1.

Choose any one of the following four responses:

1. If both assertion and reason are true and the reason is the correct explanation of the assertion.

2. If both assertion and reason are true but the reason is not the correct explanation of the assertion.

3. If the assertion is true but the reason is false.

4. If the assertion and reason both are false.

Assertion: The graph between P and Q is a straight line when P/Q is constant.

Reason: The straight-line graph means that P proportional to Q or P is equal to constant multiplied by Q.

2.

The particle's position as a function of time is given by $x = -t^2 + 6t + 3$. The maximum value of position co-ordinate of the particle is:

1. 8

2. 12

3. 3

4. 6

3.

Find $\frac{dy}{dx}$ if $y = t^3 + 1$ and $x = t^2 + 3$.

1. $\frac{t^2}{3}$
2. $\frac{t}{2}$
3. $\frac{3t}{2}$
4. t^2

4.

A particle starts rotating from rest and its angular displacement is given by $\theta = \frac{t^2}{40} + \frac{t}{5}$. Then the angular velocity ($\omega = \frac{d\theta}{dt}$) at the end of 10 s is:

1. 0.7

2. 0.6

3. 0.5

4. 0

5.

The current in a circuit is defined as $I = \frac{dq}{dt}$. If the charge (q) flowing through a circuit is given by $q = (t^2 - 3t + 4)$. The current flowing through a circuit is equal to zero at:

1. t=3 sec

2. t=2 sec

3. t=1.5 sec

4. t=15 sec

6.

The current in a circuit is defined as $I = \frac{dq}{dt}$. The charge (q) flowing through a circuit, as a function of time (t), is given by $q = 5t^2 - 20t + 3$. The minimum charge flows through the circuit at:

1. t=4 sec

2. t=2 sec

3. t= 6 sec

4. t=3 sec

7.

If charge flown through a wire is given by q=3sin(3t), then-current flown through the wire at $t = \frac{\pi}{9}$ seconds is: $(i = \frac{dq}{dt})$

1. 4.5 Amp

2. $4.5\sqrt{3}$ Amp

3. $\frac{\sqrt{3}}{2}$ Amp

4. 9 Amp

8.

The position of a particle is given by $s(t) = \frac{2t^2+1}{t+1}$. Then its velocity at t=2 is :$(v_{inst} = \frac{ds}{dt})$

1. $\frac{16}{3}$

2. $\frac{15}{9}$

3. $\frac{15}{3}$

4. None of these

9.

The area of a blot of ink is growing such that after t seconds $A = 3t^2 + \frac{t}{5} + 7$. Then the rate of increase in the area at t= 5s is:

1. 30.1
2. 30.2
3. 30.3
4. 30.4

10.

The work done by gravity exerting an acceleration of -10 m/s^2 for a 10 kg block down 5 m from its original position with no initial velocity is:

(F_{grav} = mass × acceleration and $W = \int_a^b F(x)dx$)

1. 250 J
2. 500 J
3. 100 J
4. 1000 J

11.

The acceleration of a particle is given by a=3t and at t=0, v=0, x=0. The velocity and displacement at t = 2 sec will be:

1. 6 m/s, 4 m
2. 4 m/s, 6 m
3. 3 m/s, 2 m
4. 2 m/s, 3 m

12.

Current in a circuit is given by $i = 3t^2 + 2t$. Find charge that crosses a cross-section from time t=0 to t=2 sec.

1. 12 C
2. 10 C
3. 8 C
4. 2 C

13.

A force of $F(x) = 2x^2 + 3$ N is applied to an object. How much work is done, in Joules, moving the object from x=1 to x=4 meters? (work = $\int_a^b F(x)\,dx$)

1. $\frac{11}{3}$ J
2. 51 J
3. $\frac{5}{3}$ J
4. $\frac{164}{3}$ J

14.

Work done by a force (F) in displacing a body by dx is given by $W = \int F(x).dx$. If the force is given as a function of displacement (x) by $F(x) = (x^2 - 2x + 1)N$, then work done by the force from x=0 to x=3 m is:

1. 3 J
2. 6 J
3. 9 J
4. 21 J

15.

A car travels a certain distance between 0 seconds and 2 seconds. If we defined its velocity as v(t)=6t-5, then distance in meters is (here, $v = \frac{ds}{dt}$)

1. 1 m
2. 2 m
3. 3 m
4. 4 m

16.

If acceleration of a particle is given as a(t)=sin(t)+2t. Then the velocity of particle is (acceleration $a = \frac{dv}{dt}$)

1. $-\cos(t) + \frac{t^2}{2}$
2. $-\sin(t) + t^2$
3. $-\cos(t) + t^2$
4. None of these

17.

Impulse due to a force on a body is given by I=$\int$ F dt. If the force applied on a body is given as a function of time (t) as $F = (3t^2 + 2t + 5)N$, then impulse on the body between t=3 sec to t = 5 sec is:

1. 175 kgm/sec
2. 41 kgm/sec
3. 216 kgm/sec
4. 124 kgm/sec

18.

Given velocity $v(t)=\frac{5}{2}t + 3$. Find position at t=4s, s(4) if s(0)=0. Assume s(t) is measured in meters and t is measured in seconds. Given$(v = \frac{ds}{dt})$

1. 30
2. 31
3. 32
4. 33

19.

The velocity of a rocket, in meters per second, t second after it was launched is modeled by $v(t)=2\sqrt{t}$. Then the total distance traveled by the rocket during the first four seconds of its launch is -

1. $\frac{16}{3}$ m
2. 32 m
3. $\frac{32}{3}$ m
4. 16 m

20.

The current through a wire depends on time as i = (2+3t)A. Calculate the charge crossed through the wire in 10 second $(Instantaneous\ current\ i = \frac{dq}{dt})$

1. 150 C
2. 160 C
3. 170 C
4. None of there

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