



AVIRAL CLASSES

IIT-JEE | NEET | FOUNDATIONS

ULTIMATE TEST SERIES JEE MAIN -2020

XII TEST-02 ANSWER KEY

Test Date :20-03-2020

[PHYSICS]

1. A

2. There will be excess pressure $\Delta p = \frac{4T}{R}$ inside the soap bubble. As $R_B > R_A > R_C$ so $P_C > P_A > P_B$. Therefore the air will flow from A and C towards B

3. $Y = 2\eta(1 + \sigma)$

4. C

5. MI of disc about diametric axis will be minimum.

6.
$$P = \frac{2T}{r}$$

$$= \frac{2 \times 4.65 \times 10^{-1}}{6 \times 10^{-3}} = 155 \text{ Pa}$$

7.
$$B = \frac{\Delta P}{\frac{\Delta V}{V}}$$

$$\frac{\Delta V}{V} \% = \frac{\Delta P}{B} \times 100\%$$

8.
$$v = \frac{2r^2}{9\eta}(\rho - \sigma)g$$

$$\frac{v_1}{v_2} = \left[\frac{\rho_1 - \sigma}{\rho_2 - \sigma} \right]$$

$$\frac{0.2}{v_2} = \left[\frac{19.5 - 1.5}{10.5 - 1.5} \right]$$

$$v_2 = 0.1 \text{ m/s}$$

9. C

10.
$$I_{\text{net}} = I_{\text{disc}} - I_{\text{removed}}$$

$$= \frac{1}{2} (9M)R^2 - \frac{1}{2} M \left(\frac{R}{3} \right)^2 = \frac{40}{9} MR^2$$

11. Additional kinetic energy = $TE_2 - TE_1$

$$= -\frac{GMm}{2R_2} - \left(-\frac{GMm}{2R_1} \right) = \frac{1}{2} GmM \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

12. option (c) and (d) are incorrect because option (c) is true only for spherically symm. bodies option (d) radius of gyration is irrelevant with C.G.

13. According to question and by using COME

$$-\frac{GMm}{R+R} + \frac{1}{2}m(fv)^2 = 0 + 0$$

$$\Rightarrow fv = \sqrt{\frac{GM}{R}} \text{ but } v = \sqrt{\frac{2GM}{R}}$$

$$\text{Therefore } f \sqrt{\frac{2GM}{R}} = \sqrt{\frac{GM}{R}} \Rightarrow f = \frac{1}{\sqrt{2}}$$

14. D

15. Here $\frac{dv}{dt} = \text{constant} = a$ (say)

Use $v^2 = u^2 + 2as$ where

$$s = 2 \times 2\pi r = 80 \text{ m, } u = 0, v = 80 \text{ m/s}$$

16. B

17. A

18. A

19.
$$-\frac{GMm}{2R^3} \left(3R^2 - \frac{R^2}{4} \right) + \frac{1}{2}mv_e^2 = 0$$

$$v_e = \sqrt{\frac{11}{4} \frac{GM}{R}}$$

$$\begin{aligned}
 20. \quad A_1 V_1 &= A_2 V_2 \\
 &= \pi \left(\frac{3}{2}\right)^2 \times 4 = \pi \left(\frac{6}{2}\right)^2 \times v \\
 &= v = 1 \text{ m/s}
 \end{aligned}$$

INTEGER

21. 2

22. 2

23. Sphere compresses the spring until its all K.E. is converted to P.E. of spring

$$\frac{1}{2} MV^2 \left(1 + \frac{K^2}{r^2}\right) = \frac{1}{2} Kx^2$$

$$24. \quad Q = \frac{\pi p r^4}{8 \eta l}$$

$$\frac{Q_1}{Q_2} = \left(\frac{r_1}{r_2}\right)^4 \times \frac{l_2}{l_1} = 32$$

$$Q_2 = \frac{Q}{32}$$

25. $k = yr_0$

$$r_0 = \frac{k}{y} = \frac{3.6 \times 10^{-9}}{1.2 \times 10^{11}} = 3 \times 10^{-20} \text{ m}$$

[CHEMISTRY]

$$26. \quad E_{\text{MnO}_4^- | \text{Mn}^{2+}}^{(5)} = 1.51 \text{ V}$$

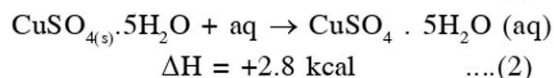
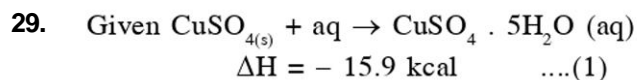
$$E_{\text{Mn}^{2+} | \text{MnO}_2}^{(2)} = -1.23 \text{ V}$$

$$E_{\text{MnO}_4^- | \text{MnO}_2}^{(3)} = \frac{1.51 \times 5 - 1.23 \times 2}{3}$$

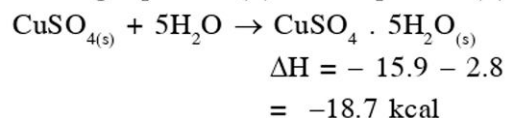
$$= \frac{7.55 - 2.46}{3} = 1.69 \text{ V}$$

27. A

28. D

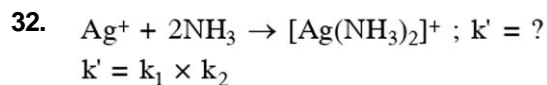


Subtracting equation (2) from equation (1)

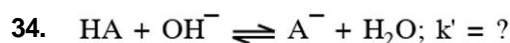


30. D

31. B

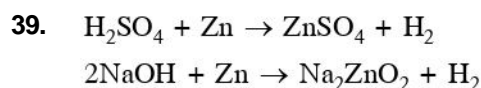
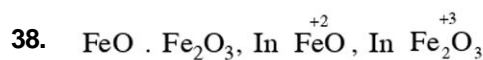
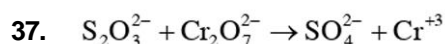


33. B



$$k' = \frac{1}{k_h} = \frac{1}{k_w / k_a} = \frac{k_a}{k_w} = \frac{10^{-4}}{10^{-14}} = 10^{10}$$

35. A

36. Intermolecular attraction $\propto a$ 

$$40. \quad S^1 = \frac{K_{sp}}{2C}$$

$$C = \frac{10 \text{ g}}{111 \text{ g/mol} \times 1 \text{ L}}$$

41. B

42. Option 4th is of weak base remaining all are salts of SAWB which have pH less than seven

43. D

44. B

45. D

INTEGER

- 46. 9
- 47. 6
- 48. 4
- 49. 1
- 50. 2

[MATHEMATICS]

51 **Ans.(4)**

$$|z|^2 - |z| - 2 < 0$$

$$\Rightarrow (|z| - 2)(|z| + 1) < 0 \Rightarrow |z| < 2$$

$$\text{Now } |z^2 + z \sin \theta| \leq |z|^2 + |z \sin \theta| \leq |z|^2 + |z| < 4 + 2 = 6$$

52 **Ans. (2)**

p	q	p∧q	(p∧q)→p	~q	q∧~q	[(p∧q)→p]→(q∧~q)
T	T	T	T	F	F	F
T	F	F	T	T	F	F
F	T	F	T	F	F	F
F	F	F	T	T	F	F

Given compound statement is always false. So it is a contradiction.

53 **Ans. (4)**

$$n_1 = 10, n_2 = 10$$

$$\text{average } m_1 = 60, m_2 = 40$$

$$\sigma_1 = 4, \sigma_2 = 6$$

Standard deviation of combined series

$$\begin{aligned} \sigma &= \sqrt{\frac{n_1\sigma_1^2 + n_2\sigma_2^2}{n_1 + n_2} + \frac{n_1n_2(m_1 - m_2)^2}{(n_1 + n_2)^2}} \\ &= \sqrt{\frac{10 \times 16 + 10 \times 36}{10 + 10} + \frac{10 \times 10(60 - 40)^2}{(10 + 10)^2}} \\ &= \sqrt{8 + 18 + 100} = \sqrt{126} = 11.2 \end{aligned}$$

54 **Ans. (3)**

Problem is same as arranging 8 things out of which 5 identical i.e. $\frac{8!}{5!}$ which gives total number of ways of selecting block and distributing them away 3 children i.e. $\frac{8!}{5!}3!$.

55 **Ans. (2)**

2 cases arise (i) P_1 & P_2 are in same pair & one

$$\text{loses } p = \frac{1}{11}$$

(ii) P_1 & P_2 are in different pairs & one loses

$$\rightarrow p = \frac{10}{11} \times \left(\frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \right) = \frac{5}{11}$$

$$\therefore \text{required probability} = \frac{6}{11}$$

56. **Ans. (1)**

$$S = (1 - \omega)(1 - \omega^2) + \dots + (2017 - \omega)(2017 - \omega^2)$$

$$S = \sum_{n=1}^{2017} (n - \omega)(n - \omega^2) = \sum_{n=1}^{2017} (n^2 + n + 1)$$

$$= \frac{2017 \cdot 2018 \cdot 4035}{6} + \frac{2017 \cdot 2018}{2} + 2017$$

$$\frac{S \cdot \pi}{2017} = \left(\frac{2018 \cdot 4035}{6} + \underbrace{1009 + 1}_{\text{even}} \right)$$

$$= (\text{odd} + \text{even})\pi = \text{odd} \times \pi$$

$$= \cos\left(\frac{S\pi}{2017}\right) = \cos(\text{odd}\pi) = -1$$

57. **Ans. (4)**

$${}^{2017}C_0 + {}^{2017}C_1 + \dots + {}^{2017}C_{1008} = 2^{2016} = \lambda^2$$

$$\lambda = 2^{1008} \Rightarrow 8 \cdot 3 \cdot 2^{201} = 8(33 - 1)^{201} = -8 = 25$$

58. **Ans. (3)**

34 terms so mean of 17th and 18th term is median

$$x_{10+n} = 148 + (n-1)(-2) = x_{17} = 136, x_{18} = 134$$

hence median = 135

59. **Ans. (2)**

p	~p	q	p→q	q ∨ ~p	(p→q) ↔ (q ∨ ~p)
T	F	T	T	T	T
T	F	F	F	F	T
F	T	T	T	T	T
F	T	F	T	T	T

60. **Ans. (4)**

Total cases ⇒ ${}^{15}C_2 \cdot 2! = 15 \cdot 14$
 $2x = 3y \Rightarrow (3, 2), (6, 4), (9, 6), (12, 8), (15, 10)$
 Favourable cases = 5

$$\text{Probability} = \frac{5}{15 \cdot 14} = \frac{1}{42}$$

61. **Ans. (2)**

$\bar{I} \quad \bar{II} \quad \bar{III} \quad - \quad - \quad - \quad - \quad - \quad \bar{IX} \quad \bar{X}$

Total number of numbers = 10^{10}
 (without any restriction)
 Total number of numbers = 9^{10}
 (when we do not use 1)

62. **Ans. (3)**

It is always true for $n \geq 5$

63. **Ans. (1)**

$P(A) = 0.3$
 $P(A \vee B) = P(A \cup B) = P(A) + P(B) - P(A)P(B)$
 $\Rightarrow 0.8 = 0.3 + P(B) - 0.3 P(B)$
 $\Rightarrow P(B) = \frac{5}{7}$
 $P(A \rightarrow B) = 1 - P(A \cap \bar{B})$
 $= 1 - (P(A) - P(A)P(B))$
 $= 1 - \left(0.3 \times \frac{2}{7}\right) = \frac{32}{35}$

64. **Ans. (4)**

$$6 \times 5!$$

65. **Ans. (2)**

Use : contrapositive of $p \rightarrow q$ is $(\sim q) \rightarrow (\sim p)$

66. **Ans. (3)**

$$\sum_{n=0}^4 (1009 - 2n)^4 {}^4C_n (-1)^n$$

$$(1009)^4 - 4(1007)^2 + 6(1005)^4 - 4(1003)^4 + (1001)^4$$

$$(1005 + 4)^4 + (1005 - 4)^4$$

$$- 4[(1005 + 2)^4 + (1005 - 2)^4] + 6(1005)^4$$

$$= 512 - 4 \times 32 = 384$$

67. **Ans. (4)**

$P = \frac{2 \times 19}{10 \times 9} = \frac{19}{45}$
 favourable : $\{(3, 4), (3, 5), \dots, (3, 10)$
 $(6, 7), (6, 8), \dots, (6, 10)$
 $(9, 10),$
 $(1, 4), (2, 4)$
 $(1, 8), (2, 8), (4, 8), (5, 8), (7, 8)\}$

68. **Ans. (2)**

Determinant value of matrix
 $= 1 - wc - aw + w^2ac = 0$
 $\Rightarrow (1 - aw)(1 - wc) = 0$
 $a = \frac{1}{w} = w^4 \Rightarrow b$ and c each have 4 and 4 options.
 if $c = \frac{1}{w} = w^4$ and $a \neq w^4$
 $\Rightarrow a$ have 3 and b have 4 options.
 \therefore Total matrices = $4 \times 4 + 3 \times 4 = 28$

69. **Ans. (3)**

Mean of $\omega_i = \ell(\text{mean of } y_i) + k$

$$55 = \ell.48 + k \quad \dots(i)$$

standard deviation of

$\omega_i = \ell(\text{standard deviation of } y_i)$

$$15 = \ell.12 \quad \dots(ii)$$

$$\ell = 1.25 \text{ and } k = -5$$

70. **Ans. (4)**

$$np = 2$$

$$npq = 1 \quad \therefore p = q = \frac{1}{2}, n = 4$$

$$P(x) = 1 - {}^4C_0 \left(\frac{1}{2}\right)^4 - {}^4C_1 \left(\frac{1}{2}\right)^4 = 1 - \frac{1}{16} - \frac{4}{16} = \frac{11}{16}$$

INTEGER

71.

$$= 12k \cdot \frac{12^{11}}{k} C_{k-1} {}^{11}C_{k-1}$$

$$\sum_{K=1}^n 12 \cdot K \cdot {}^{12}C_K \cdot {}^{11}C_{K-1} = 12^2 \sum_{K=1}^{12} \left({}^{11}C_{K-1}\right)^2$$

$$= 12^2 \cdot \frac{22!}{11!11!}$$

$$= 12 \cdot \frac{21 \cdot 19 \cdot 17 \dots 3}{11!} 2^{12} \cdot 6 \Rightarrow p = 6$$

72.

$$[(n+1)n - (n-1)]n!$$

$$T_n = (n^2 + 1)n! = n|n+1 - (n-1)|n!$$

$$\therefore S_n = n|n+1$$

$$\frac{T_{10}}{S_{10}} = \frac{10|10}{10|11} = \frac{101}{110} \quad \therefore b - a = 9$$

73.

$$\left(\frac{n(n+1)}{2}\right)^2 - \sum_{p=1}^n \frac{m(m+1)}{2} = 80$$

$$\frac{n^2(n+1)^2}{4} - \frac{n(n+1)(2n+1)}{12} - \frac{n(n+1)}{4} = 80$$

$$\Rightarrow n = 4$$

74.

$${}^nC_{r-2} = 36, {}^nC_{r-1} = 84, {}^nC_r = 126$$

$$\frac{{}^nC_{r-1}}{{}^nC_{r-2}} = \frac{84}{36} \Rightarrow \frac{n-r+2}{r-1} = \frac{7}{3}$$

$$\Rightarrow 3n + 13 = 10r \quad \dots(1)$$

$$\frac{{}^nC_r}{{}^nC_{r-1}} = \frac{126}{84} \Rightarrow \frac{n-r+1}{r} = \frac{3}{2}$$

$$\Rightarrow 2n + 2 = 5r \quad \dots(2)$$

$$\therefore n = 9, r = 4$$

$${}^nC_{2r} = {}^9C_8 = 9$$

75.

$$|z - 3 - 4i| = 4$$

$$||z| - 5| \leq 4$$

$$|z| \leq 9$$