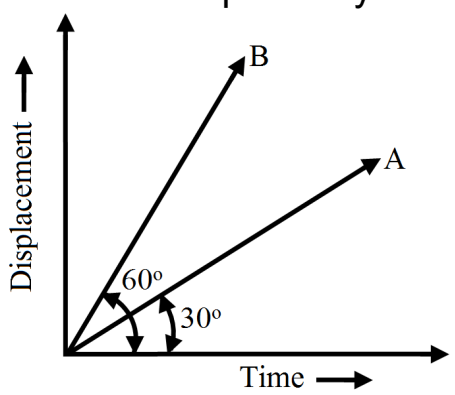
Standard: 11th Science **Subject: Physics**

Instructions

1. motion in a straight line and plane

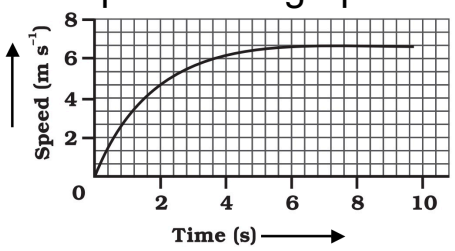
Q1. The two straight rays OA and OB on the same displacement - time graph make angle 30° and 60° with time axis respectively as shown in figure. **2 Marks**



1. Which ray represents greater velocity?
2. What is the ratio of two velocities represented by OA and OB?

Q2. A, B and C are three non-collinear, non co-planar vectors. What can you say about direction of A × (B × C)? **2 Marks**

Q3. The speed-time graph for a car is shown in figure below. **2 Marks**



1. Find how far the car travels in the first 4s? Shade the area on the graph that represents the distance travelled by the car during the period.
2. Which part of the graph represent uniform motion of the car?

Q4. In which of the following examples of motion, can the body be considered approximately a point object: A monkey sitting on top of a man cycling smoothly on a circular track. **2 Marks**

Q5. Two forces 5kg-wt. and 10kg-wt. are acting with an inclination of 120° between them. Find the angle when the resultant makes with 10kg-wt. **2 Marks**

Q6. Read statement below carefully and state with reasons and examples, if it is true or false; **2 Marks**
A particle in one-dimensional motion.
With zero speed at an instant may have non-zero acceleration at that instant.

Q7. What is meant by 'point object' in physics? **2 Marks**

Q8. The velocity of a particle is given by equation **2 Marks**
$v = 4 + 2 (C_1 + C_2t)$
where, C, and C, are constant. Find the initial velocity and acceleration of the particle.

Q9. What is the angular acceleration of a particle moving in a circle of radius 'r' with a angular speed $'\omega'$? **2 Marks**

Q10. Water from a sprinkler comes out with a constant velocity u in all the directions. What is the maximum area of the grass-land that can be watered at any time? **2 Marks**

Q11. Calculate the area of a parallelogram whose adjacent sides are given by the vectors. **2 Marks**
$\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k};\ \vec{B} = 2\hat{i} - 3\hat{j} + \hat{k}.$

Q12. How does the knowledge of projectile help, a player in the baseball game? **2 Marks**

Q13. The distance travelled by a body is proportional to the square of time. What type of motion this body has? **2 Marks**

Q14. A person sitting in a running train throws a ball vertically upwards. What is the nature of the path described by the ball to a person? **2 Marks**

1. Sitting inside the train.
2. Standing on the ground outside the train.

Q15. If $\vec{A} = (-2\hat{i} + 3\hat{j} - 4\hat{k})$ and $\vec{B} = (3\hat{i} - 4\hat{j} + 5\hat{k})$ find $\vec{A} \times \vec{B}$ and $\vec{A}.\vec{B}$ **2 Marks**

Q16. Show that $\vec{a}.(\vec{b} \times \vec{c})$ is equal in magnitude to the volume of a parallelopiped formed by the three vectors $\vec{a}, \vec{b}$ and $\vec{c}$. **2 Marks**

Q17. Draw displacement-time graph for a uniformly accelerated motion. What is its shape? **2 Marks**

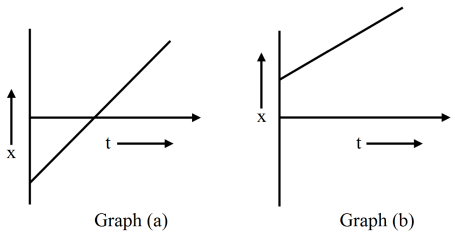
Q18. Keeping the angle of projection same, what is the effect on horizontal range of a particle when its velocity is doubled? **2 Marks**

Q19. The sum and difference of two vectors are perpendicular to each other. Prove that the ectors are equal in magnitude. **2 Marks**

Q20. A player throws a ball upwards with an initial speed of 29.4m s^{-1}. **2 Marks**
What is the direction of acceleration during the upward motion of the ball?

Q21. The position of an object is given by $x = 2t^2 + 3t$. Find out that its motion is uniform and non-uniform. **2 Marks**

Q22. What is common between two graphs shown below? **2 Marks**



Graph (a) Graph (b)

Q23. Two bodies of different masses m, and m, are dropped from two different heights 'a' and 'b'. What is the ratio of time taken by the two to drop through these distances? **2 Marks**

Q24. Two cars are going in two concentric circular orbits of radius r_1 and r_2 with angular velocities ω_1 and ω_2. **2 Marks**
What is the ratio of their linear velocities?

Q25. What is the distance travelled by a point during the time, if it moves in x - y plane, according to the relation $x = a\sin\omega t$ and $y = a(1 - \cos\omega t)$? **2 Marks**

Q26. Find the angle of projection for a projectile motion whose range R is n times the maximum height H. **2 Marks**

Q27. Write two important points to distinguish displacement from distance. **2 Marks**

Q28. Prove that the vectors $(\hat{i} + 2\hat{j} + 3\hat{k})$ and $(2\hat{i} - \hat{j})$ are perpendicular to each other. **2 Marks**

Q29. A body is travelling in a straight line with a uniformly increasing speed. Plot a graph which represents the change in distance (s) travelled with time (t). **2 Marks**

Q30. The dot product of two vectors vanishes when vectors are orthogonal and has maximum value when vectors are parallel to each other. Explain. **2 Marks**

Q31. If the displacement of a body is zero, is distance necessarily zero? Answer with one example. **2 Marks**

Q32. Can there be two vectors where the resultant is equal to either of them? **2 Marks**

Q33. Which of the following is true for displacement? **2 Marks**
1. It cannot be zero.
2. Its magnitude is greater than the distance travelled by the object.

Q34. Find the angle of projection at which horizontal range and maximum height are equal. **2 Marks**

Q35. If two vectors of equal magnitude add to either of them by magnitude, what is the angle between them? **2 Marks**

Q36. Prove the following statement "For Elevations which exceed or fall short of 45° by equal amounts, the ranges are equal". **2 Marks**

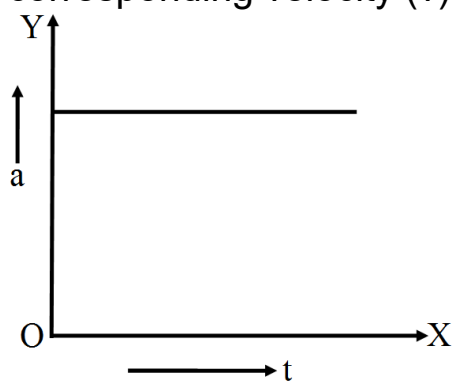
Q37. A football is kicked 20m/ s at a projection angle of 45°. A receiver on the goal line 25m away in the direction of the kick runs the same instant to meet the ball. What must be his speed, if he has to catch the ball before it hits the ground? **2 Marks**

Q38. Two forces whose magnitudes are in the ratio 3 : 5 give a resultant of 28N. If the angle of their inclination is 60^o. Find the magnitude of each force. **2 Marks**

Q39. At t = 0, a particle is at rest at origin. Its acceleration is $2m/s^2$ for the first 3s and $-2m/s^2$ for next 3s. Plot the acceleration versus time and velocity versus time graph. **2 Marks**

Q40. Pick out the only vector quantity in the following list: **2 Marks**
Temperature, pressure, impulse, time, power, total path length, energy, gravitational potential, coefficient of friction, charge.

Q41. A particle starts from rest, and its acceleration (a) plotted against time (t) is shown here. Plot the corresponding velocity (v) against time (t). Also plot the corresponding displacement (s) against time (t). **2 Marks**



Q42. Determine λ such that: **2 Marks**
$\vec{A} = 2\hat{i} + \lambda\hat{j} + \hat{k}$; $\vec{B} = 4\hat{i} - 2\hat{j} - 2\hat{k}$ are perpendicular to each other.

Q43. A car travelling with a speed of 90km/ h on a straight road is ahead of a scooter travelling with a speed of 60km/ h. How would the relative velocity be altered, if scooter is ahead of the car? **2 Marks**

Q44. A player throws a ball upwards with an initial speed of 29.4m s^{-1}. **2 Marks**
What are the velocity and acceleration of the ball at the highest point of its motion?

Q45. We can order events in time and there is no sense of time, distinguishing past, present and future. Is time a vector? **2 Marks**

Q46. A ball is thrown vertically upwards. Draw its: **2 Marks**
1. Velocity-time curve.
2. Acceleration-time curve.

Q47. Points P, Q and R are in a vertical line such that PQ = QR. A ball at P is allowed to fall freely. What is the ratio of the times of descent through PQ and QR? **2 Marks**

Q48. Is earth inertial or non-inertial frame of reference? **2 Marks**

Q49. In which of the following examples of motion, can the body be considered approximately a point object: **2 Marks**
A tumbling beaker that has slipped off the edge of a table.

Q50. 1. At what point of projectile path the speed is minimum? **2 Marks**
2. At which point, the speed is maximum?