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Daily Practice Problems

JEE PHYSICS

Topic: Kinematics

Q.1 A particle is moving towards East with a velocity 10 m/sec. In 10 seconds the velocity changes to 10 m/sec Northwards. The average acceleration during the period is -

(A) $\sqrt{2}$ m/sec² along North -East direction

(B) $\sqrt{2}$ m/sec² along North -West direction

(C) 1/ $\sqrt{2}$ m/sec² along North-East direction

(D) 1/ $\sqrt{2}$ m/sec² along North-West direction

Q.2 A train travels from one station to another at a speed of 40 km/hour and returns to the first station at the speed of 60 km/hour. Calculate the average speed and average velocity of the train

(A) 48 km/hr, zero (B) 84 km/hr, 10 km/hr

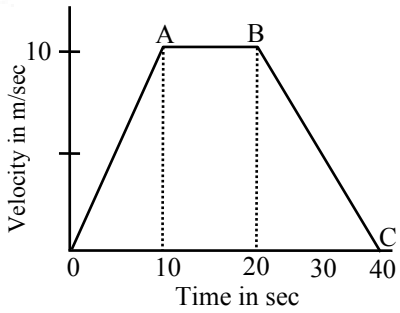
(C) 84 km/hr, zero (D) 48 km/hr, 10 km/hr

Q.3 The initial velocity of a particle (at t = 0) is u and the acceleration of particle at time t is given by f = at, where a is a constant. Which of the following relation for velocity v of particle after time t is true?

(A) $v = u + at^2$ (B) $v = u + at^2/2$

(C) $v = u + at$ (D) None of these

Q.4 The adjoining curve represents the velocity-time graph of a particle, its acceleration values along OA, AB and BC in metre/sec² are respectively-



(A) 1, 0, –0.5 (B) 1, 0, 0.5

(C) 1, 1, 0.5 (D) 1, 0.5, 0

Q.5 A body starts from rest, the ratio of distances travelled by the body during 3rd and 4th seconds is :

(A) 7/5 (B) 5/7 (C) 7/3 (D) 3/7

Q.6 An object is released from some height. Exactly after one second, another object is released from the same height. The distance between the two objects exactly after 2 seconds of the release of second object will be:

(A) 4.9 m (B) 9.8 m

(C) 19.6 m (D) 24.5 m

Q.7 A space ship going away from the earth at half the speed of light fires from its nose a rocket which travels with a speed of 0.4c with reference to the ship. The speed of the rocket with reference to earth is -

(A) zero (B) 0.1 c

(C) 0.9 c (D) c

Q.8 A body is dropped from a height h from the state of rest. It covers a distance of 9h/25 in the last second. What is the height from which the body falls? (in meter)

(A) 12.5 (B) 1.25

(C) 125 (D) Zero

Q.9 The velocity of a particle moving in the positive direction of x-axis varies as $v = \alpha\sqrt{x}$, where α is positive constant. Assuming that at the moment t = 0, the particle was located at x = 0 the value of time dependence of the velocity and the acceleration of the particle -

(A) $\frac{t}{2\alpha^2}, \frac{1}{2\alpha^2}$ (B) $\frac{\alpha^2 t}{2}, \frac{\alpha^2}{2}$

(C) $\frac{2t}{\alpha^2}, \frac{2}{\alpha^2}$ (D) None of these

Q.10 The velocity of a body depends on time according to the equation $v = 20 + 0.1t^2$. The body is undergoing -

(A) uniform acceleration

(B) uniform retardation

(C) non-uniform acceleration

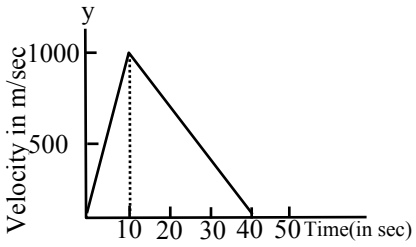
(D) zero acceleration

Q.11 The distance covered by the body in time t is proportional to the square of the time 't'. The acceleration of the body is -

(A) increasing (B) decreasing

(C) zero (D) constant

Q.12 A rocket is fired vertically upwards such that its engine takes 10 seconds in exploding fully. Its velocity-time curve is shown in the figure. The height reached by the rocket is -



(A) 20 km **(B) 40 km**

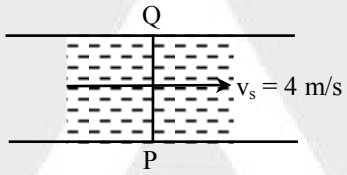
(C) 400 km **(D) 1000 km**

Q.13 A rocket is fired vertically from the ground. It moves upwards with a constant acceleration 10 m/s² for 30 seconds after which the fuel is consumed. After what time from the instant of firing the rocket will attain the maximum height? Take g = 10 m/s²

(A) 30 sec **(B) 45 sec**

(C) 60 sec **(D) 75 sec**

Q.14 A boat man could row his boat with a speed 10 m/sec. He wants to take his boat from P to a point Q just opposite on the other bank of the river flowing at a speed 4 m/sec. He should row his boat –



(A) at right angle to the stream

(B) at an angle of $\sin^{-1}$ (2/5) with PQ up the stream

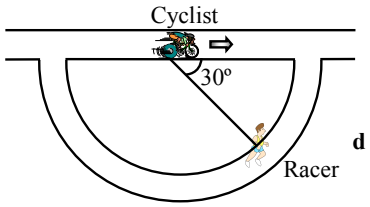
(C) at an angle of $\sin^{-1}$ (2/5) with PQ down the stream

(D) at an angle $\cos^{-1}$ (2/5) with PQ down the stream

Q.15 A train is approaching a platform with a speed of 20 km/hr. A bird is sitting on a pole at the platform. When train is 2 km away from the pole brakes are applied so that the train decelerates uniformly, simultaneously the bird also flies towards the train with a velocity 60 km/hr. It touches the nearest point on the train and flies back and back again and so on. The total distance travelled by the bird before train stop is –

(A) 30 km (B) 15 km (C) 12km (D) 10 km

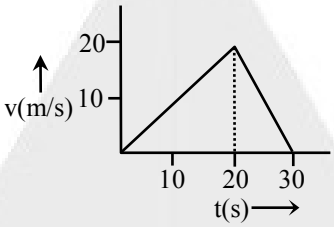
Q.16 **A cyclist is moving with a constant acceleration of 1.2 m/s² on a straight track. A racer is moving on a circular path of radius 150 m at constant speed of 15 m/s. Find the magnitude of velocity of racer which is measured by the cyclist has reached a speed of 20 m/s for the position represented in the figure -**



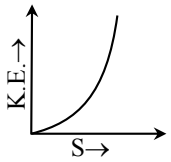
(A) 18.03 m/s **(B) 25 m/s**

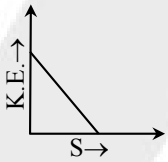
(C) 20 m/s **(D) 15 m/s**

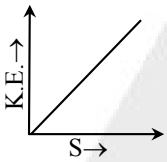
Q.17 **v-t graph of an object of mass 1 kg is shown. Select the wrong statement -**

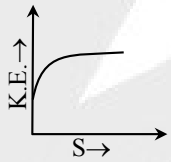


Q.18 **A body moves from rest with constant acceleration which one of the following represents the variation of its K.E. with the distance (S) travelled -**

(A)


(B)


(C)


(D)


Q.19 **At the top of the trajectory of a projectile the direction of its velocity and acceleration are-**

(A) Parallel to each other

(B) inclined at an angle of 45° to the horizontal

(C) Perpendicular to each other

(D) None of the above statement is correct

Q.720 **The maximum vertical height attained by a projectile is**

(A) $\frac{U^2 \sin\theta}{g}$ **(B)** $\frac{U^2 \sin 2\theta}{g}$

(C) $\frac{U^2 \sin 2\theta}{2g}$ **(D)** $\frac{U^2 \sin^2 \theta}{2g}$

Q.21 Equation of motion of a projectile is

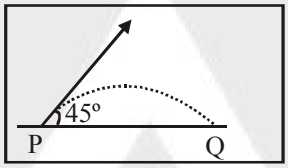
(A) $y = x \tan \theta - \frac{gx^2}{2u^2 \cos^2 \theta}$

(B) $y = x \tan \theta + \frac{gx^2}{2u^2 \cos^2 \theta}$

(C) $y = x \sin \theta - \frac{gx^2}{2u \cos^2 \theta}$

(D) $y = x \sin \theta + \frac{gx^2}{2u^2 \cos^2 \theta}$

Q.22 A projectile of mass m is fired with velocity v from the point P at an angle 45º with the horizon. The magnitude of change in momentum when it passes through the point Q on the same horizontal line on which P lies is-



(A) $mv\sqrt{2}$ **(B)** $\frac{1}{2}$ **mv**

(C) Zero **(D) 2 mv**

Q.23 An aeroplane is moving with a horizontal velocity u at a height h above the ground. If a packet is dropped from it, the speed of the packet when it reaches the ground will be-

(A) $\sqrt{u^2 + 2gh}$ **(B)** $\sqrt{2gh}$

(C) $\sqrt{u^2 - 2gh}$ **(D) 2gh**

Q.24 A marble moving with a speed 0.2 m/s rolls off the edge of a table 0.8 m high. It will strike the floor at a distance from the table

(A) 0.04 m **(B) 0.24 m**

(C) 0.16 m **(D) 0.08 m**

Q.25 **A ball rolls off the top of a stairway with a horizontal velocity u m/s. If the steps are h metres high and w metres wide, then the ball will just hit the edge of the n^{th} step if-**

(A) $n = \frac{2hu^2}{gw^2}$ **(B)** $n = \frac{2hu}{gw}$

(C) $n = \frac{2h^2u^2}{g^2w^2}$ **(D)** $n = 2h^2/gu$

Q.26 **An aeroplane is flying at a speed of 144 km/hr at an altitude of 1000 m. How far from a given target should a bomb be released from it to hit the target-**

(A) 571.43 m **(B) 671.43 m**

(C) 471.34 m **(D) 371.34 m**

Q.27 **A boy aims a gun at a bird from a point at a horizontal distance of 100 m . If the gun can impart a velocity of 500 m/sec to the bullet, at what height above the bird must he aim his gun in order to hit it ($g = 10$ m/sec^2)**

(A) 100 cm **(B) 50 cm**

(C) 40 cm **(D) 20 cm**

Q.28 **Two seconds after projection a projectile is travelling in a direction inclined at 30º to the horizon; after one more sec, it is travelling horizontally, the magnitude and direction of its velocity are-**

(A) $2\sqrt{20}$ **m/sec, 60º** **(B)** $20\sqrt{3}$ **m/sec, 60º**

(C) $6\sqrt{40}$ **m/sec, 30º** **(D)** $40\sqrt{6}$ **m/sec, 30º**

Q.29 **When a particle is thrown horizontally, the resultant velocity of the projectile at any time t is given by -**

(A) gt **(B)** $\frac{1}{2}gt^2$

(C) $\sqrt{u^2 + g^2t^2}$ **(D)** $\sqrt{u^2 - g^2t^2}$

Q.30 **A particle moves along the positive branch of the curve** $y = \frac{x^2}{2}$ **where** $x = \frac{t^2}{2}$**, where x and y are measured in metre and t in second. At t = 2 sec, the velocity of the particle is -**

(A) $\left(2\hat{i} - 4\hat{j}\right)$ **m/sec** **(B)** $\left(2\hat{i} + 4\hat{j}\right)$ **m/sec**

(C) $\left(2\hat{i} + 2\hat{j}\right)$ **m/sec** **(D)** $\left(4\hat{i} - 2\hat{j}\right)$ **m/sec**

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	A	B	A	B	D	C	C	B	C
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	A	C	B	C	A	C	C	C	D
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	A	A	A	D	A	A	D	B	C	B