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Test-7

PHYSICS		CHEMISTRY		MATHEMATICS	
1.	(3)	31.	(4)	61.	(3)
2.	(4)	32.	(3)	62.	(2)
3.	(1)	33.	(1)	63.	(1)
4.	(3)	34.	(4)	64.	(4)
5.	(2)	35.	(2)	65.	(1)
6.	(3)	36.	(2)	66.	(3)
7.	(3)	37.	(2)	67.	(2)
8.	(1)	38.	(3)	68.	(3)
9.	(2)	39.	(1)	69.	(3)
10.	(3)	40.	(1)	70.	(2)
11.	(2)	41.	(3)	71.	(4)
12.	(1)	42.	(4)	72.	(2)
13.	(2)	43.	(2)	73.	(3)
14.	(1)	44.	(4)	74.	(1)
15.	(3)	45.	(1)	75.	(2)
16.	(1)	46.	(1)	76.	(2)
17.	(1)	47.	(1)	77.	(1)
18.	(4)	48.	(4)	78.	(1)
19.	(1)	49.	(1)	79.	(1)
20.	(4)	50.	(4)	80.	(2)
21.	(1)	51.	(2)	81.	(1)
22.	(3)	52.	(4)	82.	(4)
23.	(3)	53.	(3)	83.	(2)
24.	(3)	54.	(1)	84.	(2)
25.	(1)	55.	(1)	85.	(2)
26.	(3)	56.	(4)	86.	(4)
27.	(2)	57.	(1)	87.	(1)
28.	(2)	58.	(2)	88.	(3)
29.	(2)	59.	(4)	89.	(2)
30.	(1)	60.	(1)	90.	(2)

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PHYSICS

1. Answer (3)
2. Answer (4)
3. Answer (1)
4. Answer (3)
5. Answer (2)
6. Answer (3)
7. Answer (3)
8. Answer (1)
9. Answer (2)
10. Answer (3)
11. Answer (2)
12. Answer (1)

$$\beta = \frac{\alpha}{1-\alpha} = \frac{0.96}{1-0.96} = 24$$

$$i_c = \frac{0.1}{100} = 1\times10^{-3}\,\text{A}$$

$$\beta = \frac{I_c}{I_b}$$

$$i_b = \frac{I_c}{\beta} = \frac{1\times10^{-3}}{24} = \frac{100}{24}\times10^{-5}\,\text{A}$$

$= 4.17 \times 10^{-5}$ A

$= 41.7\ \mu$A

13. Answer (2)
14. Answer (1)
15. Answer (3)
16. Answer (1)
17. Answer (1)
18. Answer (4)

Statement-I is false, Statement-II is true.

19. Answer (1)
20. Answer (4)

Statement-I false and Statement-II true

21. Answer (1)
22. Answer (3)
23. Answer (3)

$$\omega = \frac{\lambda D}{\mu d} = \frac{6400\times1.5\text{m}\times10^{-10}}{1.5\times0.5\times10^{-3}}$$

$= 2 \times 6400 \times 10^{-7}$

$= 128 \times 10^{-5}$

$= 1.28$ mm

24. Answer (3)

$$t = \frac{\lambda}{2(\mu_P - \mu_M)} = \frac{6400\text{A}^0}{2(0.1)} = 3.2\ \mu\text{m}$$

25. Answer (1)
26. Answer (3)

$$\lambda = \frac{0.693}{T_{1/2}} = \frac{0.692}{0.231} = 3$$

$N = N_0 e^{-\lambda t_1}$

$$t_1 = \frac{1}{3}\log_e \frac{N_0}{N}$$

$$= \frac{1}{3}\log_e\left(\frac{16000}{1000}\right)$$

$$= \frac{1}{3}\log_e(2)^4$$

$$= \frac{4}{3}\ln_e 2$$

$$= \frac{4}{3}\times0.693 = 0.924\,\text{s}$$

27. Answer (2)
28. Answer (2)

Number of photoelectrons emitted per second =

$$\frac{(\text{Intensity})(\text{Area})}{\text{Energy of each photon}}\times\frac{0.53}{100}$$

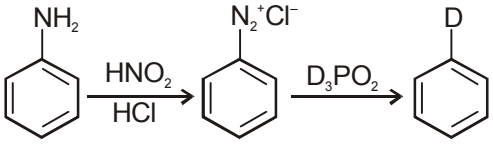
$$\frac{2.0\times1.0\times10^{-4}}{10.6\times1.6\times10^{-19}}\times\frac{0.53}{100}$$

$= 6.25 \times 10^{11}$

29. Answer (2)
30. Answer (1)

CHEMISTRY

31. Answer (4)



32. Answer (3)

The lone pair on nitrogen is available in acetanilide to be delocalised in the ring and at ortho or para positions

33. Answer (1)

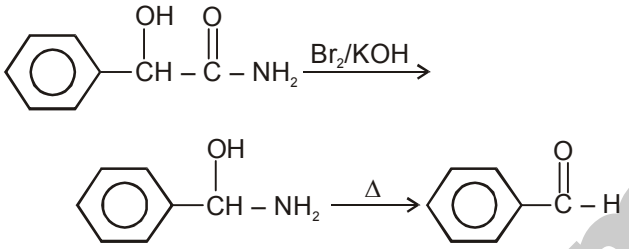
Phenacetin is an antipyretic

34. Answer (4)

35. Answer (2)

36. Answer (2)

37. Answer (2)



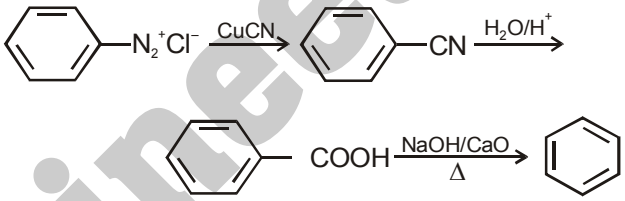
38. Answer (3)

39. Answer (1)

40. Answer (1)

41. Answer (3)

42. Answer (4)



43. Answer (2)

44. Answer (4)

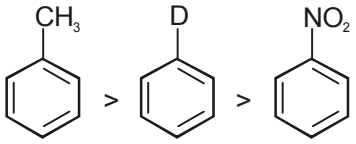
45. Answer (1)

46. Answer (1)

47. Answer (1)

48. Answer (4)

The correct order is



Benzene and duterio benzene has almost same rate of nitration

49. Answer (1)

50. Answer (4)

51. Answer (2)

52. Answer (4)

53. Answer (3)

54. Answer (1)

55. Answer (1)

56. Answer (4)

57. Answer (1)

58. Answer (2)

59. Answer (4)

60. Answer (1)

61. Answer (3)

Let $f(x) = \{f(x) + f(-x)\}\{g(x) + g(-x)\}\{h(x) - h(-x)\}$

then $f(-x) = \{f(-x) + f(x)\}\{g(-x) + g(x)\}\{h(-x) - h(x)\}$
$= -f(x)$

$\Rightarrow$ $f(x)$ is an odd function $\Rightarrow \int_{-\pi/6}^{\pi/6} f(x)dx = 0.$

62. Answer (2)

$$I = \int_0^{\pi/2} \frac{dx}{1+\tan^{2010} x} = \int_0^{\pi/2} \frac{\cos^{2010} x}{\sin^{2010} x + \cos^{2010} x}dx$$

$$= \int_0^{\pi/2} \frac{\sin^{2010} x}{\sin^{2010} x + \cos^{2010} x}dx$$

$$\therefore \quad 2I = \int_0^{\pi/2} dx = \frac{\pi}{2} \Rightarrow I = \frac{\pi}{4}$$

63. Answer (1)

$$I = \int_{-\pi/4}^{\pi/4} (x^3 - x\cos x + \tan^{11} x + 5)dx$$

$$= \int_{-\pi/4}^{\pi/4} x^3 dx - \int_{-\pi/4}^{\pi/4} x\cos x dx + \int_{-\pi/4}^{\pi/4} \tan^{11} x dx + \int_{-\pi/4}^{\pi/4} 5dx$$

$$= \frac{5\pi}{2}$$

64. Answer (4)

$$\frac{dy}{dx} = -4xy^2$$

$$\Rightarrow \quad \int \frac{dy}{y^2} = \int -4x dx \Rightarrow \int y^{-2} dy = \int -4x dx$$

$$\Rightarrow \quad \frac{-1}{y} = -2x^2 + c$$

Now $y(0) = 1 \Rightarrow c = -1$

$$\therefore \quad \frac{-1}{y} = -2x^2 - 1 \Rightarrow y = \frac{1}{2x^2+1}$$

65. Answer (1)

Let the equation of the parabola be

$(x - h)^2 = 4a(y - k) \Rightarrow 2(x - h) = 4ay'$

$$\Rightarrow \quad y' = \frac{x-h}{2a} \Rightarrow y'' = \frac{1}{2a} \Rightarrow y''' = 0$$

66. Answer (3)

$$I = \int_0^{\pi} \sqrt{\frac{1+\cos 2x}{2}}dx = \int_0^{\pi} \sqrt{\frac{1+2\cos^2 x - 1}{2}}$$

$$= \int_0^{\pi} |\cos x|\, dx = 2\int_0^{\pi/2} |\cos x|\, dx$$

$$= 2\int_0^{\pi/2} \cos x dx = 2\sin x\Big|_0^{\pi/2} = 2(1-0) = 2$$

67. Answer (2)

$$\lim_{n\to\infty} \frac{1^{99} + 2^{99} + \ldots + n^{99}}{n^{100}} = \lim_{n\to\infty} \frac{1}{n}\left(\frac{1^{99}}{n^{99}} + \frac{2^{99}}{n^{99}} + \ldots + \frac{n^{99}}{n^{99}}\right)$$

$$= \lim_{n\to\infty} \frac{1}{n}\sum_{r=1}^{n}\left(\frac{r}{n}\right)^{99} = \int_0^1 x^{99} dx = \frac{x^{100}}{100}\Big|_0^1 = \frac{1}{100}$$

68. Answer (3)

Let $I = \int \frac{dx}{5+4\cos x} = \int \frac{dx}{5+4\left(\cos^2\frac{x}{2} - \sin^2\frac{x}{2}\right)}$

$$= \int \frac{dx}{5\sin^2\frac{x}{2} + 5\cos^2\frac{x}{2} + 4\cos^2\frac{x}{2} - 4\sin^2\frac{x}{2}}$$

$$= \int \frac{dx}{\sin^2\frac{x}{2} + 9\cos^2\frac{x}{2}} = \int \frac{\sec^2\frac{x}{2}dx}{9+\tan^2\frac{x}{2}}$$

Let $\tan\frac{x}{2} = z \Rightarrow \frac{dz}{dx} = \sec^2\frac{x}{2}.\frac{1}{2}$

$$\therefore \quad I = 2\int \frac{dz}{z^2+3^2} = \frac{2}{3}\tan^{-1}\left(\frac{\tan\frac{x}{2}}{3}\right) + c$$

69. Answer (3)

$f(x) = x - [x]$ is a periodic function with period 1.

$$\therefore \quad I = \int_0^{2010} e^{x-[x]}dx = 2010\int_0^1 e^{x-[x]}dx$$

$$= 2010\int_0^1 e^{x-[x]}dx = 2010\int_0^1 e^x dx.$$

$= 2010(e - 1)$

70. Answer (2)

$$\int \frac{(x^4-x)^{1/4}}{x^5}dx = \int \frac{x\left(1-\frac{1}{x^3}\right)^{1/4}}{x^5}dx$$

$$= \int \left(1 - \frac{1}{x^3}\right)^{\frac{1}{4}} \cdot \frac{1}{x^4} dx$$

$$= \frac{4}{15}\left(1 - \frac{1}{x^3}\right)^{5/4} + c$$

71. Answer (4)
72. Answer (2)
73. Answer (3)
74. Answer (1)
75. Answer (2)
76. Answer (2)
77. Answer (1)

$$A = \int_2^3 (x^3 + 1)dx = \frac{x^4}{4} + x\Big|_2^3 = \frac{69}{4}$$

78. Answer (1)

$f(x) = |\sin x| \Rightarrow f(x + \pi) = |\sin x|$

$\therefore$ $f(x) = f(x + \pi) \Rightarrow f(x)$ is a periodic function with period π

79. Answer (1)

$$I = \int_5^7 \frac{\sqrt{x}dx}{\sqrt{12 - x} + \sqrt{x}} = \int_5^7 \frac{\sqrt{12 - x}}{\sqrt{x} + \sqrt{12 - x}} dx$$

$$\therefore \quad 2I = \int_5^7 dx = 2$$

$\Rightarrow$ $I = 1$

80. Answer (2)

$\frac{dy}{dx} = \frac{x^2 + y^2}{2xy}$. Here $f(x, y) = \frac{x^2 + y^2}{2xy}$ is a homogeneous function of degree 2.

81. Answer (1)
82. Answer (4)

Let $f(x) = xe^{\frac{-x^2}{2}}$

$$\therefore \quad f(-x) = -xe^{-\frac{x^2}{2}} \Rightarrow f(x) + f(-x) = 0 \Rightarrow f(x)$$

is an odd function.

83. Answer (2)

$$\lim_{x \to \infty} xe^{-\frac{x^2}{2}} = \lim_{x \to \infty} \frac{x}{e^{\frac{x^2}{2}}} = \lim_{x \to \infty} \frac{1}{e^{\frac{x^2}{2}} \cdot \frac{2x}{2}} = \lim_{x \to \infty} \frac{1}{xe^{\frac{x^2}{2}}} = 0$$

$\Rightarrow$ x-axis touches the curve.

84. Answer (2)

$$A = \int_0^\infty xe^{-\frac{x^2}{2}} dx = 1 \text{ sq. unit}$$

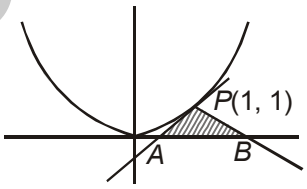
85. Answer (2)
86. Answer (4)
87. Answer (1)
88. Answer (3)

Let $I' = \int_3^{3+3T} f(2x)dx = \int_0^{3T} f(2x)dx = 3\int_0^T f(2x)dx$

$$= \frac{3}{2}\int_0^{2T} f(y)dy$$

$$= \frac{3}{2} \times 2\int_0^T f(y)dy = 3\int_0^T f(x)dx = 3I$$

89. Answer (2)



$y = x^2 \Rightarrow \frac{dy}{dx} = 2x \Rightarrow \frac{dy}{dx} = 2$ at (1, 1).

$\therefore$ Equation of the tangent is

$y - 1 = 2(x - 1) = 2x - 2 \Rightarrow y = 2x - 1$

and equation of the normal is

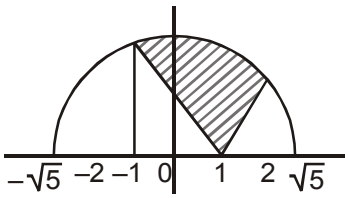
$$y - 1 = \frac{-1}{2}(x - 1) \Rightarrow 2y - 2 = -x + 1$$

$\Rightarrow$ $x + 2y = 3$

From the figure we see that the coordinates of A and B are $\left(\frac{1}{2}, 0\right)$ and $(3, 0)$ respectively.

$\therefore$ Area $= \left|\frac{1}{2}\begin{vmatrix}1 & 1 & 1\\ \frac{1}{2} & 0 & 1\\ 3 & 0 & 1\end{vmatrix}\right| = \frac{5}{4}$ sq. units

90. Answer (2)



Point of intersection of

$x^2 + y^2 = 5$ & $y = -x + 1$ is

$x^2 + (-x + 1)^2 = 5 \Rightarrow x^2 + x^2 - 2x + 1 - 5 = 0$

$\Rightarrow \quad 2x^2 - 2x - 4 = 0$

$\Rightarrow \quad x^2 - x - 2 = 0 \Rightarrow \quad x^2 - 2x + x - 2 = 0$

$\Rightarrow \quad x(x - 2) + 1(x - 2) = 0$

$\Rightarrow \quad (x - 2)\,(x + 1) = 0 \Rightarrow x = -1, 2$

$\therefore \quad A = \int_{-1}^{2} \sqrt{5 - x^2}\,dx - \frac{1}{2} \times 2 \times 2 - \frac{1}{2} \times 1 \times 1$

$= \int_{-1}^{2} \sqrt{5 - x^2}\,dx - \frac{5}{2} = \frac{5\pi - 2}{4}$