

HOLIDAY HOMEWORK 2021-22

11th PHYSICS

=====

Do this assignment in Physics Fair Note book with neat and clean handwriting:-

-----x-----x-----x-----x-----x-----x-----x-----x-----x-----

Q1 Why do we have different units for the same physical quantity?

Q2 The radius of atom is of the order of 1 \AA and radius of nucleus is of the order of fermi. How many magnitudes higher is the volume of atom as compared to the volume of nucleus? 89

Q3 Name the device used for measuring the mass of atoms and molecules.

Q4 Express unified atomic mass unit in kg.

Q5 Why length, mass and time are chosen as base quantities in mechanics?

Q6 Give an example of (a) a physical quantity which has a unit but no dimensions. (b) a physical quantity which has neither unit nor dimensions. (c) a constant which has a unit. (d) a constant which has no unit.

Q7 A new system of units is proposed in which unit of mass is α kg, unit of length β m and unit of time γ s. How much will 5 J measure in this new system?

Q8 A physical quantity X is related to four measurable quantities a, b, c and d as follows:

$$X = a^2 b^3 c^5 / 2d^{-2}.$$

The percentage error in the measurement of a, b, c and d are 1%, 2%, 3% and 4%, respectively. What is the percentage error in quantity X? If the value of X calculated on the basis of the above relation is 2.763, to what value should you round off the result.

Q9 A motor car moving at a speed of 72 km/h can not come to a stop in less than 3.0 s while for a truck this time interval is 5.0 s. On a highway the car is behind the truck both moving at 72 km/h. The truck gives a signal that it is going to stop at emergency. At what distance the car should be from the truck so that it does not bump onto (collide with) the truck. Human response time is 0.5 s.

Q10 TWO EQUAL FORCES ARE ACTING AT A POINT WITH AN ANGLE OF 60° BETWEEN THEM. IF THE RESULTANT FORCE IS EQUAL TO $20\sqrt{3}$ N. FIND THE MAGNITUDE OF EACH FORCE.

Q11 A new unit of length is chosen such that the speed of light in vacuum is unity. What is the distance between the Sun and the Earth in terms of the new unit if light takes 8 min and 20 s to cover this distance?

Q12 The length, breadth and thickness of a rectangular sheet of metal are 4.234 m, 1.005 m and 2.01 cm respectively. Give the area and volume of the sheet to correct significant figures.

Q13 The radius of a sphere is measured as (2.1 ± 0.5) cm calculate its surface area with error limits.

Q14 The voltage across a lamp is (6.0 ± 0.1) volt and the current passing through it is (4.0 ± 0.2) ampere. Find the power consumed by the lamp.

Q15 A force of (2500 ± 5) N is applied over an area of (0.32 ± 0.02) m². Calculate the pressure exerted over the area.

Q16 An experiment measured quantities a, b, c and then x is calculated by using the relation $x = ab^2 / c^{1/2}$. If the percentage errors in measurements of a, b and c are $\pm 1\%$, $\pm 2\%$ and $\pm 1.5\%$ respectively, then calculate the maximum percentage error in value of x obtained.

Q17 No physicist has ever “seen” an electron. Yet, all physicists believe in the existence of electrons. An intelligent but superstitious man advances this analogy to argue that ‘ghosts’ exist even though no one has ‘seen’ one. How will you refute his argument?

Q18A woman starts from her home at 9.00 am, walks with a speed of 5 km h on a straight road up to her office 2.5 km away, stays at the office up to 5.00 pm, and returns home by an auto with a speed of 2.5 km h . Choose suitable scales and plot the x-t graph of her motion.

Q19 A drunkard walking in a narrow lane takes 5 steps forward and 3 steps backward, followed again by 5 steps forward and 3 steps backward, and so on. Each step is 1 m long and requires 1 s. Plot the x-t graph of his motion. Determine graphically and otherwise how long the drunkard takes to fall in a pit 13 m away from the start

Q20 5. A jet airplane travelling at the speed of 500 km h⁻¹ ejects its products of combustion at the speed of 1500 km h relative to the jet plane. What is the speed of the latter with respect to an observer on the ground?

Q21 A car moving along a straight highway with speed of 126 km h is brought to a stop within a distance of 200 m. What is the retardation of the car (assumed uniform), and how long does it take for the car to stop?

Q22 Two trains A and B of length 400 m each are moving on two parallel tracks with a uniform speed of 72 km h in the same direction, with A ahead of B. The driver of B decides to overtake A and accelerates by 1 ms⁻². If after 50 s, the guard of B just brushes past the driver of A, what was the original distance between them?

Q23 On a two-lane road, car A is travelling with a speed of 36 km h . Two cars B and C approach car A in opposite directions with a speed of 54 km h each. At a certain instant, when the distance AB is equal to AC, both being 1 km, B decides to overtake A before C does. What minimum acceleration of car B is required to avoid an accident?

Q24 A man walks on a straight road from his home to a market 2.5 km away with a speed of 5 km h . Finding the market closed, he instantly turns and walks back home with a speed of 7.5 km h What is the (a) Magnitude of average velocity, and (b) Average speed of the man over the interval of time (i) 0 to 30 min. (ii) 0 to 50 min. (iii) 0 to 40 min?

Q25 A police van moving on a highway with a speed of 30 km h fires a bullet at a thief s car speeding away in the same direction with a speed of 192 km h . If the muzzle speed of the bullet is 150 ms⁻¹, with what speed does the bullet hit the thief s car?

Q26A boy standing on a stationary lift (open from above) throws a ball upwards with the maximum initial speed he can, equal to 49 m s⁻¹. How much time does the ball take to return to his hands? If the lift starts moving up with a uniform speed of 5 m s⁻¹ and the boy again throws the ball up with the maximum speed he can, how long does the ball take to return to his hands?

Q27 A passenger arriving in a new town wishes to go from the station to a hotel located 10 km away on a straight road from the station. A dishonest cab man takes him along a circuitous path 23 km long and reaches the hotel in 28 min. What is (a) the average speed of the taxi, (b) the magnitude of average velocity? Are the two equal?

Q28 Rain is falling vertically with a speed of 30 m s⁻¹. A woman rides a bicycle with a speed of 10 m s⁻¹ in the north to south direction. What is the direction in which she should hold her umbrella ?

Q29 A man can swim with a speed of 4.0 km h in still water. How long does he take to cross a river 1.0 km wide if the river flows steadily at 3.0 km h and he makes his strokes normal to the river current? How far down the river does he go when he reaches the other bank?

Q30 In a harbour, wind is blowing at the speed of 72 km/h and the flag on the mast of a boat anchored in the harbour flutters along the N-E direction. If the boat starts moving at a speed of 51 km/h to the north, what is the direction of the flag on the mast of the boat?

Q31 The ceiling of a long hall is 25 m high. What is the maximum horizontal distance that a ball thrown with a speed of 40 m s⁻¹ can go without hitting the ceiling of the hall?

Q32 A cricketer can throw a ball to a maximum horizontal distance of 100 m. How much high above the ground can the cricketer throw the same ball?

Q33 An aircraft is flying at a height of 3400 m above the ground. If the angle subtended at a ground observation point by the aircraft positions 10 s apart is 30° , what is the speed of the aircraft? Time taken by aircraft from A to B is 10 s.

Q34 A vector has both magnitude and direction. Does that mean anything that has magnitude and direction is necessarily a vector? The rotation of a body can be specified by the direction of the axis of rotation and the angle of rotation about the axis. Does that make any rotation a vector?

Q35 A bullet fired at an angle of 30° with the horizontal hits the ground 3 km away. By adjusting its angle of projection, can one hope to hit a target 5 km away? Assume the muzzle speed to be fixed, and neglect air resistance.

Q36 A fighter plane flying horizontally at an altitude of 1.5 km with speed 720 km/h passes directly overhead an anti-aircraft gun. At what angle from the vertical should the gun be fired for the shell with muzzle speed 600 m/s to hit the plane? At what minimum altitude should the pilot fly the plane to avoid being hit? (Take $g = 10 \text{ m s}^{-2}$)?

Q37 If instead of mass, length and time as fundamental quantities, we choose velocity, acceleration and force as fundamental quantities and express their dimensions by V, A and F respectively, show the dimensions of power in these new quantities.

Q38 If $x = at^2 + bt + c$; where x is displacement as a function of time. Write the dimensions of a, b and c.

Q39 What do you mean by order of magnitude? Explain.

Q40 A body travels uniformly a distance of (13.8 ± 0.2) m in a time (4.0 ± 0.3) s. What is the velocity of the body within error limits?

Q41 Given that the value of G in the CGS system as $6.67 \times 10^{-8} \text{ dyne cm}^2 \text{g}^{-2}$, find the value in MKS system.

Q42 Do all physical quantities have dimensions? If no, name four physical quantities which are dimensionless.

Q43 Name at least six physical quantities whose dimensions are ML^2T^{-2} .

Q44 The volume of a cube of side 1 cm is equal to..... m^3 .

(b) The surface area of a solid cylinder of radius 2.0 cm and height 10.0 cm is equal to(mm^2).

(c) A vehicle moving with a speed of 18 km h^{-1} covers m in 1 s.

(d) The relative density of lead is 11.3. Its density is g cm^{-3} or kg m^{-3}

Q45 Fill in the blanks by suitable conversion of units

(a) $1 \text{ kg m}^2 \text{s}^{-2} = \dots \text{ g cm}^2 \text{s}^{-2}$

(b) $1 \text{ m} = \dots \text{ ly}$

(c) $3.0 \text{ m s}^{-2} = \dots \text{ km h}^{-2}$

(d) $G = 6.67 \times 10^{-11} \text{ N m}^2 (\text{kg})^{-2} = \dots (\text{cm})^{-3} \text{s}^{-2} \text{ g}^{-1}$.