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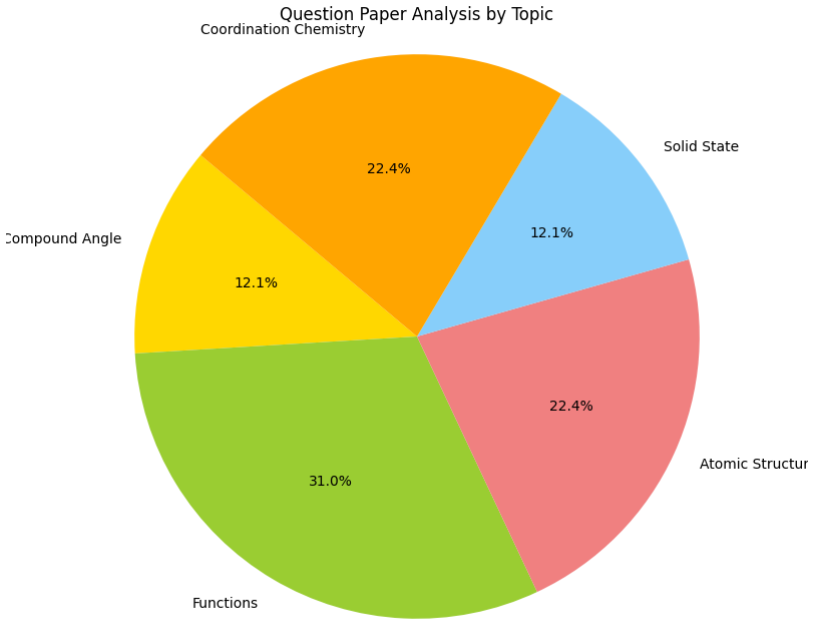
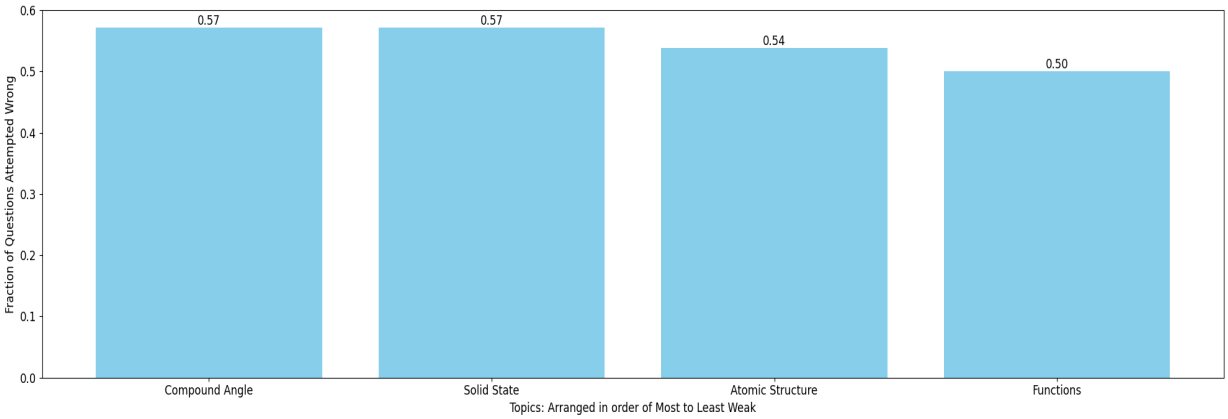
Question Paper Analysis:



Weak Topic Analysis:



Practice Questions:

Compound Angle:

1. The value of $\tan 9^\circ + \tan 36^\circ + \tan 9^\circ \cdot \tan 36^\circ$ is equal to

(A) 2 (B) 1 (C) $\tan 60^\circ$ (D) $\tan 30^\circ$

10. Two parallel chords of a circle of radius 2 are at a distance $\sqrt{3}+1$ apart. If the chords subtend at the centre, angles of $\frac{\pi}{k}$ and $\frac{2\pi}{k}$, where $k > 0$, then the value of [k] is
[Note : [k] denotes the largest integer less than or equal to k]. **[JEE 2010]**

12. In a $\triangle PQR$, if $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then the angle R is equal to **[AIEEE 2012]**

(A) $\frac{5\pi}{6}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

1. (a) If $y = 10\cos^2 x - 6\sin x.\cos x + 2\sin^2 x$, then find the greatest & least value of y.
(b) If $y = 1 + 2\sin x + 3\cos^2 x$, find the maximum & minimum values of $y\ \forall\ x \in R$.
(c) If $a \le 3\cos\left(\theta + \frac{\pi}{3}\right) + 5\cos\theta + 3 \le b$, find a and b.

16. Calculate without using trigonometric tables:

(a) $4\cos 20^\circ - \sqrt{3}\cot 20^\circ$ (b) $\frac{2\cos 40^\circ - \cos 20^\circ}{\sin 20^\circ}$

(c) $\cos^6\frac{\pi}{16} + \cos^6\frac{3\pi}{16} + \cos^6\frac{5\pi}{16} + \cos^6\frac{7\pi}{16}$ (d) $\tan 10^\circ - \tan 50^\circ + \tan 70^\circ$

Solid State:

15. An element has a face-centred cubic (fcc) structure with a cell edge of a. The distance between the centres of two nearest tetrahedral voids in the lattice is: **[Jee Main, April 2019]**

(A) $\sqrt{2a}$ (B) a (C) $\frac{a}{2}$ (D) $\frac{3}{2}a$

38. In a compound, atoms of element Y form ccp lattice and those of element X occupy 2/3rd of tetrahedral voids. The formula of the compound will be: **[AIEEE-08]**

(A) X_4Y_3 (B) X_2Y_3 (C) X_2Y (D) X_3Y_4

14. KCl crystallizes in the same type of lattice as does NaCl. Given that $\frac{r_{Na^+}}{r_{Cl^-}} = 0.5$ and $\frac{r_{Na^+}}{r_{K^+}} = 0.7$

Calculate:

(a) The ratio of the sides of unit cell for KCl to that for NaCl and

(b) The ratio of densities of NaCl to that for KCl.

8. Which of the following statements is/are correct?

(A) In an anti-fluorite structure anions form FCC lattice and cations occupy all tetrahedral voids.

(B) Number of nearest Na^+ ions of another Na^+ in Na_2O crystal will be 8.

(C) Each sphere is surrounded by six voids in two dimensional hexagonal close packed layers

(D) 8 Cs^+ ions occupy the second nearest neighbour locations of a Cs^+ ion

49. The lattice site in a pure crystal cannot be occupied by _____.

(A) molecule (B) ion (C) electron (D) atom

Atomic Structure:

27. The third line in Balmer series corresponds to an electronic transition between which Bohr's orbits in hydrogen

(A) $5 \rightarrow 3$ (B) $5 \rightarrow 2$ (C) $4 \rightarrow 3$ (D) $4 \rightarrow 2$

23. The first Lyman transition in the hydrogen spectrum has DE = 10.2 eV. The same energy change is observed in the second Ballmer transition of :-

(A) Li^{2+} (B) Li^+ (C) He^+ (D) Be^{3+}

10. Which of the following statements in relation to the hydrogen atom is correct ?

(1) 3s, 3p and 3d orbitals all have the same energy **[AIEEE-2005]**

(2) 3s and 3p orbitals are of lower energy than 3d orbitals

(3) 3p orbital is lower in energy than 3d orbital

(4) 3s orbitals is lower in energy than 3p orbital

8. Which of the following sets of quantum number is correct for an electron in 4f orbital ?

[AIEEE-2004]

(1) $n = 3, l = 2, m = -2, s = +\frac{1}{2}$ (2) $n = 4, l = 4, m = -4, s = -\frac{1}{2}$

(3) $n = 4, l = 3, m = +1, s = +\frac{1}{2}$ (4) $n = 4, l = 3, m = +4, s = +\frac{1}{2}$

18. Statement-1 : Emitted radiations will fall in visible range when an electron jump from higher level to n = 2 in Li^{+2} ion.

Statement-2 : First for lines of Balmer series of H-atom belong to visible range.

(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false.

(D) Statement-1 is false, statement-2 is true.

Functions:

8. If $F(n+1) = \frac{2F(n)+1}{2}, n = 2, \ldots\ldots 8F(1) = 2$ then $\frac{F(101)}{26}$ equals

5. Which one of the following function is surjective but not injective?

(A) $f: R \to R, f(x) = x^3 + x + 1$ (B) $f: [0, \infty) \to (0,1]; f(x) = e^{-|x|}$.

(C) $f: R \to R, f(x) = x^3 + 2x^2 - x + 1$ (D) $f: R \to R^+, f(x) = \sqrt{1 + x^2}$

5. Let $f: \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \to R$ be given by $f(x) = (\log(\sec x + \tan x))^3$. Then, **[JEE Ad. 2014]**

(A) f(x) is an odd function (B) f(x) is a one-one function

(C) f(x) is an onto function (D) f(x) is an even function

3. Number of integral values of x in the domain of function $f(x) = \sqrt{\ln\ |\ln\ |x||} + \sqrt{7|x| - |x|^2 - 10]}$ is equal to

(A) 4 (B) 5 (C) 6 (D) 7

2. The sum of all different values of λ for which the equation $4\lambda[x]^2 = \lambda + 12$ has a solution in $[1, \infty)$, is

[Note : [k] denotes greatest integer less than or equal to k.]

(A) 8 (B) 3 (C) 4 (D) 6

PARAGRAPH BASED

Paragraph for question nos. 3 & 4

Let f be an even function satisfying $f(x-2) = f\left(x + \left[\frac{6x^2+13}{x^2+2}\right]\right) \forall x \in R$

and $f(x) = \begin{cases} 3x, & 0 \le x < 1 \\ 4 - x, & 1 \le x \le 4 \end{cases}$

[Note : [y] denotes greatest integer function of y.]