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FINAL TEST SERIES JEE -2017 TEST-05

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[PHYSICS]

1. Answer (2) $BIV = iR + \frac{q}{C}$ or $BIV = \left(\frac{dq}{dt}\right)R + \frac{q}{C}$

Hence the charge on capacitor increases with time

2. Answer (3) Flux can't change in a superconducting loop.
 $\Delta\phi = 2\pi R^2 \cdot B$

\therefore Finally $L i 2\pi R^2 \times B$. $i = \frac{2\pi R^2 \times B}{L}$

3. Answer (2)

$$I = \frac{1}{2} \Sigma_0 E_0^2 C$$

$$E_0 = \sqrt{\frac{2I}{\Sigma_0 C}} = 77.6 \frac{N}{C}$$

4. Answer (1)

5. Answer (3)

6. Answer (1)

$$x = vt, \quad y = \frac{1}{2} a_y t^2$$

$$y = Bx^2 \left(\frac{q}{8mV}\right)^{\frac{1}{2}}$$

7. Answer (1)

8. Answer (2)



$$F = i l B = 20 \text{ N}$$

9. Answer (2)

10. Answer (3)

11. Answer (4)

12. Answer (4)

13. Answer (2)

$$T = 2\pi \sqrt{\frac{I}{MB}}$$

$$I' = \frac{I}{8}$$

$$M' = \frac{M}{2}$$

14. Answer (3)

$$\tan \theta = \frac{B_V}{B_H} = -2 \cot(90 + \lambda)$$

15. Answer (1)

$$\text{Energy} = \frac{1}{2} Li^2, \quad \text{emf} = -L \frac{di}{dt}$$

16. Answer (1)

17. Answer (2)

18. Answer (3)

19. Answer (1)

$$\text{Ratio} = \frac{Li \frac{di}{dt}}{Vi}$$

20. Answer (3)

$$V_{\text{comma}} = \frac{3CV_0 + 7CV_0}{5C} = 2V_0$$

$$V = \frac{1}{2} CC^2$$

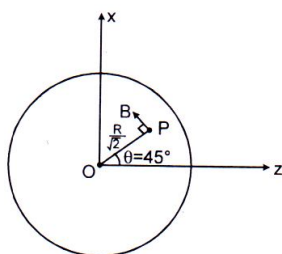
$$= \frac{1}{2} \times 3C \times 4V_0^2$$

$$= 6CV_0^2$$

21. Answer (3)

22. Answer (1)

23. Answer (1) The magnitude of magnetic field at



$$P\left(\frac{R}{2}, y, \frac{R}{2}\right) \text{ is}$$

$$B = \frac{\mu_0 I r}{2} = \frac{\mu_0 i}{2\pi R^2} \times \frac{R}{\sqrt{2}} = \frac{\mu_0 i}{2\sqrt{2}\pi R}$$

unit vector in direction of magnetic field is

$$\therefore \vec{B} = B \hat{B} = \frac{\mu_0 i}{4\pi R} (\hat{i} - \hat{k})$$

Alternate solution

$$\vec{B} = \frac{\mu_0}{2} \vec{j} \times \vec{r} = \frac{\mu_0}{2} \frac{i}{\pi R^2} \hat{j} \times \left(\frac{R}{2} \hat{i} + \frac{R}{2} \hat{k} \right) = \frac{\mu_0 i}{4\pi R} (\hat{i} - \hat{k})$$

24. Answer (1)

25. Answer (1)

26. Answer (2)

27. Answer (1)

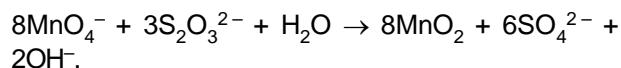
28. Answer (1)

29. Answer (1)

30. Answer (1)

[CHEMISTRY]

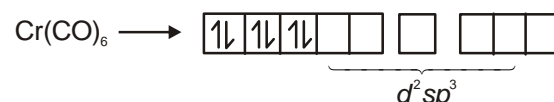
31. Answer (2)



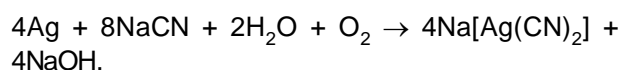
32. Answer (4)

The correct IE is Au > Cu > Ag

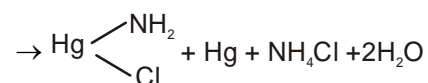
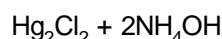
33. Answer (1)

In $\text{C}(\text{CO})_6$, no orbital is present which is singly occupied, hence magnetic moment value is zero.

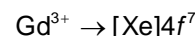
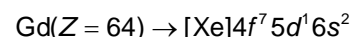
34. Answer (2)



35. Answer (1)



36. Answer (1)

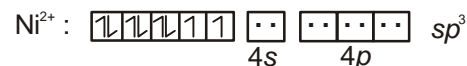


Half-filled 4f orbitals are present.

37. Answer (2)

Magnetic moment = 2.83 indicates that there is two unpaired electrons.

$$\mu = \sqrt{n(n+2)} \text{ BM } n = 2$$

In $[\text{NiCl}_4]^{2-}$, Ni has d^8 configuration and Cl^- is a weak ligand.

38. Answer (1)

 Mn^{7+} has d^0 configuration.

39. Answer (1)

 C_2H_4 does not possess an unshared lone pair but it can act as π -acid ligand.

40. Answer (2)

It has only two geometrical isomers.

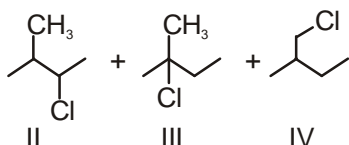
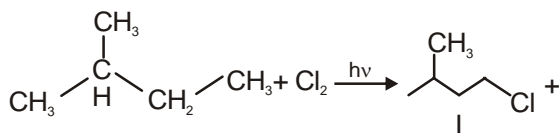
41. Answer (3)

CO does backbonding with metal atoms.

So, it have both σ & π bonds.

42. Answer (1)

43. Answer (1)



Out of these (II) and (IV) occur in enantiomeric forms hence, four chiral forms are formed.

44. Answer (1)

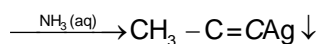
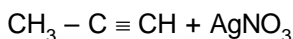
This is oxymercuration and demercuration reaction due to cyclic mercurian ion intermediate formation, there is no rearrangement and product will be based on Markovnikov rules.

45. Answer (1)

Li and NH_3 give trans product.

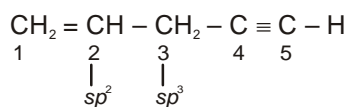
46. Answer (4)

Terminal alkynes form silver salt with Tollen's reagent while alkene does not react with Tollen's reagent.



47. Answer (4)

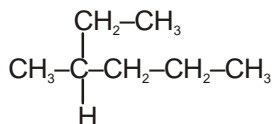
According to the IUPAC conventions compound can be numbered as



48. Answer (4)

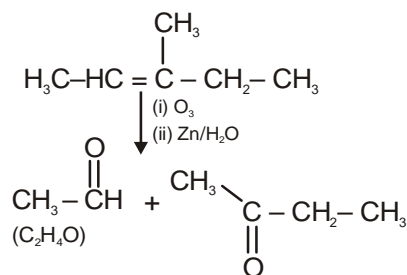
 AlCl_3 does isomerisation reaction.

49. Answer (4)

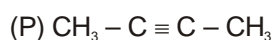
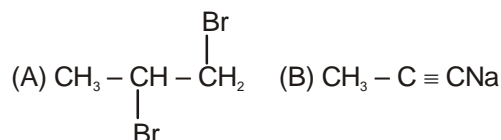
 C_7H_{16} - mol. wt.

50. Answer (4)

51. Answer (1)

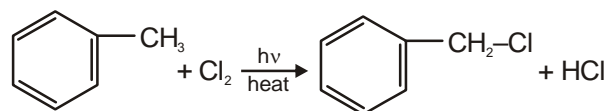


52. Answer (1)



53. Answer (4)

54. Answer (3)



55. Answer (1)



56. Answer (2)

57. Answer (1)

58. Answer (2)

59. Answer (1)

60. Answer (2)

[MATHEMATICS]

61. Answer (2)

$$y' = k^2 e^{kx}$$

$$\text{hence } y' = k^2 \quad (\because x = 0)$$

$$\text{So angle with } x\text{-axis} = \tan^{-1}(k^2)$$

$$\text{So angle with } y\text{-axis} = \cot^{-1}(k^2)$$

62. Answer (2)

$$x^2 e^{-x} = \frac{1}{e^2}$$

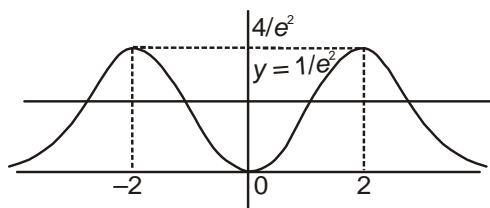
$$\text{Let } f(x) = x^2 e^{-x} \quad \text{for } x > 0$$

$$f'(x) = 2x e^{-x} - x^2 e^{-x} = 0$$

$$= x(e^{-x})(2-x) = 0$$

$$\Rightarrow x = 0, x = 2.$$

So graph is



So four solutions.

63. Answer (3)

$$\int \frac{\frac{1}{x^7} - 1}{x\left(\frac{1}{x^7} + 1\right)} dx = \int \left(\frac{\frac{1}{x^7} - 1}{\frac{1}{x^7} + 1}\right) \times \frac{x^7}{x^8} dx$$

Put $\frac{1}{x^7} = t \quad -\frac{7}{x^8} dx = dt \Rightarrow \frac{dx}{x^8} = -\frac{dt}{7}$

So $-\int \left(\frac{t-1}{t+1}\right) \frac{1}{t} \times \frac{1}{7} dt = -\frac{1}{7} \int \frac{t-1}{t(t+1)} dt$

Now do partial fraction and integrate.

64. Answer (2) 65. Answer (4)

$$\int_0^3 y dx = \int_0^1 y dx + \int_1^2 y dx + \int_2^3 y dx$$

$$= \int_0^1 x^0 dx + \int_1^2 (x-1) dx + \int_2^3 (x-2)^2 dx = \frac{11}{6}$$

66. Answer (4)

$$I = \int_{-\pi}^{\pi} \frac{\cos^2(-x)}{1+a^{-x}} dx; \quad I = \int_{-\pi}^{\pi} \frac{a^x \cos^2 x}{1+a^x} dx$$

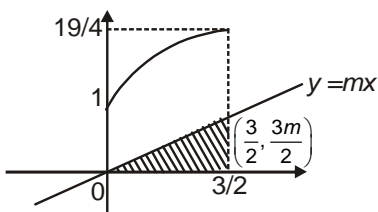
Adding we get

$$2I = 2 \int_0^{\pi} \cos^2 x dx = \left[x + \frac{\sin 2x}{2} \right]_0^{\pi} = \pi$$

$$2I = \pi \Rightarrow I = \frac{\pi}{2}$$

67. Answer (1)

Total area = $\int_0^{\frac{3}{2}} (1+4x-x^2) dx$



$$= \left(x + 2x^2 - \frac{x^3}{3} \right) \Big|_0^{\frac{3}{2}}$$

$$= \frac{39}{8}$$

$$\text{Half area} = \frac{39}{16} = \frac{1}{2} \times \frac{3}{2} \times \frac{3m}{2}$$

$$\Rightarrow m = \frac{13}{6}$$

68. Answer (2)

69. Answer (1)

$$f'(x) = 2 - \frac{1}{1+x^2} - \frac{1}{\sqrt{1+x^2}} \geq 0 \quad \forall x \in R$$

and equality holds at $x = 0$ only

so, $f(x)$ is increasing in $(-\infty, \infty)$

Hence (1) is correct.

70. Answer (3)

Put $\cot^{-1}(e^x) = t \Rightarrow e^x = \cot(t)$

$$e^x dx = -\operatorname{cosec}^2(t) dt \Rightarrow dx = -\frac{\operatorname{cosec}^2 t dt}{\cot(t)}$$

Now simplify and integrate by parts.

71. Answer (1)

Put $x = t^6 \Rightarrow dx = 6t^5 dt$

$$I = \int \frac{6t^5(t^6 + t^4 + t)}{t^6(1+t^2)} dt = \int \frac{6(t^5 + t^3 + 1)}{(t^2 + 1)} dt$$

$$= \int 6t^3 dt + \int \frac{6 dt}{t^2 + 1}$$

$$= \frac{6t^4}{4} + 6 \tan^{-1}(t) = \frac{3}{2} x^{2/3} + 6 \tan^{-1}(x^{1/6}) + C$$

72. Answer (3)

73. Answer (2)

$$I = \int_0^{\pi} x \sin x \cdot \cos^4 x dx$$

$$= \int_0^{\pi} (\pi - x) \sin(\pi - x) \cos^4(\pi - x) dx$$

$$= \int_0^{\pi} (\pi - x) \sin x \cdot \cos^4 x dx$$

$$= \pi \int_0^{\pi} \sin x \cdot \cos^4 x dx - I$$

$$2I = \pi \left[-\frac{\cos^5 x}{5} \right]_0^{\pi} = \frac{2\pi}{5} \Rightarrow I = \frac{\pi}{5}$$

74. Answer (2)

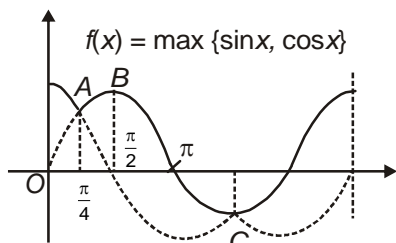
$$\frac{dx}{dy} = \frac{x}{y} + 2y^2$$

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

This is linear in x, IF = $\frac{1}{y} e^{-\int \frac{1}{y} dy}$

Solutions is $x \cdot \frac{1}{y} = \int 2y^2 \cdot \frac{1}{y} dx \Rightarrow \frac{x}{y} = y^2 + c$

75. Answer (1) 76. Answer (3)



Clearly A, B, C are critical points
Hence (3) is the correct answer.

77. Answer (2)

Put $\ln(6x^2) = t$

$$\frac{1}{6x^2} \times 12x dx = dt$$

$$\frac{dx}{x} = \frac{dt}{2}$$

$$\text{So } \frac{1}{2} \int t dt = \frac{t^2}{4} + C = \frac{1}{4} [\ln(6x^2)]^2 + C$$

78. Answer (4)

Put $(x + 1) = t^6$

$$\Rightarrow dx = 6t^5 dt$$

$$I = \int \frac{6t^5 dt}{t^2 + t^3} = 6 \int \frac{t^5 dt}{t^2(t+1)}$$

Divide N by D and then do partial fractions.

79. Answer (1)

$$\begin{aligned} S &= \lim_{n \rightarrow \infty} \sum_{r=0}^{n(b-a)} \frac{1}{na+r} \\ &= \lim_{n \rightarrow \infty} \sum_{r=0}^{n(b-a)} \frac{1}{a+\frac{r}{n}} \times \frac{1}{n} = \int_0^{b-a} \frac{1}{a+x} dx \\ &= \ln\left(\frac{b}{a}\right). \end{aligned}$$

80. Answer (4)

$$\begin{aligned} \text{Area} &= \int_0^\infty x \cdot e^{-ax} dx = -\frac{x \cdot e^{-ax}}{a} + \frac{1}{a} \int e^{-ax} dx \\ &= \left[-\frac{x}{a} e^{-ax} - \frac{e^{-ax}}{a^2} \right]_0^\infty = \frac{1}{a^2}. \end{aligned}$$

81. Answer (3) 82. Answer (2) 83. Answer (2)

$$f(x) = e^{-x} + 2e^{-2x} + 3e^{-3x} + \dots$$

$$e^{-x} \cdot f(x) = e^{-2x} + 2e^{-3x} + \dots$$

$$\begin{aligned} f(x)[1 - e^{-x}] &= e^{-x} + e^{-2x} + e^{-3x} + \dots \\ &= \frac{e^{-x}}{1 - e^{-x}} \end{aligned}$$

$$f(x) = \frac{e^{-x}}{(1 - e^{-x})^2}$$

$$\text{So } I = \int_{\ln 2}^{\ln 3} \frac{e^{-x} dx}{(1 - e^{-x})^2}$$

Put $1 - e^{-x} = t$

$$\begin{aligned} I &= \int_{1/2}^{2/3} \frac{dt}{t^2} = -\frac{1}{t} \Big|_{1/2}^{2/3} \\ &= -\frac{3}{2} - (-2) = 2 - \frac{3}{2} = \frac{1}{2}. \end{aligned}$$

84. Answer (1)

$$\frac{dx}{dy} = xy[x^2 \sin y^2 + 1]$$

$$\Rightarrow \frac{1}{x^3} \frac{du}{dy} - \frac{y}{x^2} = y \sin y^2$$

Put $-\frac{1}{x^2} = u$ so equation becomes

$$\frac{du}{dy} + 2uy = 2y \sin y^2$$

So which becomes LDE multiply by $IF = e^{y^2}$ and solve.

85. Answer (3)

$a^2 x^2 + ax + 1$ is clearly positive for \forall real x

$$\begin{aligned} \text{Area} &= \int_0^1 (a^2 x^2 + ax + 1) dx = \frac{a^2}{3} + \frac{a}{2} + 1 \\ &= \frac{1}{6}(2a^2 + 3a + 6) = \frac{1}{6}\left(2\left(a^2 + \frac{3a}{2} + \frac{9}{16}\right) + 6 - \frac{18}{16}\right) \\ &= \frac{1}{6} \left(2 \left(a + \frac{3}{4} \right)^2 + \frac{3a}{8} \right) \end{aligned}$$

Which is minimum for $a = -\frac{3}{4}$.

86. Answer (4)

87. Answer (2)

88. Answer (1)

89. Answer (2)

90. Answer (4)