PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 7

Total Marks : 29

Max. Time : 31 min.

Topic : Mathematical Tools

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.4	(3 marks, 3 min.)	[12, 12]
Subjective Questions ('–1' negative marking) Q.5 to Q. 6	(4 marks, 5 min.)	[8, 10]
Comprehension ('–1' negative marking) Q.7 to Q.9	(3 marks, 3 min.)	[9, 9]

1. If $y = \sqrt{\sin\sqrt{x}}$, then $\frac{dy}{dx}$ is :

(A) $\frac{1}{4\sqrt{x}} \cdot \frac{\cos\sqrt{x}}{\sin\sqrt{x}}$ (B) $\frac{1}{4\sqrt{x}} \cdot \sqrt{\tan\sqrt{x}}\sqrt{\cos\sqrt{x}}$ (C) $\frac{1}{4\sqrt{x}}\sqrt{\frac{\cos\sqrt{x}}{\sin\sqrt{x}}}$ (D) $\frac{1}{4\sqrt{x}}\sqrt{\cot\sqrt{x}} \cdot \sqrt{\cos\sqrt{x}}$

2. A particle moves along a straight line such that its displacement at any time t is given by :
$s = t^3 - 6t^2 + 3t + 4$ metresThe velocity when the acceleration is zero is :
(A) 3 ms^{-1} (B) – 12 ms^{-1} (C) 42 ms^{-1} (D) – 9 ms^{-1}

3. The area of region between y = sinx and x–axis in the interval $\left[0, \frac{\pi}{2}\right]$ will be :

(A) 1 (B) 0 (C) 2 (D) $\frac{1}{2}$

4. The value of $\int_0^{\pi/2} \sin^2 x\,dx$ will be :

(A) 1 (B) 0 (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

Evaluate : -

5. $\int_0^1 (3x^2 + 4)dx$

6. $\int_0^{\pi/2} (\sin x + \cos x)\,dx$

COMPREHENSION

If $a = (3t^2 + 2t + 1)m/s^2$ is the expression according to which the acceleration of a particle varies moving along a straight line . Then -

7. The expression for instantaneous velocity at any time 't' will be (if the particle was initially at rest) -
(A) $t^3 + 2t + 1$ (B) $t^3 + t + 1$ (C) $t^3 + t^2 + t$ (D) $t^3 + t^2 + t + C$

8. The change in velocity after 3 seconds of its start is :
(A) 30 m/s (B) 39 m/s (C) 3 m/s (D) 20 m/s

9. Find displacement of the particle after 2 seconds of start -
(A) 26 m (B) 26/3 m (C) 30/7 m (D) 26/7 m

Answers Key

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1. (D) **2.** (D) **3.** (A) **4.** (C) **5.** 5
6. 2 **7.** (C) **8.** (B) **9.** (B)

Hint & Solutions

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1. $\frac{d}{dx}\left[\left(\sin\sqrt{x}\right)^{1/2}\right] = \frac{1}{2}(\sin\sqrt{x})^{-1/2} \cdot [\cos\sqrt{x}] \cdot \frac{1}{2}$

$(x)^{-1/2}$ (By power chain rule)

$= \frac{1}{4\sqrt{x}} \cdot \frac{\cos\sqrt{x}}{\sqrt{\sin\sqrt{x}}} = \frac{1}{4\sqrt{x}} \cdot \sqrt{\cot\sqrt{x}} \cdot \sqrt{\cos\sqrt{x}}$

2. $v = \frac{ds}{dt} = 3t^2 - 12t + 3,\ a = \frac{dv}{dt} = 6t - 12 = 0$

$\Rightarrow$ $t = 2s$

$v_{t=2} = 3 \times 4 - 12 \times 2 + 3 = -9$ m/s

3. $\int_0^{\pi/2} \sin x dx = [-\cos x]_0^{\pi/2} = 1.$

4. $\int_0^{\pi/2} \sin^2 x dx = \left[\frac{x}{2} - \frac{\sin 2x}{4} + c\right]_0^{\pi/2} = \frac{\pi}{4}.$

Evaluate :

5. $\int_0^1 (3x^2 + 4)dx = [x^3]_0^1 + 4[x]_0^1 = 1 + 4 = 5$

6. $\int_0^{\pi/2} (\sin x + \cos x)\, dx = [-\cos x]_0^{\pi/2} + [\sin x]_0^{\pi/2}$

$= 1 - 0 + 1 - 0 = 2$

7. $a = 3t^2 + 2t + 1$

$$\int_0^v dv = \int_0^t 3t^2 + 2t + 1)dt \qquad v = t^3 + t^2 + t$$

8. $V(t = 0) = 0$

$V_{t=3} = (3)^3 + (3)^2 + 3$

$= 27 + 9 + 3$

$= 39$

$\Delta V = 39 - 0 = 39$ m/s.

9. $\int_0^s dS = \int_0^2 (t^3 + t^2 + t)dt \qquad S = \left[\frac{t^4}{4} + \frac{t^3}{3} + \frac{t^2}{2}\right]_0^2 \qquad S$

$$= 4 + \frac{8}{3} + 2S = \frac{12 + 8 + 6}{3} = \frac{26}{3}$$