

(A.)a.)5 Hz

b.)20cm

c.)1m/s

61. A car is traveling at a speed of 36 Km/hr. A force acts upon the car so that it acquires a velocity of 90km/hr in 6 sec. Calculate the work done and the force applied on the car.

SHORT QUESTIONS

1. A fireman weighing 80kg. Slides down a pole. If the resisting force is 720N, his acceleration would be:
 a) 1m/sec^2 b) 0.1 m/sec^2 c) zero d) 0.9 m/sec^2

One atmosphere is the unit of:

a) Density b) specific gravity c) energy d) Pressure

2.The ship can sail easily on sea water because:

a) Salty water is denser b) it is less dense c) it is salty d) it is still water

3.The density of ice is:

a) greater than water b) less than water c) equal to water d) none of these

1. The density of glass stopper in water:

a) decreases b) increases c) remains same d) none of these

2. The formula of frequency of simple pendulum:

a) $2\pi \sqrt{l/g}$ b) $2\pi \sqrt{g/l}$ c) $\frac{1}{2}\pi \sqrt{l/g}$ d) $\frac{1}{2}\pi \sqrt{g/l}$

4. How does a person move forward during swimming?

5 . What is meant by balanced forces

6. Briefly explain how an expert karate player breaks a slab of ice with a single blow.

7 . Why does a boxer move his head backwards to minimize the effect of on coming punch?

8. When a force acting on a body has an equal & opposite reaction, then why should the body move at all.

9. What do you mean by impulsive force?

10. Define impulse.

11. Define momentum.

12. What force is needed to produce an acceleration of 2 m/s^2 in a body of mass 3kg?

13.What is energy of a body?

14.Define kinetic energy.

15.What is potential energy?

16. What will be the work done by a force if displacement of the body is zero?

17.When is work done on a body positive?

18.Can energy be converted from one form to another?

19,Define power.

20.What will be the new kinetic energy of a body if its speed is doubled?

21.What is the audible range of the average human ear?

22.What is reverberation

23.What is characterized by the frequency of the sound wave

24.Can sound wave travel through vacuum

25.What is characterized by the amplitude of the wave

26.What is amplitude of a wave

27.What is intensity of sound

28.What does 'SONAR' mean

29. Which part of the ear turns pressure variations into electrical signals

30.Why sound waves are called mechanical waves

31.When do we say the acceleration of a body is zero?

32.Why is uniform linear motion not an accelerated motion?

33. A moving train is brought to rest within 20 sec by applying brakes. Find the initial velocity, if the retardation due to brakes is 2 m/s^2
34. When does the velocity change?
35. When does the velocity and speed of a moving body become identical?

THEORY

1. What is the nature of distance time graph for uniform motion of an object?
2. What is the unit of power?
3. An electric bulb of 100 W is used 20 hours per day. Calculate the units of energy consumed in a one week?
4. An object of mass 20 kg is moving with uniform velocity of 6 m/s. what is kinetic energy possessed by the object?
5. What is relative density of a substance? Relative density of silver is 10.8. The density of water is 1000 kg/m^3 . What is the density of silver in SI unit?
6. State various laws of motion?
7. State the universal law of gravitation? What is its importance?
8. a) What are waves and how are they classified. Give an example of each type.
b) Give 3 characteristics of wave motion
9. When a carpet is beaten with a stick dust comes out of it. Why?
10. What is acceleration of a free falling body?
11. a) What is potential energy?
b) When a bulb is lighted what type of energy changes take place?
12. An echo returns in 4 seconds. What is the distance of the reflecting substance from source? Assume the speed of sound be 340 m/s ?
13. a) Explain how bats use ultrasound to catch their prey?
b) Give 2 examples where Newton's third law of motion can be seen?

14. State universal law of gravitation? Derive the relation to find the force between 2 objects placed at distance “r”?
15. What is work? Calculate the work required to be done to stop a car of 1500 kb moving at a velocity of 60 km/h?
16. How can you say that sound waves are longitudinal?
17. What do you understand by the terms loudness & timbre?
18. What is weight? How is it different from mass? Give two differences
19. What is buoyant force? What is buoyancy? Give two factors on which it depends.
1. What is motion? What are types of motion? Define them with one example each.
 2. What is wave motion? What is sound? Give the audible frequency range for the human beings. What are Ultrasounds? Mention any two uses of ultrasound.
20. What are sound waves? How do they travel in air? How can a human being hear the sound? Explain.
21. A car, initially at rest, picks up a velocity of 72 kmhr⁻¹, over a distance of 25 m.
22. Calculate (i) acceleration of car (ii) time in which it picks up above velocity.
[Ans. (i) 8ms⁻² (ii) 2.5 s]
23. State Newton’s third law of motion and give two examples.
24. Why is automobile tyres provided with rough surface ? Explain.
25. A force of 1600 dynes acts on a rigid body, such that the perpendicular distance between force and turning point is 40 cm. Calculate the moment of force.
[Ans. 64,000 dyne-cm]
26. Is it possible to have a body, whose centre of gravity is outside the body ? If so, then give an example.
27. State Pascal’s law of transmission of pressure in a liquid.
28. Why does a ship made of iron not sink in water, while an iron nail sinks in it ?
29. The frequency of a tuning fork is 500 Hz. Calculate the time period.
[Ans. 0.002 s.]
30. Show that the weight of an object will be 1/6 the weight of an object on earth?