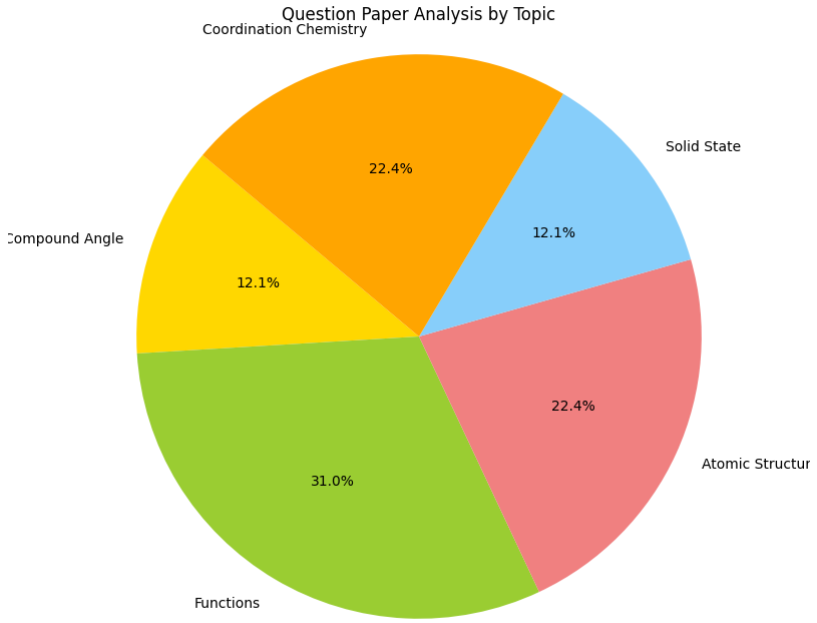
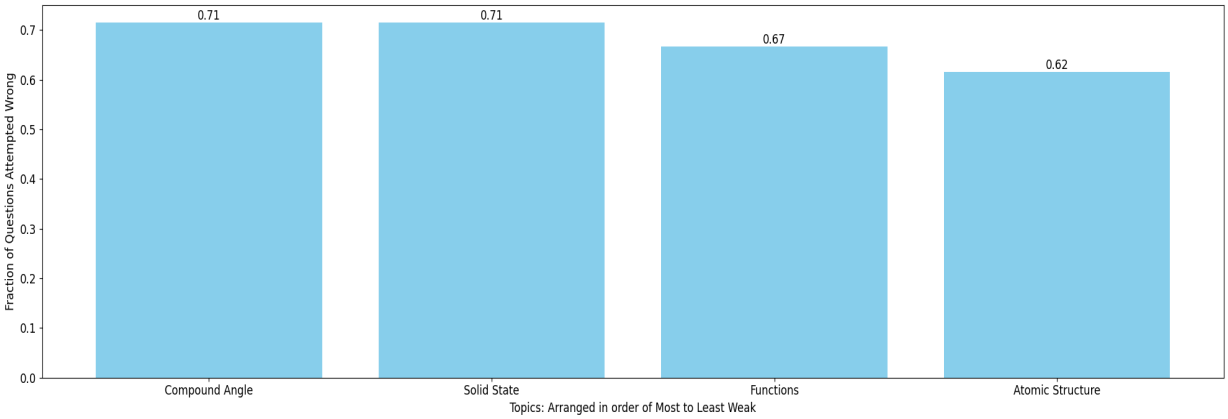
Kunal Agnihotri Total
MLAssist - Personalised DPP

Question Paper Analysis:



Weak Topic Analysis:



Practice Questions:

Compound Angle:

6. Prove that: $\cos^2\alpha + \cos^2(\alpha+\beta) - 2\cos\alpha \cdot \cos\beta \cos(\alpha+\beta) = \sin^2\beta$

5. Which of the following relations is (are) possible?

(A) $\sin\theta = \frac{\pi}{2}$ (B) $\tan\theta = 2016$

C) $\cos\theta = \frac{1+t^2}{1-t^2} (t \neq 0, \pm 1)$ (D) $\sec\theta = \frac{3}{4}$

20. (a) If $A + B + C = \pi$; prove that $\tan^2\frac{A}{2} + \tan^2\frac{B}{2} + \tan^2\frac{C}{2} \geq 1$.

(b) Prove that the triangle ABC is equilateral iff , $\cot A + \cot B + \cot C = \sqrt{3}$.

5. If θ and ϕ are acute angles satisfying $\sin\theta = \frac{1}{2}, \cos\phi = \frac{1}{3}$, then $\theta + \phi \in$

[JEE 2004 (Screening)]

(A) $\left(\frac{\pi}{3}, \frac{\pi}{2}\right]$ (B) $\left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$ (C) $\left(\frac{2\pi}{3}, \frac{5\pi}{6}\right)$ (D) $\left(\frac{5\pi}{6}, \pi\right)$

14. If $A + B + C = \pi$, prove that $\sum\left(\frac{\tan A}{\tan B \cdot \tan C}\right) = \sum(\tan A) - 2\sum(\cot A)$.

Solid State:

19. A cubic solid is made up of two elements A and B. Atoms B are at the corners of the cube and A at the body centre. What is the formula of compound?

13. Iron crystallizes in several modifications. At about 910°C, the body-centered cubic '□' form undergoes a transition to the face-centered cubic '**γ**' form. Calculate the ratio of the density of □ iron to that of α iron at the transition temperature.

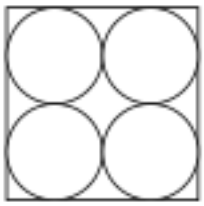
37. Diamond belongs to the crystal system:

(A) Cubic (B) triclinic (C) tetragonal (D) hexagonal

4. The density of CaF_2 (fluorite structure) is 3.18 g/cm^3. The length of the side of the unit cell is

(A) 253 pm (B) 344 pm (C) 546 pm (D) 273 pm

1. Identical 4 spheres are taken and are arranged in a layer of square packing touching each other as shown



The percentage of vacant space is

(A) $100\left(1-\frac{3\pi}{8}\right)$ (B) $100\left(1-\frac{\pi}{6}\right)$ (C) $100-\frac{3\pi}{8}$ (D) $\frac{\pi}{6}$

Functions:

8. Let g: R → R defined by $g(x) = \{e^x\}$, where {x} denotes fractional part function.

Statement-1 : g(x) is periodic function.

Statement-2 : {x} is periodic function.

(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 statement2 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

MULTIPLE CORRECTTYPE

7. A function f: R → R is such that $f\left(\frac{1-x}{1+x}\right) = x$ for all $x \neq -1$. Prove the following.

(a) $f(f(x)) = x$

(b) $f(1/x) = -f(x), x \neq 0$ (c) $f(-x-2) = -f(x) - 2$

22. If $g(x) = x^2 + x - 1$ and $(gof)(x) = 4x_2 - 10x + 5$, then $f\left(\frac{5}{4}\right)$ is equal to: **[JEE - Main 2020]**

(A) $-\frac{1}{2}$ (B) $\frac{3}{2}$ (C) $\frac{-3}{2}$ (D) $\frac{1}{2}$

5. Solve the following problems from (a) to (e) on functional equation.

(a) The function f(x) defined on the real numbers has the property that $f(f(x)) \cdot (1 + f(x)) = -f(x)$ for all x in the domain of f. If the number 3 is in the domain and range of f, compute the value of f(3).

(b) Suppose f is a real function satisfying $f(x + f(x)) = 4\,f(x)$ and $f(1) = 4$. Find the value of f(21).

(c) Let ' f ' be a function defined from $R^+ \to R^+$. If $[f(xy)]^2 = x(f(y))^2$ for all positive numbers x and y and $f(2) = 6$, find the value of f(50).

(d) Let f be a function such that $f(3) = 1$ and $f(3x) = x + f(3x - 3)$ for all x. Then find the value of f(300).

36. For p, q ∈ R, consider the real valued function $f(x) = (x - p)^2 - q$, x ∈ R and q > 0. Let a_1, a_2, a_3 and a_4 be in an arithmetic progression with mean p and positive common difference. If $|f(a_i)| = 500$ for all I = 1, 2, 3, 4, then the absolute difference between the roots of f(x) = 0 is: **[JEE - Main 2022]**

Atomic Structure:

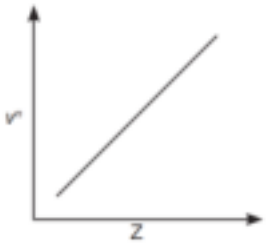
27. The third line in Balmer series corresponds to an electronic transition between which Bohr's orbits in hydrogen

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

48. For a valid Bohr orbit, its circumference should be:

(A) $= n\lambda$ (B) $= (n-1)\lambda$ (C) $> n\lambda$ (D) $< n\lambda$

56. It is observed that characteristic X-ray spectra of elements show regularity. When frequency to the power "n" i.e, ν of X-rays emitted is plotted against atomic number "Z", following graph is obtained. **[JEE Main (April) 2023]**



The value of "n" is

(A) 3 (B) 2 (C) 1 (D) 1/2

Ans. **D**

22. The angular momentum of an electron in a given orbit is J, Its kinetic energy will be :

(A) $\frac{1}{2}\frac{J^2}{mr^2}$ (B) $\frac{Jv}{r}$ (C) $\frac{J^2}{2m}$ (D) $\frac{J^2}{2\pi}$

Spectrum

6. Correct order of radius of the Ist orbit of H, He^+, Li^{2+}, Be^{3+} is :

(A) $H > He^+ > Li^{2+} > Be^{3+}$ (B) $Be^{3+} > Li^{2+} > He^+ > H$

(C) $He^+ > Be^{3+} > Li^{2+} > H$ (D) $He^+ > H > Li^{2+} > Be^{3+}$