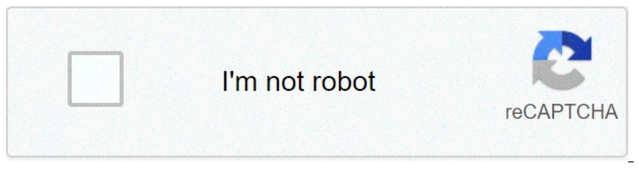

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Class 9 science chapter motion pdf

3 Marks Questions1. An object has moved through a distance. Can it have zero displacement? If yes, support your answer with an example.Ans. Yes, if an object has moved through a distance it can have zero displacement because displacement of an object is the actual change in its position when it moves from one position to the other. So if an object travels from point A to B and then returns back to point A again, the total displacement is zero.2. A farmer moves along the boundary of a square field of side10 m in 40 s. What will be the magnitude of displacement of the farmer at the end of 2 minutes20 seconds?Ans. Distance covered by farmer in 40 seconds = Speed of the farmer = distance/time = 40m/40s = 1 m/s. Total time given in the question = 2min20seconds = 60+60+20 =140seconds Since he completes 1round of the field in 40seconds so in he will complete 3rounds in 120 seconds (2mins) or 120m distance is covered in 2minutes. In another 20seconds will cover another 20m so total distance covered in 2min20sec = 120 +20 =140m. Displacement = 200 =(as per diagram) = 14.14 m. 3. A train starting from a railway station and moving with uniform acceleration attains a speed 40 km in 10 minutes. Find its acceleration.Ans. Since the train starts from rest(railway station) = u = zeroFinal velocity of train =v= = = time (t) = 10 min = = 600 secondsSince a = (v – u)/t 4. What can you say about the motion of an object whose distance-time graph is a straight-line parallel to the time axis?Ans. If the object's distance time graph is a straight line parallel to the time axis indicates that with increasing time the distance of that object is not increasing hence the object is at rest i.e. not moving. 5. What can you say about the motion of an object if its speed time graph is a straight line parallel to the time axis?Ans. Such a graph indicates that the object is travelling with uniform velocity. 6. A train is travelling at a speed of. Brakes are applied so as to produce a uniform acceleration of. Find how far the train will go before itis brought to rest.Ans. u = =, v =0(train is brought to rest)v= u+at = 25 + (-0.5)x t0 =25 – 0.5 x0.5t = 25, or t = 25/0.5 = 50seconds== 1250 – 625 = 625m7. A stone is thrown in a vertically upward direction with a velocity of. If the acceleration of the stone during its motion is in the downward direction, what will be the height attained by the stone and how much time will it take to reach there?Ans. v = 0 (since at maximum height its velocity will be zero)v = u + at = 0 = 5 – 10t10t = 5 , or, t = 5/10 =0.5second.= = 2.5 – 1.25 = 1.25m8. Derive the second equation of motion graphically?Ans. let at time T=0 body moves with initial velocity u and at time 't' body has final velocity 'v' and un time 't' it covers a distance's. AC=v, AB=u, OA= t, DB=OA=t, BC=AC-AB =V-u Area under a v-t curve gives displacement so, S= Area of DBC + Area of rectangle OABD (i) Area of DBC=BaseHeight DBBC = t (v-u) (ii) Area of rectangle OABD= lengthBreadth= OA BA= tu (iii)S= ut+t(v-u)S= ut +tat (use V-u=at)S= ut+at29. A car moving with a certain velocity comes to a halt if the retardation was, find the initial velocity of the car? Ans. V=0 (comes to rest) V= final velocityS= 62.5m(retardation)U=?From 3rd equation of motion,= 2(-5)62.5= -1062.5,u= [u=25m/s]10. Two cars A and B are moving along in a straight line. Car A is moving at a speed of 80KMph while car B is moving at a speed 50KMph in the same direction, find the magnitude and direction of (a) tive v the relative of car A with respect to B The relative velocity of car B with respect to A. Ans. (a) Velocity of car A = 80KMphVelocity of Car B = - 50 kmph(-ve sign indicates that Car B is moving in opposite direction to Car A)Relative velocity of car A with respect to B= velocity of car A + (- velocity of car B)= 80 + (-(-50))= 80+50=+130KMph+130 KM ph shows that for a person in car B, car A will appear to move in the same direction with speed of sum of their individual speed.(b) Relative velocity of car B with respect to A= velocity of car B+ (- velocity of car A)= -50 + (-80)= -130kmph It shows that car B will appear to move with 130 kmph in opposite direction to car A11. A ball starts from rest and rolls down 16m down an inclined plane in 4 s.(a) What is the acceleration of the ball?(b) What is the velocity of the ball at the bottom of the incline? Ans. u= initial velocity = 0(body starts from rest)S= distance = 16 mT= time = 4s(i) From, 16=a16(ii) From, v= u +atv=0+24[v= 8m/s]12. Two boys A and B, travel along the same path. The displacement – time graph for their journey is given in the following figure. (a) How far down the road has B travelled when A starts the journey?(b) Without calculation, the speed, state who is traveling faster A or B?(c) What is the speed of A?(d) What is the speed of B?(e) Are the speed of A and B uniform?(f) What dose point X on the graph represent?(g) What is the speed of approach of A towards B?What is the speed of separation of A from B? Ans. (a) When A starts his journey at 4 sec, B has already covered a distance of 857m(b) A travels faster than B because A starts his journey late but crosses B and covers more distance then B in the same time as B (c) Speed of A =Let at t =12 min, distance covered = 3500m(d) Speed of B = (e) Speed of approach of A towards B = 375 m/min- 214 m/min= 161 m/min(f) Speed of separation of A from B = 161 m/min.13. A body is dropped from a height of 320m. The acceleration due to the gravity is?(a) How long does it take to reach the ground?(b) What is the velocity with which it will strike the ground?Ans. Height = hDistance = s = 320mAcceleration due to gravity = Initial velocity = u =0(a) from s = ut + (b) 14. Derive third equation of motion numerically?Ans. We know; …….(i).…….(ii)Where, v = final velocityu = initial velocitya = accelerationt = times = distanceFrom equation (i) t = Put the value of t in equation (ii)15. The velocity time graph of runner is given in the graph.(a) What is the total distance covered by the runner in 16s?(b) What is the acceleration of the runner at t = 11s? Ans. (a) We know that area under v-t graph gives displacement:So, Area = distance = s = area of triangle + area of rectangleArea of triangle = = = 30mArea of rectangle = length breadth= (16-6)10=1010= 100mTotal area = 180mTotal distance =180m(b) Since at t = 11sec, particles travels with uniform velocity so, there is no change in velocity hence acceleration = zero.16. A boy throws a stone upward with a velocity of 60m/s.(a) How long will it take to reach the maximum height?(b) What is the maximum height reached by the ball?(c) How long will it take to reach the ground?Ans. u = 60 m/s; ; v=0(a) The time to reach maximum height is;(b) The maximum height is;(c) The time to reach top is equal to time taken to reach back to ground. Thus, time to reach the ground after reaching top is 6s Or the time to reach the ground after throwing is 6 + 6 =12s.17. The displacement x of a particle in meters along the x- axis with time 't' in seconds according to the equation- (a) draw a graph if x versus t for t = 0 and t =5 sec (b) What is the displacement come out of the particles initially? (c) What is slope of the graph obtained? Ans. X= 20m + (12) t(i) At t=0 X=20+120=12 m(ii) At t=1 X=20+12=32m(iii) At t =2 X= 20+24= 44m(iv) At t=5 X=20+125=72 m(a) (b) At T= 0 (initially) Displacement =20m.(c) Slope = 18. The velocity of a body in motion is recorded every second as shown- calculate the – (a) Acceleration (b) distance travelled and draw the graph. Ans. (a) Acceleration =slope of the velocity time graph a= (b) Distance = 600-300 = 300 m(c) 19. Draw the graph for uniform retardation –(a) position – time graph (b) velocity – time(c) Acceleration- time Ans. (1) Position – time (2) Velocity – time (3) Acceleration- time 20. The displacement – time graph for a body is given. State whether the velocity and acceleration of the body in the region BC, CD, DE and EF are positive, negative or Zero. Ans. (i) For AB, the curve is upward stopping i.e. slope is increasing so velocity is positive and remains same so, V= +ve but a=0 (ii) For BC, curve has still has +ve slope so, V= +ve but velocity is decreasing wrt time so, a=negative (iii) For CD, both velocity and acceleration are Zero because slope is Zero. (iv) For DE, velocity is the (v is increasing wrt time) and so is acceleration is +ve. (v) For EF, velocity is +ve (positive slope of x-t graph) but acceleration is Zero because velocity remains some with time. 21. Derive the third equation of motionas graphically?Ans. Let at time t=0, body moves with initial velocity u and time at 't' has final velocity 'v' and in time 't' covers a distance 's' Area under v-t graph gives displacement S = Area of DBC + Area of rectangle OABD S = Now, v-u = at Put the value of 't' in equation (i) third equation of motion NCERT solutions for class 9 science chapter 8 Motion: How do you describe the term Motion? After going through chapter 8 motion you will be able to give the answer to this question. Motion is a relative term. That is if we are travelling on a bus, a person sitting behind us is at rest with respect to us but for a person outside the bus, he is moving. We feel like trees are moving when we are travelling in a bus, this is due to relative motion. We can find such an enormous example related to motion. By using some good examples, NCERT solutions for class 9 science chapter 8 Motion will also give you a better understanding of the concept. For example, if a person says that my home is 60 Km north of the airport. Here, the reference point is the airport. To specify the position of an object we need to choose a reference point and a direction. If in the previous case the person says that my home is 60 Km from the airport then we can go 60 Km in any direction. To know the exact point specifying direction along with reference is also important. Along with exercise solutions for NCERT class 9 science chapter 8 Motion, you will also get NCERT solutions for the questions mentioned in between the chapter. The solutions are created by our experts. Below you can read important points of the chapter which will help you to understand the chapter properly. Latest : Trouble with homework? Post your queries of Maths and Science with step-by-step solutions instantly. Ask Mr AL 1. Distance and Displacement: To understand the concept of distance and displacement mentioned in the chapter let's consider an ant moving along a straight line. The ant starts from point O and moves a distance 50 cm and reaches point B, then it comes back a distance of 25 cm and reaches point A. We need to calculate the distance and displacement when the ant is at B and also when the ant is at A. When the ant is at B the distance travelled = 50cm and displacement (shortest distance from the origin) = 50 cm. That is displacement = distance. When the ant comes back to A total distance travelled = OB+BA=50+25=75 cm but displacement = OA =25 cm. Here the displacement is less than distance. The main point to remember from this session of NCERT Solutions for Class 9 is that distance is always greater than or equal to displacement. The distance (path length) travelled cannot be zero but the displacement can be zero. In the above example of the ant comes back to O then displacement=0 but distance = 50+50 =100 cm. 2. Speed and Velocity: A very important and interesting concept of the NCERT class 9 science chapter 8 Motion is speed and velocity. Certain points to remember from this topic are listed below If we specify the direction along with speed the term is known as velocity. Velocity is the speed of an object in a definite direction If the object is moving with varying velocity then the For example, if an ant moves along a rectangle as shown in figure 2 from point A to C through B in 5 seconds then what is the average speed and average velocity of the ant? figure 2 Solution: The distance travelled by the ant = 3+4 =7m average speed=7/5 = 1.4 m/s The displacement = AC AC is obtained using Pythagoras theorem average velocity = displacement / total time taken= 5/5 =1 m/s The next topic of the NCERT Solutions for Class 9 Science Chapter 8 Motion is acceleration: Acceleration is the rate of change of velocity The SI unit of acceleration is The acceleration is taken to be positive if it is in the direction of velocity and negative when it is opposite to the direction of the velocity If an object travels in a straight line and its velocity changes by equal amounts in equal intervals of time, then the acceleration is uniform. If the change in velocity is not equal in equal interval of time then the acceleration is non-uniform 3. Distance time graph of an object moving with uniform velocity: Figure 3 The distance-time graph for an object moving with uniform velocity is a straight line. The speed of the object can be determined as follows Consider a small portion AB on the line. Draw a line parallel to x-axis from A and a line parallel to y-axis. Let both the lines meet at C, then and mark the corresponding points of A, B and C as shown in the above figure. The points are s1,s2,t1 and t2 4. The velocity-time graph of an object moving with uniform velocity: figure 4 The graph of an object moving with uniform velocity is a straight line parallel to the x-axis. To find the distance travelled for a given time interval (say t2-t1 as in the above figure) we have to calculate the area of the velocity-time graph. That is in the above figure the area ABCD gives the distance travelled in time t2-t1. 5. Velocity-time graph for a car moving with uniform acceleration: Figure 5 Velocity-time graph for a car moving with uniform acceleration is a straight line and the area of the graph gives the distance travelled during a time interval. In the above graph during t2-t1 the distance travelled= area of triangle ADE+area of rectangle ABCD. An important topic of the NCERT Solutions for Class 9 Science Chapter 8 is equations of motion for an object moving with uniform acceleration. If the initial velocity is u, the final velocity is v and t is the time taken and s is the distance travelled then the following are the three equations of motion. 6. Uniform circular motion: Let's understand this through an example: If an ant moves along a circular path of radius 7 cm from point A to B through C and then to A through D as shown in figure 6 with a uniform speed of 1cm/sec i) what is the distance travelled when the ant is at B. Is the distance equal to displacement? Solution: Displacement =AB=diameter =14cm. So distance not equal to the displacement ii) what is the total distance travelled and the final displacement? Total distance travelled = circumference of the circle = Displacement =0 as the initial and final position are the same iii) What is the time taken by the ant to travel from A to B The time = distance / speed = 22 / 1 = 22 sec Main topics of NCERT solutions for class 9 science chapter 8 Motion are listed below: 8.1 Describing Motion 8.1.1 Motion along a straight line 8.1.2 Uniform Motion and Nonuniform Motion 8.2 Measuring the rate of motion 8.2.1 Speed with Direction 8.3 Rate of Change of Velocity 8.4 Graphical Representation of Motion 8.4.1 Distance- Time Graphs 8.4.2 Velocity-Time Graphs 8.5 Equations of Motion by Graphical Method 8.5.1 Equation for Velocity-Time Relation 8.5.3 Equation for Position-Velocity Relation 8.6 Uniform Circular Motion If you stuck anywhere or want to complete your homework on time, refer to the solutions mentioned below: Topic 8.2 Measuring the Rate of Motion Q 1. Distinguish between speed and velocity. Answer: Speed Velocity Speed is the distance travelled by an object in unit time Velocity is the speed of an object moving in a definite direction. Speed is a scalar quantity Velocity is a vector quantity Speed does not depend on the direction Velocity changes with change in direction Speed can never be negative Velocity can be positive, negative or zero. Q 4. What does the path of an object look like when it is in uniform motion? Answer: An object is having a uniform motion if it covers equal distance in equal interval of time (which implies speed is constant!). So the path can be straight or curved. For eg. Consider a circular path. For understanding purposes, divide the circumference of the circle in six equal parts each subtending at the centre. The object covers each equal part in equal amount of time. Hence, by definition, this object is in uniform motion. Topic 8.3 Rate of Change of Velocity Q 1. When will you say a body is in (i) uniform acceleration? (ii) nonuniform acceleration? Answer: (i) If the velocity of an object traveling in a straight line increases or decreases by equal amounts in equal intervals of time, then the acceleration of the object is said to be uniform. For example, An apple having a free-fall motion. (ii) On the other hand, if the velocity of the object increases or decreases by unequal amounts in equal intervals of time, then the acceleration of the object is said to be non-uniform. For example, A car travelling along a straight road increasing its speed by unequal amounts in equal intervals of time. Topic 8.4 Graphical Representation of Motion Q 1. What is the nature of the distance-time graphs for uniform and non-uniform motion of an object? Answer: Distance-time graph is the plot of distance travelled by an object along x-axis against time along y-axis. For the uniform motion of an object, the distance-time graph is a straight line with a constant slope. (Note: However, the path may be straight or curved!) For non-uniform motion of an object, the distance-time graph is a curved line with an increasing or decreasing slope. (a) from A to B and (b) from A to C? Answer: Given, (a) Distance between A and B = Time taken to reach from A to B = Average speed from A to B = And, Average velocity from A to B = (In this case, average speed is equal to the average velocity) (b) Distance travelled from A to reach C = And, Displacement from A to C = Also, time taken to reach C from A = Average speed from A to C = And, Average velocity from A to C = (In this case, average speed is not equal to the average velocity) Q 3. Abdul, while driving to school, computes the average speed for his trip to be . On his return trip along the same route, there is less traffic and the average speed is . What is the average speed for Abdul's trip? Answer: Given, Average speed while going to school, And Average speed while returning back from school, Let the distance between starting point and school be And time taken by Abdul during the two trips be We know, And, -(i) Now, Total distance that Abdul covers = And total time Abdul takes to cover this distance = Therefore, the average speed for Abdul's trip is (Note:) Q 7. A ball is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of 10 m s -2 , with what velocity will it strike the ground? After what time will it strike the ground? Answer: Considering downward direction as positive direction. Given, Height from which ball is dropped, Acceleration of the ball, = Initial velocity, (i) We know, (In downward direction) Therefore, the ball will strike the ground with a velocity of (ii) Now, we know, Therefore, the ball reaches the ground in . Note: was rejected because in this case, the negative sign implies the velocity in upward direction, which is opposite to the direction of the motion of the ball(before collision). NCERT Solutions for Class 9 Science- Chapter Wise NCERT Solutions for Class 9 - Subject Wise What are the benefits of NCERT Solutions for class 9 science chapter 8 Motion? It will help you to complete your homework and assignments. The language of the solutions is easy to understand. Solutions for NCERT class 9 science chapter 8 Motion, will save you time and help you for quick revision of the chapter. Here you will get step by step detailed solutions created by experts. Solutions