

X PHYSICS

"NUMERICALS"

“MEASUREMENTS”

NUMERICALS

Q.1: (a) From diagram 1 calculate the zero error.

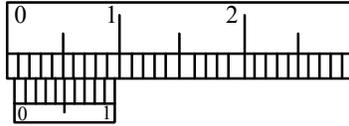


Diagram 1

(b) Diagram 2 shows the reading obtained for the diameter of a sphere using the same calipers. Calculate the diameter of the sphere.

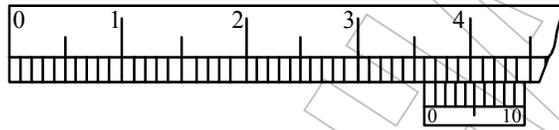


Diagram 2

Q.2:

of this graph. Explain the quantity which the slope of the graph gives. Use the graph to determine the distance covered after 40 seconds.

Time (a)	=	10	15	20	25	30	35	45
Distance (m)	=	20	30	40	50	60	70	80

Q.3: The mass of an electron is 9.11×10^{-31} kg. Convert it in gm, milligram and microgram.

Q.4: The radius of hydrogen atom is 0.53×10^{-10} m. Convert it into cm, mm and nm.

Q.5: The time taken by an electron to complete one rotation above its nucleus is 0.5×10^{-18} seconds. Convert it into minutes, hours and micro seconds.

“SCALARS & VECTORS”

NUMERICALS

- Q.1: Draw representative lines of the following vectors:
(i) Displacement of 100 km in the direction of east.
(ii) Velocity of 50 km/h towards north-east.
(iii) Force of 20 N making an angle of 45° with x-axis.
- Q.2: A boy while selling his newspapers walks on distance of 300 m towards east. From there he goes along another road through a distance of 200 m towards north. He again travels a distance of 200 m on a road which makes an angle of 60° north of west. Finally he walks 200 m on a road going to the west. Find the displacement of the boy from the starting point to the end point.
- Q.3: A river is flowing west to east with a velocity of 8 km/h. A motor boat starts from a point on the south bank and moves towards north. If velocity of motor boat in still water is 6 km/s. Find the velocity of motor boat in the river.
- Q.4: Three forces of magnitude 40 N, 30 N and 90 N are acting at angles of 0° , 30° and 135° with the x-axis respectively. Find the magnitude of the resultant force.
- Q.5: A force of 100 N acts at an angle of 30° with the horizontal. Find its horizontal and vertical components.
- Q.6: A roller tied to a string is dragged on a floor. The string makes an angle of 45° with the floor. If the tension in the string is 10 N, Find the force with which the roller is dragged.

“KINEMATICS”

NUMERICALS

- Q.1: A car moving on a straight road at 5.0 m/s. It is accelerated at 3.0 m/s^2 . What will be its velocity and distance covered after 5 minutes.
- Q.2: A bullet train starts from rest and moves with uniform acceleration of 0.12 m/s^2 . Find its final velocity and distance covered by the bus before it stops.
- Q.3: A bus is moving with a velocity of 72 km/h. By applying brakes, a deceleration of 0.4 m/s^2 is produced. Find the distance covered by the bus before it stops.
- Q.4: What is the acceleration of an object which accelerates along a straight path from rest, and attains a velocity of 20 m/s after covering a distance of 50 m in 5 s.
- Q.5: A wicket keeper catches a ball moving at 30 m/s.
(a) If he does not move his hand, the ball comes to rest in his glove over a distance of 1 m. What is the average acceleration?
(b) If he moves hand as the ball is caught so that it comes 25 minutes. It then continues to move with uniform speed for two hours. Then brakes are applied and it comes to rest in 25 minutes. Find the total distance covered.
- Q.6: A train starting from a station acquires a speed of 90 km/h in 25 minutes. It then continues to move with uniform speed for two hours. Then brakes are applied and it comes to rest in 25 minutes. Find the total distance covered.
- Q.7: A stone dropped from a bridge strikes the water in 5 seconds.
(a) What is the velocity of the stone when it strikes the water?
(b) What is the height of the bridge?
- Q.8: A ball is dropped from a height of 176.4 m.
(a) How much time will it take to reach the ground?
(b) With what velocity will it strike the ground?
- Q.9: A shell is fired vertically upward with a velocity of 98 m/s. Find
(a) The time taken by it to reach the highest point.
(b) How long it will stay in the air.
(c) The maximum height reached.
(d) The velocity with which it will hit the ground.
- Q.10: A projectile is fired vertically upwards and reaches a height of 125 m. Find the velocity of projection and the time it takes to reach its highest point.

“FORCE & MOTION”

NUMERICALS

- Q.1: Determine the acceleration of a 72 kg skater, when an unbalanced force of 144 N acts on him.
- Q.2: Two boys push horizontally a 30 kg bicycle and it accelerates at 1.5 m/s^2 . If the sum of opposing force is 40 N. What force must they be exerting on it?
- Q.3: An object of mass 3 kg is moving on a rough surface with a velocity of 16 m/s. It covers a distance of 20 m before coming to rest. Find the opposing force.
- Q.4: The weight of a tyre is 400 N. A force of 280 N is required to drag it on the road. Find the coefficient of friction between the tyre and the road.
- Q.5: A bullet of mass 10 g is fired towards west at a velocity of 60 m/s. Calculate the momentum of the bullet.
- Q.6: Which object has the greater momentum (a) an object A of 50 kg moving at 3 m/s or (b) an object B of mass 3 kg moving at 50 m/s.
- Q.7: A truck is moving east ward with a velocity of 15 m/s. If the momentum of the truck is 30000 kg m/s. Find the mass of the truck.
- Q.8: A body of mass 10 kg is moving with a velocity of 10 m/s. A constant force acts for 4 seconds and reduces its velocity to 2 m/s. Find the momentum before and after the application of the force.

“STATICS”

NUMERICALS

- Q.1: A force is applied perpendicularly on a gate, 2 metres wide which requires a torque of 100 Nm to open it. What will be the minimum force required?
- Q.2: A force of 50 N acts on a body. If moment arm is 0.5 m, find the value of torque.
- Q.3: A body is pulled rightward with a force of 25 N. To keep the body in equilibrium how much force will be applied leftward on the body?

“CIRCULAR MOTION AND GRAVITATION”

NUMERICALS

- Q.1: An automobile is running on a circular high way with a velocity of 120 m/s. The radius of the high way is 1000 m. What is the centripetal acceleration.
- Q.2: A mass of 3 kg at the end of string is being whirled in a circle of radius 3m with a constant speed of 10 m/s. What is the pull of the whirling body on the string?
- Q.3: Calculate the tension on a string 500 m long when tied to a mass of 200 g and whirled in a circle with a speed of 10 m/s.
- Q.4: Two balls of 50 kg and 25 kg masses are placed in such a way that the distance between their centres is 50 cm. Find the force of attraction between the balls if the value of $G = 6.67 \times 10^{-11} \text{ N.m}^2/\text{kg}^2$
- Q.5: What is the mass of an object that is pulled down by a force of gravity of 294 N at the surface of earth?

“WORK, ENERGY & POWER”

NUMERICALS

- Q.1: A car of 1000 kg is accelerated from rest at 4 m/s^2 for 10 seconds. Calculate the work done.
- Q.2: Calculate the work done by a person who lifts a 10 kg object from the floor to a shelf 2 m above the floor.
- Q.3: A force of 5 N is applied on an object of mass 0.1 kg for 5 seconds. Find the work done by the force.
- Q.4: A force 588 N acts on a box to move it 4 m in 40 s. Calculate the power.
- Q.5: A boy runs upstairs which has 500 steps each 20 cm high. His mass is 40 kg and he takes 2 minutes. Calculate the power used by the boy in climbing upstairs.
- Q.6: How much energy is required in changing the velocity of an object of mass 5000 kg from 20 m/s to 30 m/s?
- Q.7: A resultant force of 20 N acts on an object of mass 4 kg for 10 m. Find the final speed if the initial speed is 50 m/s.
- Q.8: A pendulum is raised to a height of 0.1 m above its lowest position and released. Calculate its maximum velocity.
- Q.9: An arrow is shot vertically upward with an initial velocity of 14 m/s. How high will it go?
- Q.10: Calculate the K.E. of an object of mass 4 kg at a speed of 10 m/s.

“MACHINES”

NUMERICALS

- Q.1: A lift carrying 120 kg weight of bricks travels to the top of a building 10 m high. Calculate the energy used.
- Q.2: A lever overcomes a resistance of 3300 N when an effort of 165 N is applied on it. Calculate the mechanical advantage and the efficiency of the lever if the effort arm is 25 times as long as the load arm.
- Q.3: An object of mass 100 kg is raised 2 m above the ground using an inclined plane of length 10 m. Calculate the effort applied parallel to the inclined plane.
- Q.4: An exit ramp on a major free way is 200 m long and upper end is 10 m above the highway. Determine the effort required to move a truck with trailer whose mass is 2000 kg to the end of the ramp.
- Q.5: The handle of the screw jack is 0.35 m and its pitch is 0.005 m. What effort must be applied at the end of the handle when lifting a load of 2200 N if the efficiency of the jack is 40%.

“MATTER”

NUMERICALS

- Q.1: An aluminium pipe has an inner radius of 0.02 m and an outer radius of 0.022 m. It is subjected to a stress of $5 \times 10^6 \text{ Nm}^2$. What is the applied force? If the pipe is 1 m long, find also the elongation produced. Young's modulus for aluminium is $7.0 \times 10^{10} \text{ Nm}^{-2}$.
- Q.2: A 2 kg object is suspended from a copper wire 2.5 m long and 0.6 mm in diameter. How much does the wire stretch due to the gravitational force on the 2 kg object. Young's modulus for copper is $12.5 \times 10^{10} \text{ Nm}^{-2}$.
- Q.3: If the height of a dam is 150 m. What pressure does the water exert at the base of the dam? Take the density of water as 1000 kg/m^3 .
- Q.4: A hydraulic lift is operated by means of a pump which can exert a pressure of $4.9 \times 10^5 \text{ Pa}$. This pump is connected to a pipe of 50 mm diameter. What should be the diameter of a piston that can raise a car of mass 2000 kg?
- Q.5: An object floats on water with 80 percent of its volume below the water surface. Find the density of the object. Take the density of water as 1000 kg/m^3 .

“HEAT”

NUMERICALS

- Q.1: (a) Convert 10°F to its equivalent temperature on Celsius and Kelvin Scale.
(b) Convert 300 K to its equivalent temperature on Celsius and Fahrenheit Scale.
(c) Convert 20°C to its equivalent temperature on Fahrenheit and Kelvin Scale.
- Q.2: How much heat per second will be conducted approximately from one end to the other of a uniform rod of silver 1 m long and 10 cm^2 in cross-section if the temperature of one end is maintained at 50°C and the other at 0°C .
- Q.3: The Coefficient of linear thermal expansion of aluminum is $26 \times 10^{-6} \text{ }^{\circ}\text{C}^{-1}$. An aluminum rod is 2 m long at 25°C . What will be its length at 75°C ?
- Q.4: Calculate the volume occupied by 5 mole of gas at 27°C if it is subjected to a pressure of $1.0 \times 10^5 \text{ N/m}^2$, (gas constant $R = 8.13 \text{ J.mole}^{-1}.\text{K}^{-1}$).
- Q.5: If 10 mole of a gas exert a pressure of $20 \times 10^4 \text{ N/m}^2$ when confined a tank of 40 m^3 capacity at 57°C , what would be the pressure of 100 mole of the same gas when confined in a 80 m^3 tank at 477°C .
- Q.6: How much heat energy will be required to raise the temperature of 100 g of iron, through 10°C . The specific heat of iron is $499.8 \text{ J/kg.}^{\circ}\text{C}$.
- Q.7: If 117.60 Joules of heat is required to raise the temperature of 10 g of silver through 50°C , calculate the specific heat of silver.
- Q.8: A piece of metal material is 0.2 kg and is held in boiling water for 2 minutes and is then dropped into a copper calorimeter of mass 0.2 kg containing 0.3 kg of water at 20°C . If the final temperature of the water is 25°C , calculate the specific heat of the material. The specific heats of copper and water are $390 \text{ J/kg.}^{\circ}\text{C}$ and $4200 \text{ J/kg.}^{\circ}\text{C}$ respectively.
- Q.9: 20 g of ice at -10°C is converted into steam at 100°C . Find out the total energy required to accomplish the change. Given the specific heat of ice, latent heat of ice and the latent heat of steam as 2.1 J/g , 326 J/g , and 2268 J/g , respectively.

“WAVES & SOUND”

NUMERICALS

- Q.1: The wavelength of a wave is 0.1 nm. Its speed is $3 \times 10^8 \text{ m.s}^{-1}$. What is the frequency of the wave.
- Q.2: A tuning fork vibrates 256 times each second and produces a wave 1.3 m long. Calculate (a) the period and (b) the velocity of the wave.
- Q.3: A radio station broad casts an AM radio wave whose frequency is $1230 \times 10^3 \text{ Hz}$ and an FM radio wave whose frequency is $91.9 \times 10^6 \text{ Hz}$. Find the distance between adjacent crest in each wave. (The speed of AM and FM radio wave is $3.00 \times 10^{10} \text{ cm/s}$.)
- Q.4: Find the time period of a simple pendulum whose length is 144 cm.
- Q.5: A body of mass 0.3 kg is attached to a horizontal spring. If the value of the spring constant is 5 N/m, find the time period of the body if it is given a small displacement.
- Q.6: A piece of paper completes 50 vibrations in 5 s when some waves pass through the surface of water. Find the time period and the frequency of the piece of paper. If the wave is 10 cm, find the velocity of the waves.
- Q.7: 40 waves pass through a point on to surface of a pond in 2s. Calculate the wave-length if the velocity of waves is 3.5 m/s.
- Q.8: Calculate the length of a second's pendulum taking g equal to 9.5 m/s^2 (A second's pendulum is a simple pendulum having a time period of 2 seconds).

“PROPAGATION & REFLECTION OF LIGHT”

NUMERICALS

- Q.1: An object is placed at a distance of 30 cm from a concave mirror of focal length 5 cm. If the object is 5 cm high, find position and size of the image.
- Q.2: If an object is placed at a distance of 10 cm from a spherical mirror and its virtual image is formed at a distance of 5 cm from the mirror. Find the focal length and nature of the mirror.
- Q.3: An object is situated at a distance of 20 cm from a concave mirror. Find the nature and position of the image if the focal length of the mirror is 15 cm.
- Q.4: An object is situated at a distance of 24.0 cm from a concave mirror. The focal length of the concave mirror is 6 cm. Determine the size of the image and its distance from the mirror if the object is 12 cm high.
- Q.5: The focal length of a concave mirror is 10 cm. Where should an object be placed so as to get its, real image magnified twice.
- Q.6: The radius of curvature of a concave mirror is 40 cm. Where should an object placed so as to get its, real image magnified four times.
- Q.7: An object is situated at a distance of 20 cm from a convex mirror of radius of curvature 20 cm. Find the position and nature of the image.
- Q.8: Focal length of a concave mirror is 10 cm. If the object is situated at a distance of (i) 60 cm, (ii) 20 cm, (iii) 5 cm from the mirror, find the distance of image in each case.

“REFRACTION OF LIGHT & OPTICAL INSTRUMENTS”

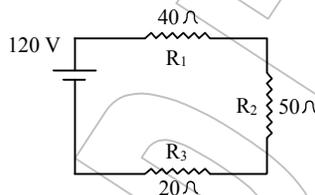
NUMERICALS

- Q.1: Calculate the speed of light in glycerine if its index of refraction is 1.47.
- Q.2: The speed of light in water is 2.25×10^5 km/s. What is the index of refraction of water?
- Q.3: Light travels from air into water whose index of refraction is 1.33. If the angle of incidence is 40° . What is the angle of refraction?
- Q.4: The focal length of a convex lens is 10 cm. What should an image be placed to get (a) a real image (b) a virtual image twice the size of the object?
- Q.5: Find the focal length of a convex lens if (a) $p = 5$ cm, $q = 10$ cm and the image is virtual, (b) $p = 30$ cm and the image is real.
- Q.6: The focal length of a convex lens is one metre and an object is placed at a distance of 2 m before it. Determine the position, nature and magnification of the image.
- Q.7: The distance between an object and a screen is 49 cm. A convex lens is placed between the object and the screen so as to get an image on the screen magnified six times, calculate the focal length of the lens.
- Q.8: The distance between an object and a convex lens is 18 cm. The focal length of the lens is 6 cm. Determine the nature, position and magnification by using the lens formula.

“ELECTRICITY”

NUMERICALS

- Q.1: Calculate the amount of work done in carrying a charge of $+2.5\mu\text{C}$ from A to B if A is at a potential of -60V and B is at $+10\text{V}$.
- Q.2: Find the potential difference between the two ends of a conductor if it offers a resistance of 5Ω . Take the current flowing through the conductor as 5 amperes.
- Q.3: The potential difference applied to the terminals of a portable radio is 9.0 Volts. Find the resistance of the radio if a current of 25 mA is flowing through it.
- Q.4: An electric toaster has a resistance of 12Ω . What current will it draw from a 120 V supply?
- Q.5: A series circuit consisting of three resistors having resistances of 40Ω , 50Ω respectively, is connected across a voltage source of 120V as shown in figure below. Find the current in the circuit and the potential difference across each resistor.
(1.09 amp, $V_1 = 43.64$ Volt, $V_2 = 54.5$ V and 21.8 V)



- Q.6: Resistances of 4Ω , 6Ω and 12Ω are connected in parallel and then joined to an emf source of 6V. Find the value of
(i) the equivalent resistance of the circuit
(ii) the total current from the circuit
(iii) the current passing through each resistance
[(i) 2Ω , (ii) 3 amp (iii) 1.5 amp, 1 amp and 5 amp]
- Q.7: Two light bulbs of 100 watt and 60 watt both operate in a 220V circuit. Which bulb has the higher resistance and which bulb carries the greater current?

“NUCLEAR PHYSICS”

NUMERICALS

- Q.1: The nucleus of nitrogen contains 9 neutrons. Find its charge number if its mass number is 16.
- Q.2: The mass of ${}^6_6\text{C}^{12}$ nucleus is found to be 0.164×10^{-27} kg less than its constituents. Calculate the energy released.
- Q.3: How much energy will be released when 15 gm of mass is completely transformed to energy?
- Q.4: Radium has a half life of 1600 years. How much of 60 gm radium would be left after 4800 years.
- Q.5: Half life of radon is 3.82 days. How much of a 100 gram sample of radon would be left after 764 days.