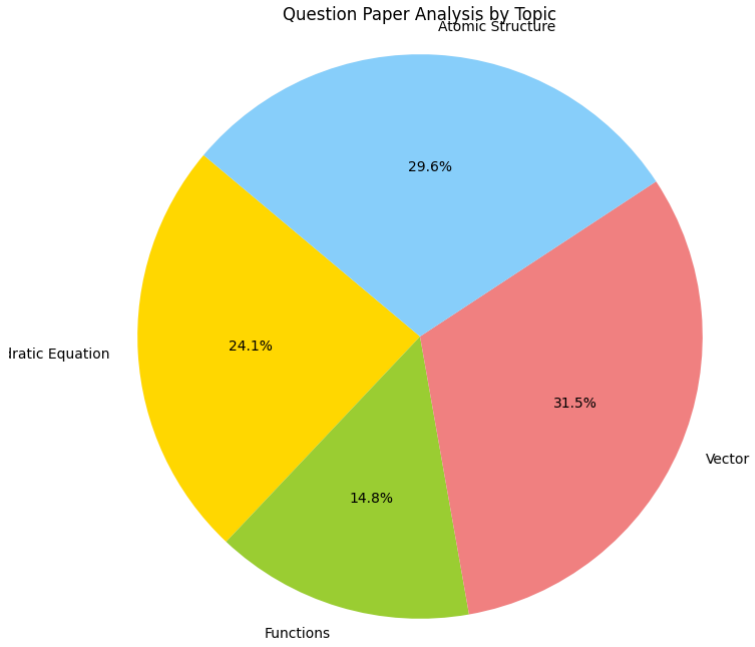
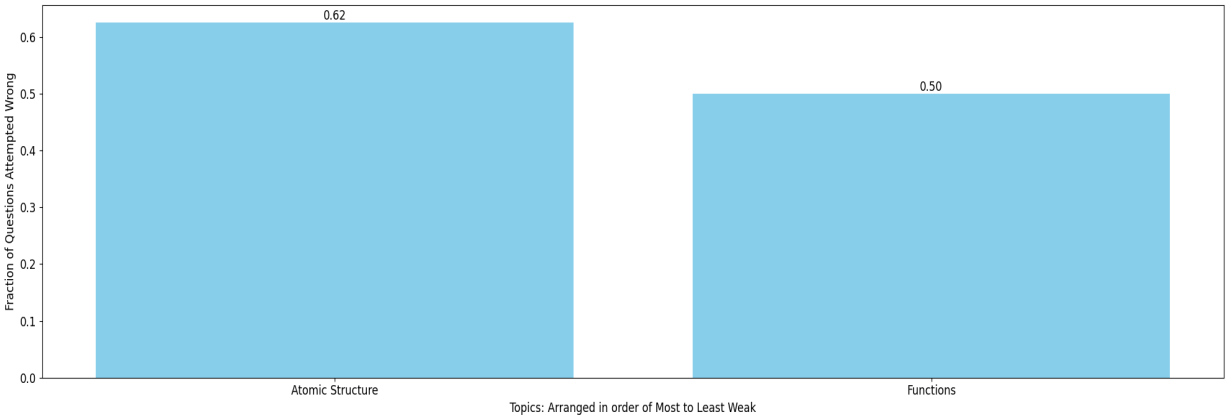
Sourasish Mitra Total
MLAssist - Personalised DPP

Question Paper Analysis:



Weak Topic Analysis:



Practice Questions:

Atomic Structure:

18. For the given orbital in Column 1, the only CORRECT combination for any hydrogen- like species is

(A) (IV) (iv) (R) (B) (II) (ii) (P) (C) (III) (iii) (P) (D) (I) (ii) (S)

1. Which of the following could be derived from Rutherford's α-particle scattering experiment-

(A) Most of the space in the atom is empty

(B) The radius of the atom is about 10^{-10} m while that of nucleus is 10^{-15}m

(C) Electrons move in a circular path of fixed energy called orbits

(D) Radius of nucleus is directly proportional to cubic root of mass number.

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10. Consider the following nuclear reactions involving X & Y.

$$X \longrightarrow Y + {}^{2}_{4}He$$

$$Y \longrightarrow {}_{8}O^{18} + {}_{1}H^{1}$$

If both neutrons as well as protons in both the sides are conserved in nuclear reaction then moles of neutrons in 4.6 gm of X

(A) 2.4 N_A (B) 2.4 (C) 4.6 (D) 0.2 N_A

20. The electrons identified by quantum numbers n and l : **[AIEEE-2012]**

(a) n = 4 , ℓ = 1 (b) n = 4, ℓ = 0 (c) n = 3, ℓ = 2 (d) n = 3, ℓ = 1

Can be placed in order of increasing energy as

(1) (a) < (c) < (b) < (d) (2) (c) < (d) < (b) < (a)

(3) (d) < (b) < (c) < (a) (4) (b) < (d) < (a) < (c)

42. If p is the momentum of the fastest electron ejected from a metal surface after the irradiation of light having wavelength λ, then for 1.5 p momentum of the photoelectron, the wavelength of the light should be : (Assume kinetic energy of ejected photoelectron to be very high in comparison to work function) : **[JEE Main (April) 2019]**

(1) $\frac{3}{4}\lambda$ (2) $\frac{4}{9}\lambda$ (3) $\frac{1}{2}\lambda$ (4) $\frac{2}{3}\lambda$

Functions:

38. Let R_1 and R_2 be relations on the set {1, 2.....50} such that
$R_1 = \{(p, p^n) : p \text{ is a prime and } n \geq 0 \text{ is an integer}\}$ and
$R_2 = \{(p, p^n) : p \text{ is a prime and } n = 0 \text{ or } 1\}$.
Then, the number of elements in $R_1 - R_2$ is _____. **[JEE - Main 2022]**

3. If the functions f(x) and g(x) are defined on $R \to R$ such that

$f(x) = \begin{cases} x+3, & x \in \text{ rational} \\ 4x, & x \in \text{ irrational} \end{cases}$ and $g(x) = \begin{cases} x+\sqrt{5}, & x \in \text{ irrational} \\ -x, & x \in \text{ rational} \end{cases}$ then $(f-g)(x)$ is

(A) one - one and onto (B) neither one-one nor onto

(C) one-one but not onto (D) onto but not one-one

35. Let α, β and γ be three positive real numbers, let $f(x) = \alpha x^5 + \beta x^3 + \gamma x, x \in R$ and $g : R \to R$ be such that $g(f(x)) = x$ for all $x \in R$. If $a_1, a_2, a_3, \ldots a_n$ be in arithmetic progression with mean zero, then the value of $f\left(g\left(\frac{1}{n}\sum_{i=1}^{n} f(a_i)\right)\right)$ is equal to **[JEE - Main 2022]**

(A) 0 (B) 3 (C) 9 (D) 27

42. Let $A = \{1, 2, 3, 4, ..., 10\}$ and $B = \{0, 1, 2, 3, 4\}$. The number of elements in the relation $R = \{(a, b) \in A \times A : 2(a - b)^2 + 3(a - b)^2 + 3(a - b) \in B\}$ is _____. **[JEE - Main 2023]**

9. The set of real values of ' x ' satisfying the equality $\left[\frac{3}{x}\right] + \left[\frac{4}{x}\right] = 5$ (where [ ] denotes the greatest integer function) belongs to the interval (a, b/c] where a, b, c $\in$ N and b/c is in its lowest form. Find the value of a +b + c + abc.