

Most Authentic
**ANSWER
KEY**
of **IIT-JEE**
(Main)
2017



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(irrespective of question paper set)



(PAPER WITH SOLUTION) SET – D**JEE (MAIN) 2017
MATHEMATICS**

1. If S is the set of solution, then S is:

Ans. (4) A singleton

2. The following statement is :

Ans. (1)

p	q	$p \rightarrow q$	$N p \rightarrow q$	$(N p \rightarrow q) \rightarrow q$	$(p - q) \rightarrow [(N p \rightarrow q) \rightarrow q]$
T	T	T	T	T	T
T	F	F	T	F	T
F	T	T	T	T	T
F	F	T	F	T	T

Hence Tautology

3. If $5(\tan^2 x - \cos^2 x) = 2 \cos 2x + 9$, ... of $\cos 4x$ is :

Ans. (4) $5\left(\frac{\sin^2 x}{\cos^2 x} - \cos^2 x\right) = 2(2 \cos^2 x - 1) + 9$

$$5\left(\frac{1 - \cos^2 x - \cos^4 x}{\cos^2 x}\right) = 2(2 \cos^2 x - 1) + 9$$

Let $\cos^2 x = y$

$$\Rightarrow 9y^2 + 12y - 5 = 0$$

$$y = \frac{1}{3} \Rightarrow \cos^2 x = \frac{1}{3}$$

$$\cos^2 x = 2 \cos^2 x - 1 = 2 \times \frac{1}{3} - 1 \Rightarrow \cos^2 x = -\frac{1}{3}$$

$$\cos^4 x = 2 \cos^2 2x - 1 = 2 \times \left(-\frac{1}{3}\right)^2 - 1 \Rightarrow \cos^4 x = -\frac{7}{9}$$

4. For three events events occurs, is :

Ans. (2) $P(A) + P(B) - 2P(A \cap B) = \frac{1}{4}$ $P(B) + P(C) - 2P(B \cap C) = \frac{1}{4}$

$$P(C) + P(A) - 2P(A \cap C) = \frac{1}{4} \quad P(A \cap B \cap C) = \frac{1}{16}$$

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C)$$

$$- P(C \cap A) + P(A \cap B \cap C) = \frac{7}{16}$$

5. Let ω be a complex then k is equal to :

Ans. (1) $2\omega + 1 = \sqrt{3}i$

$$\omega = \frac{\sqrt{3}i - 1}{2} \Rightarrow \omega \text{ is cube root of unity.}$$

$$\omega = \frac{\sqrt{3}i - 1}{2} \Rightarrow \omega^3 = 1 \text{ \& } 1 + \omega + \omega^2 = 0$$

Given determinant is

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \end{vmatrix}$$

$$1(\omega^2 - \omega^4) - 1(\omega - \omega^2) + 1(\omega^2 - \omega)$$

$$\omega^2 - \omega - \omega + \omega^2 + \omega^2 - \omega$$

$$3(\omega^2 - \omega) = 3 - \sqrt{3}i = -3z \Rightarrow k = -z$$

6. Let k be an integer is at the point:

Ans. (4) $\left(2, \frac{1}{2}\right)$

7. Twenty meters of flower-bed, is :

Ans. (3) $2r + r\theta = 20 \quad \theta^c = \left(\frac{20-2r}{r}\right) \quad A = \frac{\pi r^2}{2\pi} \times \theta = \frac{r^2\theta}{2} \quad A = r^2 \left(\frac{20-2r}{2r}\right)$

$$A = \frac{20r - 2r^2}{2} \quad r = \frac{20}{a} = 5 \quad A = \frac{100 - 50}{2} = \frac{50}{2} = 25$$

8. The area (in sq.units) $y \leq 1 + \sqrt{x}$ } is :

Ans. (4) $\frac{5}{2}$

9. If the image of is equal to:

Ans. (2) $2\sqrt{42}$

10. If for $x \in \left(0, \frac{1}{4}\right)$, ... then $g(x)$ equals:

Ans. (1) $\frac{9}{1+9x^3}$

11. If $(2x + \sin x) \frac{dy}{dx} + (y+1)\cos x = 0$ is equal to:

Ans. (1) $\frac{1}{3}$

12. Let a vertical tower $\tan \beta$ is equal to:

Ans. (3) $\frac{2}{9}$

13. If $A = \begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$, then $\text{adj} (3A^2 + 12A)$ is equal to :

Ans. (2) Given that $A = \begin{pmatrix} 2 & -3 \\ -4 & 1 \end{pmatrix}$ by using characteristics equation

$$|A - \lambda I| = 0 \quad \text{i.e.} \quad \begin{vmatrix} 2-\lambda & -3 \\ -4 & 1-\lambda \end{vmatrix} = 0$$

$$\Rightarrow (2-\lambda)(1-\lambda) - 12 = 0 \Rightarrow \lambda^2 - 3\lambda + 2 - 12 = 0 \Rightarrow \lambda^2 - 3\lambda = 10.$$

$$\text{Put } \lambda = A \Rightarrow A^2 - 3A = 10I \quad \text{i.e.} \quad 3A^2 + 12A = 21A + 30I = \begin{pmatrix} 72 & -63 \\ -84 & 51 \end{pmatrix}$$

$$\text{Now, } \text{adj} (3A^2 + 12A) = \begin{pmatrix} 51 & 63 \\ 84 & 72 \end{pmatrix}$$

14. For any three positive Then :

Ans. (2) $450a^2 + 18b^2 + 50c^2 - 150ac - 90ab - 30bc = 0$

$$(15a - 3b)^2 + (5c - 3b)^2 + (15a - 5c)^2 = 0$$

$$\text{It is possible only when } 15a - 3b = 0 \Rightarrow 5a = b \Rightarrow \frac{a}{1} = \frac{b}{5} = \frac{c}{3} = k$$

$$5c - 3b = 0 \Rightarrow 5c = 3b \quad 15a - 3c = 0 \Rightarrow 3a = c \quad \text{Now, } b, c \text{ and } a \text{ are in A.P.}$$

15. The distance of the point $\frac{x-2}{2} = \frac{y+1}{-1} = \frac{z+7}{-1}$, is:

Ans. (2) $\vec{b}_1 \times \vec{b}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -2 & 3 \\ 2 & -1 & -1 \end{vmatrix} = 5\hat{i} + 7\hat{j} + 3\hat{k}$

$$\text{Now, equation of normal is } 5(x-1) + 7(y+1) + 3(z+1)$$

$$\text{i.e. } 5x - 7y + 33 + 5 = 0 \quad \text{Now, } d = \frac{10}{\sqrt{83}}$$

16. Let $I_n = \int \tan^n x dx, (n > 1)$ is equal to :

Ans. (2) Given that $I_n = \int \tan^n x dx. \quad I_n = \int \tan^{n-2} x (\sec^2 x - 1) dx.$

$$\Rightarrow I_n = \int \tan^{n-2} x \sec^2 x - \int \tan^{n-2} x dx \quad \text{i.e.}$$

$$I_n + I_{n-2} = \frac{\tan^{n-1} x}{n-1} + c \quad I_4 + I_6 = \frac{\tan^5 x}{5} + c \quad a = \frac{1}{5}, b = 0$$

17. The eccentricity of an at $\left(1, \frac{3}{2}\right)$ is:

Ans. (2) $e = \frac{1}{2}$ $x = -4$

$$e = \frac{1}{2} \quad x = -4 \quad +4 = \frac{a}{e} \quad a = 2 \quad e = \sqrt{1 - \frac{b^2}{a^2}} = \frac{1}{4} = 1 - \frac{b^2}{4} \quad b = \sqrt{3}$$

$$\frac{x^2}{4} + \frac{y^2}{3} = 1 \quad \frac{2x}{4} + \frac{2y}{3} \frac{dy}{dx} = 0 \quad \frac{dy}{dx} = \frac{-x/2}{2y/3} = -\frac{3x}{4y}$$

$$y - \frac{3}{2} = \frac{4y}{3x}(x-1) \Rightarrow y - \frac{3}{2} = \frac{4 \times 3/2}{3 \times 1}(x-1) \Rightarrow \frac{2y-3}{2} = 2x-2 \Rightarrow 2y-3 = 4x-4$$

$$4x - 2y = 1$$

18. A hyperbola passes through the the point.

Ans. (2) $(2\sqrt{2}, 3\sqrt{3})$

19. The function $f: R \rightarrow \left[-\frac{1}{2}, \frac{1}{2}\right]$ $f(x) = \frac{x}{1+x^2}$, is:

Ans. (3) Given that $f(x) = \frac{x}{1+x^2} \Rightarrow f(x) = \frac{1}{x+yx}$

$$\Rightarrow f'(x) = \frac{(1+x^2)1-2x^2}{(1+x^2)^2} \Rightarrow f'(x) = \frac{1-x^2}{(1+x^2)^2}$$

$$\Rightarrow f'(x) = \frac{(1-x)(x+1)}{(1+x^2)^2} = -\frac{(x+1)(x-1)}{(1+x^2)^2}$$

So, $f(x)$ is surjective but not injective

$x = 1$ is maxima point

$x = -1$ is minima point

$$f(x)_{\max} = \frac{1}{2} \quad f(x)_{\min} = -\frac{1}{2}$$

Range = Codomain

20. $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cot x - \cos x}{(\pi - 2x)^2}$ equals:

Ans. (2) $\lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{\cot x \cdot \cos x}{(\pi - 2x)^3} \right) = \frac{1}{8} \lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{\cos x (1 - \sin x)}{\left(\frac{\pi}{2} - x\right)^3} \right)$

Put $\frac{\pi}{2} - x = t$ Now, $\frac{1}{8} \lim_{t \rightarrow 0} \left(\frac{\sin t \times 2 \sin^2 t / 2}{4 \cdot t^{3/4}} \right) = \frac{1}{16}$

21. Let $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ is equal to :

Ans. (2) $\left| -(\vec{c} \times (\vec{a} \times \vec{b})) \right| = 3 \Rightarrow \left| -(\vec{c} \times \vec{b})\vec{a} - (\vec{c} \times \vec{a})\vec{b} \right| = 3 \Rightarrow \left| (\vec{c} \times \vec{a})\vec{b} - (\vec{c} \times \vec{b})\vec{a} \right| = 3$

Now, $|\vec{c} - \vec{a}|^2 = 3 \Rightarrow |\vec{c}|^2 + |\vec{a}|^2 - 2\vec{a} \cdot \vec{c} = 9 \Rightarrow |\vec{c}|^2 = 2\vec{a} \cdot \vec{c} \Rightarrow |\vec{c}| = 2.$

22. The normal to through the point:

Ans. (2) $y(x-2)(x-3) = x+6$

Put $x=0 \Rightarrow 6y=6 \Rightarrow y=1$ Point is (0,1)

$$y(x^2 - 5x + 6) = x + 6 \Rightarrow \frac{dy}{dx}(x^2 - 5x + 6) + y(2x - 5) = 1 \Rightarrow \frac{dy}{dx}(6) + (1)(-5) = 1$$

$$\Rightarrow 6 \frac{dy}{dx} = 6 \Rightarrow \frac{dy}{dx} = 1 \Rightarrow m_N = -1$$

Thus, equation of normal at (0,1) is –

$$(y-1) = -1(x-0) \Rightarrow y-1 = -x \Rightarrow y = -x+1 \Rightarrow x+y=1 \Rightarrow \left(\frac{1}{2}, \frac{1}{2}\right)$$

23. If two different numbers multiple of 4, is:

Ans. (1) $n(5) = {}^{11}C_2 \quad a+b=4m \quad a-b=4n \Rightarrow a=2(m+n), b=2(m-n)$

$$0, 2, 4, 6, 8, 10 \quad (0,4), (0,8), (2,6), (2,10), (4,8), (6,10) \Rightarrow n(A) = 6$$

$$\Rightarrow p(A) = \frac{6}{{}^{11}C_2} = \frac{6 \times 2}{10 \times 11} = \frac{6}{55}$$

24. A man X has 7 friends, ... in this party, is :

$$X = 7F \begin{cases} 42 \\ 3m \end{cases} \quad Y = 7F \begin{cases} 32 \\ 4m \end{cases}$$

Ans. (1)

(i) $X_{32} \quad Y_{3m} = {}^4C_3 \times {}^4C_3 = 16$

(ii) $X_{22}X_{1m} \quad Y_{12}Y_{2m} = {}^4C_2 \times {}^3C_1 \times {}^3C_1 \times {}^4C_2 = 6 \times 3 \times 3 \times 6 = 324$

(iii) $X_{11}X_{2m} \quad Y_{22}Y_{1m} = {}^4C_1 \times {}^3C_2 \times {}^3C_2 \times {}^4C_1 = 4 \times 3 \times 3 \times 4 = 144$

(iv) $X_{3m} \quad Y_{3L} = {}^3C_3 \times {}^3C_3 = 1 \quad = 16 + 324 + 144 + 1 = 485$

25. The value of $({}^{21}C_{10} - {}^{10}C_{10})$ is:

Ans. (4) $S = {}^{21}C_1 + {}^{21}C_2 + \dots + {}^{21}C_{10} = \frac{1}{2}$

$${}^{21}C_0 + {}^{21}C_1 + {}^{21}C_2 + \dots + {}^{21}C_{10} + {}^{21}C_{11} + {}^{21}C_{12} + \dots + {}^{21}C_{21} = 2^{21}$$

$${}^{21}C_0 + 25 + {}^{21}C_{21} = 2^{21} \Rightarrow 5 = 2^{20} - 1 \quad \dots (1)$$

$$\text{Let } S' = {}^{10}C_1 + {}^{10}C_2 + \dots + {}^{10}C_{10} = 2^{10} - 1 \quad \dots (2)$$

$$S - S' = 2^{20} - 2^{10}$$

26. A box contains 15 green and green balls drawn is:

Ans. (1) $n = 10, p(G) = \frac{15}{25} = P, \quad p(y) = \frac{100}{25} = q \quad n.p.q. = 10 \times \frac{3}{5} \times \frac{2}{5} = \frac{12}{5}$

27. Let $a, b, c \in R$ $\sum_{n=1}^{10} f(n)$ is equal to:

Ans. (1) $f(0) = 2f(0) \Rightarrow f(0) = 0 \Rightarrow c = 0 \quad f(2) = 3 \quad a + b = 3 \quad \dots\dots(1)$

$f(0) = f(1) + f(-1) - 1 \Rightarrow 0 = 3 + f(-1) - 1 = f(-1) = -2 \Rightarrow a - b = -2 \quad \dots\dots(2)$

$2a = 1 \Rightarrow a = \frac{1}{2} \quad b = 3 - \frac{1}{2} = \frac{5}{2} \quad f(x) = \frac{x^2}{2} + \frac{5x}{2}$

$S = \sum_{x=1}^{10} f(n) = \frac{1}{2} \left[(1^2 + 2^2 + \dots + 10^2) + \frac{5}{2}(1 + 2 + \dots + 10) \right] = 330$

28. The radius of a circle, ...lines, $y = |x|$ is:

Ans. (3) $4(\sqrt{2} - 1)$

29. If, for a positive n is equal to:

Ans. (4) 11

30. The integral $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \frac{dx}{1 + \cos x}$ is equal to:

Ans. (2) $I = \int_{\frac{11}{4}}^{\frac{3h}{4}} \frac{1}{1 + \cos x} dx \quad I = \int_{\frac{11}{4}}^{\frac{3h}{4}} \frac{1}{2 \cos^2 \frac{x}{2}} dx \quad I = \frac{1}{2} \int_{\frac{h}{4}}^{\frac{3h}{4}} \sec^2 \left(\frac{x}{2} \right) dx$

$I = \frac{1}{2} \left[\tan \left(\frac{x}{2} \right) \right]_{\left(\frac{1}{2} \right)} \quad I = \tan \left(\frac{3\lambda}{8} \right) - \tan \left(\frac{\lambda}{8} \right) \quad I = (\sqrt{2} + 1) - (\sqrt{2} - 1) = 2$



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National Record in IIT-JEE (Adv.) with **4 Zone Toppers** in 3 years.

2013
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KANPUR
ZONE TOPPER
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Sharvik Mital

DELHI
ZONE TOPPER
2014
AIR-3
Govind Lahoti

DELHI
ZONE TOPPER
2016
AIR-6
Kartik Patekar

2015
AIR-3

Anjali Rai
DELHI ZONE TOPPER

JEE (Adv.) Workshop starting from
5th April'17

PHYSICS

31. A radioactive nucleus t is given by :

Ans. (3) $\frac{N}{N_0} = \left(\frac{1}{2}\right)^n$ $n = \frac{t}{T}$ (no. of half lives) $\log \frac{N}{N_0} = n \log \frac{1}{2}$

$$\log \frac{N}{N_0} = n \log 2 \quad \log \frac{N_0}{N} = \frac{t}{T} \log 2 \quad t = \frac{T}{\log 2} \log \frac{N_0}{N}$$

A	$\rightarrow$	B
$t = 0$	N_0	0
$t = t$	N	$0.3N$

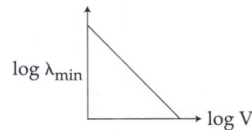
$$N + 0.3N = N_0 \quad 1.3N = N_0 \quad 1.3 = \frac{N_0}{N} \quad t = \frac{T}{\log 2} \log 1.3$$

32. The following observations were is closest to:

Ans. (3) $100 \times \frac{\Delta T}{T} = \left(\frac{\Delta r}{r} + \frac{\Delta h}{h} + \frac{\Delta g}{g} \right) \times 100 = \left(\frac{.01}{1.25} \times 100 + \frac{.01}{1.45} \times 100 + \frac{.01}{9.8} \times 100 \right)$

$$= 1.591\% \approx 1.5\%$$

33. An electron beam is accelerated represented in :



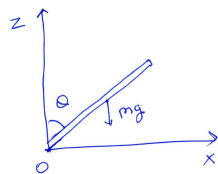
Ans. (2)

34. The moment of inertia of of inertia is minimum?

Ans. (2) $\sqrt{\frac{3}{2}}$

35. A slender uniform rod with the vertical is:

Ans. (2)



Torque about $O = mg \sin \theta \frac{l}{2}$ $T = mg \sin \theta \frac{l}{2}$

$$\frac{ML^2}{3} \alpha = mg \sin \theta \frac{l}{2} \quad \alpha = \frac{3g \sin \theta}{2l}$$

36. C_p and C_v are specific heats a and b is:

Ans. (4) $C_p - C_v = b \Rightarrow 4.12$ $C_p - C_v = a \Rightarrow 0.297$ $a = 14 b$

37. A copper ball of mass 100 gm heat of copper = 0.1 cal/gm °C

Ans. (3) Heat loss by hotter body = Heat gained by colder body.

$$m_b c_{\omega} \Delta T = m_c c_{\omega} \Delta T + m_o c_{\omega} \Delta T$$

$$100 \times 0.1 \times [T - 75] = 100 \times 0.1 \times [75 - 30] + 170 \times 1 \times [75 - 30] = 10T - 750 = 450 + 7650$$

$$T = 885^{\circ}\text{C}$$

38. In amplitude modulation, sinusoidal in the modulated wave?

Ans. (2) In amplitude modulated wave angular frequency ω_m is not exist.

39. The temperature of an open room $n_f - n_i$ will be :

Ans. (1) $Pv = nRT$

Pressure and volume are constant.

$$n_i RT = Pv$$

$$n_f RT = Pv$$

$$11_i \times 8 \times 290 = 1 \times 10^5 \times 30$$

$$n_f \times 8 \times 300 = 10^5 \times 30$$

$$n_f - n_i = \frac{30 \times 10^5}{8} \left[\frac{1}{290} - \frac{1}{300} \right]$$

$$\text{No. of molecules } \frac{30 \times 10^5}{8} \left[\frac{1}{240} - \frac{1}{300} \right] 6 \times 10^{23} = 2.5 \times 10^{25}$$

$$n_f - n_i = -2.5 \times 10^{25}$$

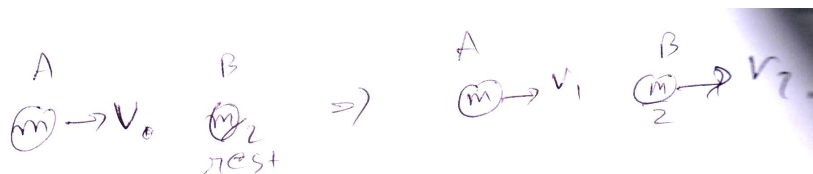
40. In a Young's double slit wavelengths coincide is:

Ans. (3) $n_1 \lambda_1 = n_2 \lambda_2$ $\frac{n_1}{n_2} = \frac{\lambda_1}{\lambda_2} = \frac{52\theta}{65\theta}$ $n = 5$ for $\lambda = 520 \text{ nm}$ $n = 4$ for $\lambda = 650 \text{ nm}$

$$x = \frac{\lambda D}{d} = \frac{5 \times 520 \times 1505 \times 10^{-9} \times 10^{-2}}{5 \times 10^{-4}} \quad x = 7.8 \text{ mm}$$

41. A particle A of mass m and initial after the collision is:

Ans. (3)



$$mv = mv_1 + \frac{m}{2} v_2 \quad 2v = 2v_1 + v_2 \quad \dots\dots(i)$$

$$e = 1 = \frac{v_2 - v_1}{v} \quad v = v_2 - v_1 \quad \dots\dots(ii)$$

$$v_2 = \frac{4v}{3} \quad \& \quad v_1 = \frac{v}{3} \quad \frac{\lambda_A}{\lambda_B} = \frac{P_B}{P_A} = \frac{\frac{m}{2} \times \frac{4v}{3}}{m \times \frac{v}{3}} = 2$$

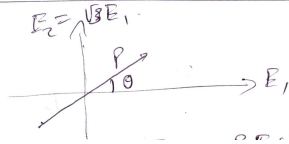
42. A magnetic needle of magnetic moment 10 complete oscillations is:

Ans. (2) $\frac{6.7 \times 10^{-7} (0.01)}{7.5 \times 10^{-6}} = \omega^2$

$$\omega = \sqrt{\frac{67}{75}} \times 10^2 \Rightarrow 10 \sqrt{\frac{9 \times 7}{25 \times 3}}$$

$$t = 10 \times T = \frac{2\pi}{\omega} = \frac{2\pi}{8} \times 10 = 6.68 \text{ s}$$

43. An electric dipole has a fixed dipole The angle θ is :



Ans. (4)

$$T_1 = PE \sin \theta \quad T_2 = PE \cos \theta$$

$$\text{Given } T_2 = -T_1 \quad \tan \theta = \sqrt{3} \quad \theta = 60^\circ$$

44. In a coil of resistance 100Ω , ...through the coil is :

Ans. (4) $I_{avg} = \frac{\epsilon}{R} \quad \epsilon = \frac{d\phi}{dt} \quad I_{avg} = \frac{d\phi}{R dt} \quad d\phi = I_{avg} R dt = 5 \times 100 \times \frac{1}{2} = 250 \text{ Wb}$

45. A time dependent force $F = 6t$ first 1 sec. will be:

Ans. (2) $F = 6t \quad \omega = \int 6t dt \dots\dots(i)$

Put dx value in equation (i)

$$a = 6t \quad v = 3t^2 \quad x = t^3 \quad dx = 3t^2 dt \dots\dots(ii)$$

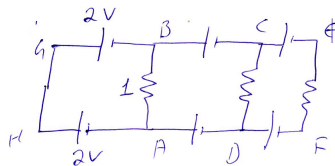
$$\omega = \int 6t \times 3t^2 dt = 18 \frac{t^4}{4} \Big|_0^1 \Rightarrow \frac{18}{4} \Rightarrow \frac{9}{2} \Rightarrow 4.5 \text{ J}$$

46. Some energy levels is given by:

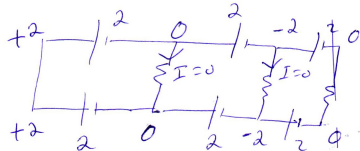
Ans. (1) $E = \frac{hC}{\lambda} \quad E = \frac{hC}{\lambda_1} \dots\dots(i) \quad \frac{1}{3} E = \frac{hC}{\lambda_2} \dots\dots(ii) \quad \frac{\lambda_1}{\lambda_2} = \frac{1}{3}$

47. In the above resistance is:

Ans. (1) 0 A



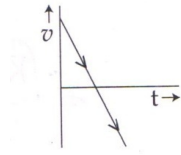
Consider A to be point -f zero potential.



48. A body is thrown vertically velocity vs time?

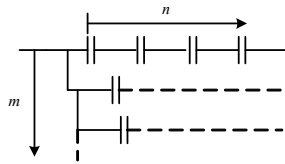
Ans. (4) $V = u + at$ Velocity decreases, becomes zero & then changes direction.

$$V = u + gt$$



49. A capacitance of $2\mu F$ is achieve this is :

Ans. (1)

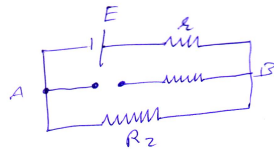


$$\frac{C}{n} \times m = 2\mu F \quad \frac{1Kv}{n} = 300 \quad n = \frac{10}{3} \quad n \rightarrow 4 \quad C \frac{m}{n} = 2\mu F$$

$$1\mu F \times \frac{M}{4} = 2\mu F \quad M = 8 \quad \text{Total} = 8 \times 4 = 32$$

50. In the given circuit capacitance C will be :

Ans. (4) $i = \frac{E}{r + r_2} \quad V_A + E - ri = V_B \quad V_B - V_A = E - ir \quad V_B - V_A = E - \frac{Er}{r + r_2}$



$$V_B - V_A = \frac{Er_2}{r + r_2} \quad C \times [V_B - V_A] = \frac{CEr_2}{r + r_2}$$

51. In a common emitter amplifier voltages will be :

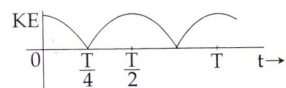
Ans. (1) If CE amplifier circuit the phase different between input and out put voltage is 180°

52. Which of the following statements is false?

Ans. (3) In a balanced wheatstone bridge if the cell and the galvanometer are exchanged, the null point is disturbed.

(3) is false on interchanging cell & galvanometer there will be no change.

53. A particle is executing particle will look like:



Ans. (1)

At $t = 0$ particle is at mean position $\Rightarrow V_{\max} \Rightarrow (KE)_{\max}$ in $\frac{T}{4}$ particle will reach extreme point $\Rightarrow v = 0 \Rightarrow KE = 0$

54. An observer is moving(speed of light = $3 \times 10^8 \text{ ms}^{-1}$)

Ans. (4) $f = f_0 \frac{\left[\sqrt{1 - \frac{v^2}{c^2}} \right]}{1 - \frac{V}{C}}$ $f = f_0 \frac{\left[\sqrt{1 - \frac{1}{4}} \right]}{1 - \frac{1}{2}}$ $f = f_0 \sqrt{3}$ $f = 10 \times 1.73$ $f = 17.3$

55. A man grows into a giant such that change by a factor of:

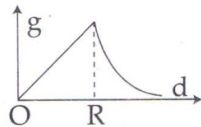
Ans. (2) $\text{Stress} = \frac{Mg}{A} = S \times \left(\frac{V}{A} \right) \times g$ $\text{Stress} = \int g \times L$ $\left(\left[\frac{V}{A} = L \right] \right)$
 $(\text{Stress})_{\text{new}} = \int g \times 9L = 9 \times \int gL$ $(\text{Stress})_{\text{new}} = 9 \times (\text{stress})_{\text{old}}$

56. When a current of 5mA is passed range 0–10V is:

Ans. (2) **Range** = 0–10V

$$V = I(a + r) \quad 10V = \left(\frac{5}{1000} \right) (15 + r) \text{ Solving} \quad R = 1.985 \times 10^3 \Omega$$

57. The variation of acceleration due to(R = Earth's radius):

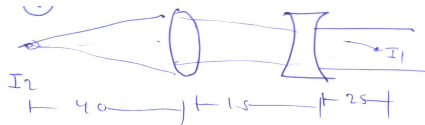


Ans. (1)

58. An external pressure P is should be raised by :

Ans. (2) $P = K \left(\frac{\Delta V}{V} \right)$ $\frac{\Delta V}{V} = \frac{P}{K}$ **Also,** $\frac{\Delta V}{V} = \alpha \Delta T = 3 \alpha \Delta T$
 $\therefore \frac{P}{K} = 3 \alpha \Delta T \therefore \Delta T = \frac{P}{3 \alpha K}$

59. A diverging lens with magnitude of focal Image formed is:



Ans. (2)

real and at a distance of 40 cm from convergent lens.

60. A body of mass $m = 10^{-2} \text{ kg}$ is moving, the value of k will be :

Ans. (4) $vi = vo$

$$kb = \frac{m}{2} vb^2 = \frac{\ln}{\Delta} vo^2 \quad \therefore \quad vb = \frac{v_0}{2} \quad f = -kv^2 = m \frac{dv}{dt} \quad \therefore \quad \frac{-K}{m} \int_0^t dt = \int_{v_0}^{\frac{v_0}{2}} \frac{dv}{v^2}$$

Solving K = $10^{-4} \text{ kg m}^{-1}$



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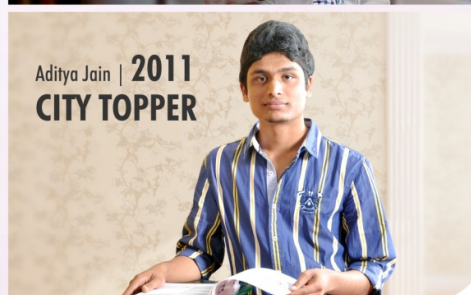
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CHEMISTRY

61. 1 gram of a carbonate (M_2CO_3) M_2CO_3 in $g\ mol^{-1}$ is:

Ans. (1) $\frac{0.01186}{1} = \frac{1}{m} \Rightarrow m = \frac{1}{0.01186} \Rightarrow m = 84.3$

62. Given $C_{(graphite)} + O_2(g) \rightarrow CO_2(g)$ will be:

Ans. (2) $\Delta H_R = -393.5 - 2 \times 285.8 + 890.3 = -393.5 - 571.6 + 890.3 = -74.8\ kJ\ mol^{-1}$

63. The freezing point of benzene benzene will be:

Ans. (3) $0.45 = \frac{\left(1 - \infty + \frac{\infty}{2}\right) \times K_f \times 0.2 \times 1000}{20 \times 60}$ $\frac{20 \times 60 \times 0.45}{0.2 \times 1000 \times 5.12} = 1 - \frac{\infty}{2}$

$\frac{\infty}{2} = 1 - 0.527$ $\infty = 0.9453$ $\infty = 94.6\%$

64. The most abundant elements by by ^2H atoms is:

Ans. (2) kH of $H = \frac{75 \times 10}{100} = 7.5\ kg$

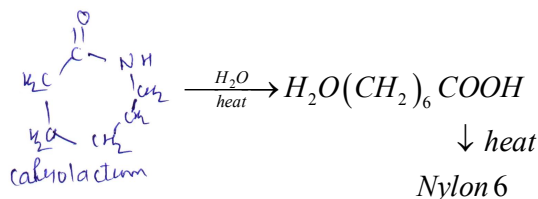
On replacing 'H' by H^2 ωt is doubled so gain = 7.5 Kg

65. ΔU is equal to :

Ans. (2) $\Delta U = q + W$ in Adiabatic work $q = 0$ $\Delta U = W$

66. The formation of which of the following polymers involves hydrolysis reaction?

Ans. (4) Nylon 6



67. Given, the strongest reducing agent is:

Ans. (4) For strongest reducing agent Reduction potential should be lowest $E^\circ_{Cr^{+3}/Cr}$ is lowest so, Answer is Cr.

68. The Tyndall effect is observed only when following conditions are satisfied:

Ans. (1) For tyndall effect diameter $\approx \lambda$

Refractive indices are greatly differs in magnitude.

The answer is (1), which is (b) and (d).

69. In the following reactions, ZnO respectively acting at a/an:

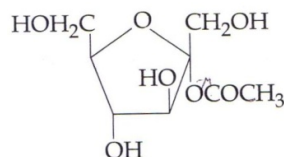
Ans. (3) In $ZnO + Na_2O \longrightarrow Na_2ZnO_2$ ZnO is Acid.

In $ZnO + CO_2 \longrightarrow ZnCO_3$ ZnO is Base.

Acid and Base

70. Which of the following compounds will behave as a reducing sugar in an aqueous KOH solution?

Ans. (4)



71. The major product obtained in the following reaction is:

Ans. (1) $C_6H_5CH = CHC_6H_5$

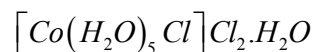
72. Which of the following species is not paramagnetic?

Ans. (1) $CO \Rightarrow \sigma 1s^2 \quad \sigma^* 1s^2 \quad \sigma 2s^2 \quad \pi 2px^2 \quad \pi 2py^2 \quad \sigma^* 2s^2 \quad \sigma 2pz^2$

73. On treatment of 100 mL of The complex is:

Ans. (3) $n_{Ag} = \frac{1.2 \times 10^{22}}{6.023 \times 10^{23}} = 0.2 \times 10^{-1} = 0.02$

$$n_{CoCl_3} \cdot 6H_2O = \frac{0.1 \times 100}{1000} = 0.01$$



74. pK_a of a weak acid salt (AB) solution is:

Ans. (1) $pH = 7 + \frac{3.2 - 3.4}{2} = 6.9$

75. The increasing order of the reactivity of the following halides for the S_N1 reaction is:

Ans. (1) (II) < (I) < (III)

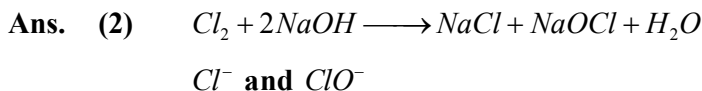
76. Both Jithuim and magnesium is incorrect is:

Ans. (4) Mg forms $MgCO_3$. $Mg(OH)_2$ while Li forms Li_2CO_3 .
Both form basic carbonate.

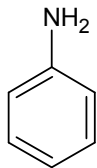
77. The correct sequence of reagents for the following conversion will be:

Ans. (4) $[Ag(NH_3)_2]^+ OH^-, H^+ / CH_3OH, CH_3MgBr$

78. The products obtained when chlorine gas reacts with cold and dilute aqueous NaOH are:



79. Which of the following compounds mono-nitration reaction?



Ans. (2)

80. 3-Methylpent-2-ene on reaction.....for the product is:

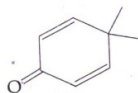
Ans. (3) Four

81. Two reactions R_1 and R_2 have ($R = 8.314 J mol^{-1} K^{-1}$)

Ans. (3) $E_{a1} - E_{a2} = 10 kJ / mole$

$$K_1 = Ae^{-\frac{E_{a1}}{RT}} \quad K_2 = Ae^{-\frac{E_{a2}}{RT}} \quad \frac{K_2}{K_1} = e^{\frac{E_{a1} - E_{a2}}{RT}} \quad \ln \frac{K_2}{K_1} = \frac{E_{a1} - E_{a2}}{RT} = \frac{10 \times 10^3}{8.314 \times 300} = 4$$

82. Which of the following molecules is least resonance stabilized?



Ans. (3)

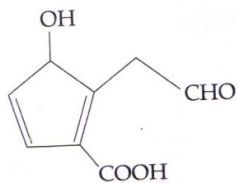
83. The group having isoelectronic species is:

Ans. (4) $O^{2-} \longrightarrow 10e^-$, $F^- \longrightarrow 10e^-$, $Na^+ \longrightarrow 10e^-$, $Mg^{++} \longrightarrow 10e^-$

84. The radius of the second Bohr $\epsilon_0 = 8.854185 \times 10^{-12} kg^{-1} m^{-3} A^2$

Ans. (3) $r = \frac{0.529 \times 2^2}{1} = 0.529 \times 4 = 2.12 \text{ \AA}$

85. The major product obtained in the following reaction is:



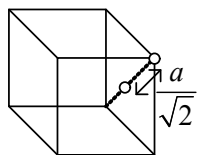
Ans. (4)

86. Which of the following reactions is an example of a redox reaction?

Ans. (4) $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$ $Xe^{+4} \longrightarrow Xe^{+6}$ $O^{+1} \longrightarrow O^0$

87. A metal crystallises in a face metallic crystal will be:

Ans. (3) $\frac{a}{\sqrt{2}}$



88. Sodium salt of an organic acid of $KMnO_4$. 'X' is:

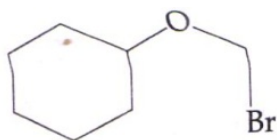
Ans. (3) $Na_2C_2O_4$

89. A water sample has ppm drinking is/are :

Ans. (2) only F^-

90. Which of the following upon colour of bromine?

Ans. (4)



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