DELHI PUBLIC SCHOOL RUBY PARK , KOLKATA

HOLIDAY HOMEWORK

SUBJECT- **PHYSICS** CLASS-**XI** SESSION -**2018-19**

TOPIC : UNITS AND MEASUREMENTS :

Q1) Write down the dimension of following quantities in terms of fundamental quantities :

a) Angular Momentum , b)Latent Heat c) Torque , d)Capacitance, e) Inductance,f) Resistivity

Q2) A gas bubble form an explosion under water, oscillates with a period T proportional to $p^a d^b E^c$, where p is static pressure, d is density of water and E is the total energy of explosion .Find the values of a, b, c.

Q3) The density of the material in c.g.s. system is 8g cm $^{-3}$. In a system of units , in which the unit of length is 5 cm and unit of mass is 20 g , What is the density of the material in new system ?

Q4) Write down the dimensions of a & b in the relation :$E=\frac{b-x^2}{at}$; E , x and t represent energy , distance & time.

Q5) Write the dimension of a/b in the relation :

$F = a\sqrt{x} + bt^2$ Where F is force ,x is displacement and t is time.

Q6) Check the correctness of following relations :

a) $\rho = 3g / 4\pi rG$, where ρ −density , g – gravitational acceleration , r- radius of satellite , G= gravitational constant. b) $h= r\rho g / 2s \cos\theta$ where r- radius , g- acceleration due to gravity , s- surface tension .c) $t= k\sqrt{\rho r^3/s}$ t – time period , ρ- density of liquid , s- surface tension , k- constant .

Q7) The escape velocity of a body depends upon : (i) the acceleration due to gravity (g) on the planet (ii) the radius (R) of the planet .Establish the relationship between them by dimensional analysis .

Q8) The velocity of water waves may depend upon their wavelength (λ) , the density of water(ρ) and the acceleration due to gravity (g) . Find the relation between given physical quantities by method of dimensional analysis.

Q9) The no of particles given by, $n= -D(\frac{n_2-n_1}{x_2-x_1})$are crossing a unit area held perpendicular to x-axis in unit time . n_1 and n_2 are the no. of particles per unit volume for the values of 'x' meant to be x_1 and x_2 . What is the dimensional formula of diffusion constant D ?

Q 10) If the velocity of light c, gravitational constant G and Planck's constant h be chosen as fundamental units , then what is the dimensions of (i) mass ,(ii) length (iii) time in new system?

Q 11) State the number of significant figures in the following: (a) 600900 (b) 400m (c) 5212.0 (d)70 (e) 6.023 (f) 9.1×10^{-31} (g) .0006032

Q 12) 5.74g of a substance occupies a volume of 1.2cm^3 . Calculate the density with due regard for significant figures?

Q 13) A calorie is a unit of heat or energy and it equals about 4.2 J, where $1J=1kgm^2s^{-2}$. Suppose we employ a system of unit in which the unit of mass is α kg, the unit of length is β m, the unit of time is γ sec. Show that a calorie has a magnitude $4.2\alpha^{-1}\beta^{-2}\gamma^2$ in terms of the new units.

Q14) If E,M,J and G respectively denote energy, mass, angular momentum and gravitational constant, Calculate the dimensions of EJ^2/M^5G^2.

TOPIC : APPLICATION OF CALCULUS

Q15) Given a particle moving in one dimension with position function $x(t) = 5t^3 – 8t^2 + 20$:

a) Determine the velocity *v* as a function of time *t*. b) Determine the acceleration *a* as a function of time *t*.

c) At what time(s) will the particle come to a momentary stop? d) At what time (s) will the particle's acceleration be zero?

Q16) A particle in simple harmonic motion has a position defined by the function $x(t) = (80\text{ cm}) \sin[(20\text{ s}^{-1})t]$. a) Determine the velocity *v* as a function of time *t*. b) Determine the acceleration *a* as a function of time *t*.

Q17) A particle of unit mass undergoes one dimensional motion such that its velocity varies according to $v(x) = bx^{-2n}$, where b and n are constants and x is the position of the particle. Find acceleration as a function of x.

Q18) Two cars P and Q starts from a point at the same time in a straight line and their positions are represented by $Xp(t)= at + bt^2$ and $X_q(t)= ft- t^2$. At what time do the cars have same velocity?

Q19) The oscillation of a body on a smooth horizontal surface is represented by the equation, $X= A\cos\grave{\omega}t$. Show graphically the variation of acceleration with time.

Q20) A particle of mass m is at rest at the origin at time t= 0. Is subjected to a force $F(t)= F_oe^{-bt}$ in the x direction. Graphically show the variation of speed with time and justify your answer.

Q21) The displacement of a body is proportional to t^3 , where t is time elapsed. What is the nature of acceleration- time graph of the body?

Q 22) Given: The equation of motion of four particles a, b, c and d,

$x_a=3t+9$; $x_b=4t^2+t-1$; $x_c=3t^3-4t^2+7t-8$; $x_d=4\sin45°-6\sin60° + 7cos30°-18$.

Comment on the nature of the motion of the four particles.

Q 23) The displacement x moving in 1d under the action of a constant force is related to time t by the equation $t = \sqrt{x}+3$, where x is in metres and t is in seconds. Find the displacement of the particle when the velocity is zero.

TOPIC: MOTION IN A STRAIGHT LINE

Q 24) A body is thrown vertically upwards at a velocity of 4.9m/s. Another body is thrown vertically downwards at the same initial speed simultaneously from the maximum height that can be achieved by the first body. Determine when and where the two bodies will meet?

Q 25) Two towns A and B are connected by a regular bus service with a bus leaving in either direction every T minutes. A man cycling with a speed of 20km/hr in the direction A to B, notices that a bus goes past him every 18 minutes in the direction of his motion and every 6minutes in the opposite direction. What is the period T of the bus service and with what speed(assumed constant) do these buses move on the road?

Q 26) A stone is thrown upwards at a initial speed of 5m/sec from a height of 1m. How much later on must a 2^{nd} stone be dropped from same initial height so that the two stones reach the ground simultaneously?

Q 27) A point traversed half the distance with a velocity v_0,the remaining part of the distance was covered with the velocity v_1 for half the time and with the velocity v_2 for the other half of the time. Find the mean velocity of the point averaged over the whole time of motion.

Q28) Two vertically mountain mirrors move towards each other with a speed of vm/s each. A particle that can bounce back between the two mirrors starts from one mirror when the mirrors are separated by d m. On reaching the 2^{nd} mirror the particle bounces back and so on. If the particle continues to travel with a constant speed of 3v m/s, calculate the number of trips that the particle can make before the mirrors collide. Also determine the total distance travelled by the particle.

Q 29) A stone is dropped from the top of a tower 200m in height and t the same time, another is projected vertically upwards from the ground with a velocity 50 m/s. Find where and when the two will meet.

Q 30) A body falling freely from a given height H hits an inclined plane in its path at height h. As a result of this impact the direction of the velocity of the body becomes horizontal. For what value of h/H, the body will take the maximum time to reach the ground.

Q 31) A ball is dropped from a height of 90m on a floor. At each collision with the floor the ball looses $1/10^{th}$ of its speed . Plot the speed-time graph of its motion between t=0 and t=12 sec.

Q32) When a balloon rising vertically upward at a velocity of 10m/s is at a height 45m from the ground, a parachutist bails out from the balloon. After 3s, he opens the parachute and decelerates at a constant rate of $5ms^{-2}$. (a) What is the height of the parachutist above the ground when he opens the parachute? (b) How far is he from the balloon at this instant? (c) With what velocity does he strike the ground? (d) What time does he take in striking the ground after his exit from the balloon? ($g= 10ms^{-2}$)

Q33)An object is in uniform motion along a straight line, what will be position time graph for the motion of the object if (i) x_0 = positive, v = negative v is constant (ii) both x_0 and v are negative v is constant where x_0 is position at t = 0.