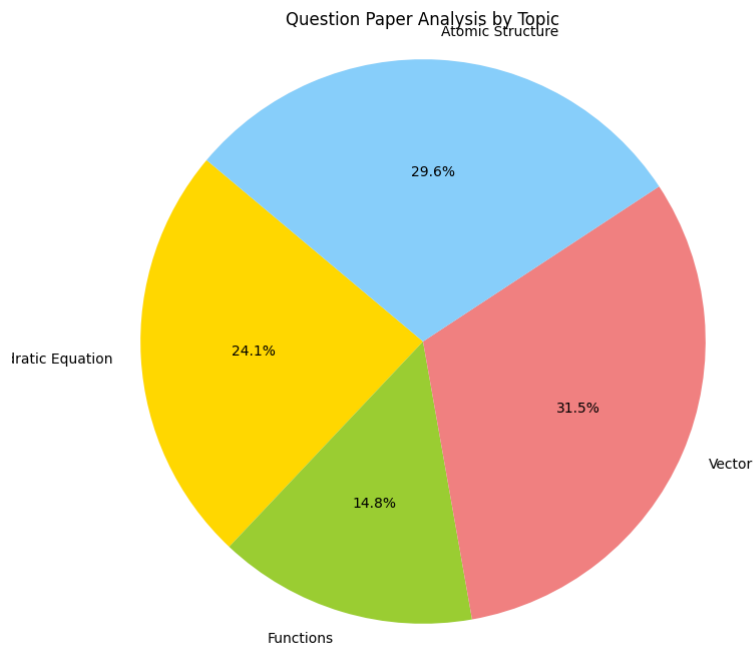
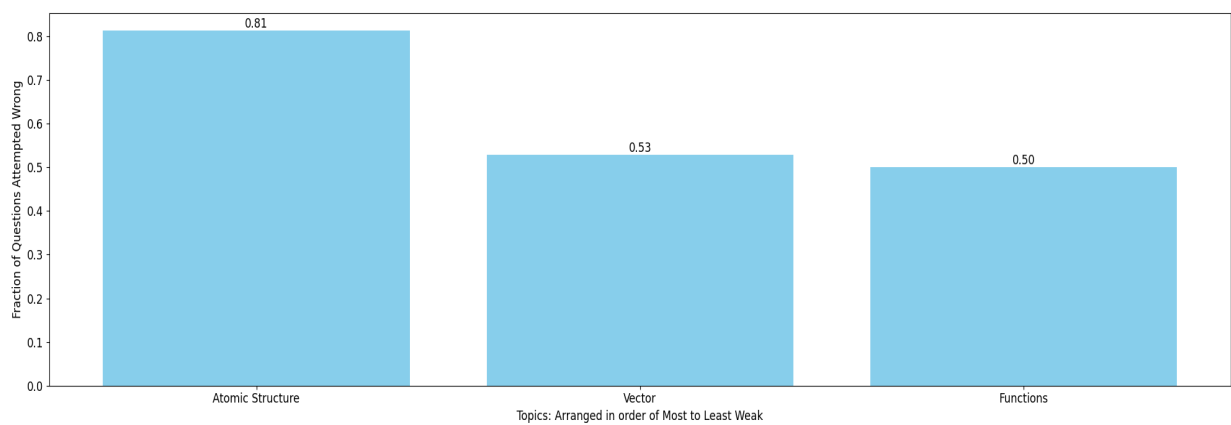


Rahul kumar Total  
MLAssist - Personalised DPP

Question Paper Analysis:



Weak Topic Analysis:



### Practice Questions:

#### Atomic Structure:

3. A sodium street light gives off yellow light that has a wavelength of 600 nm. Then

(For energy of a photon take  $E = \frac{12400 \text{ eV } \text{\AA}}{\lambda (\text{\AA})}$ )

- (A) frequency of this light is  $7 \times 10^{14} \text{ s}^{-1}$  (B) frequency of this light is  $5 \times 10^{14} \text{ s}^{-1}$   
(C) wave number of the light is  $3 \times 10^6 \text{ m}^{-1}$  (D) energy of the photon is approximately 2.07 eV

5. (a) The Schrodinger wave equation for hydrogen atom is [IIT-2004]

$$\psi_{2s} = \frac{1}{4(2\pi)^{1/2}} \left( \frac{1}{a_0} \right)^{3/2} \left( 2 - \frac{r_0}{a_0} \right) e^{-r/a}$$

Where  $a_0$  is Bohr's radius. Let the radial node in 2s be at  $r_0$ . Then find  $r_0$  in terms of  $a_0$ .

- (b) A base ball having mass 100 g moves with velocity 100 m/s. find out the value of wavelength of base ball.

29. The ratio of difference in wavelengths of 1<sup>st</sup> and 2<sup>nd</sup> lines of Lyman series in H-like atom to difference in wavelength for 2<sup>nd</sup> and 3<sup>rd</sup> lines of same series is:

- (A) 2.5 : 1 (B) 3.5 : 1 (C) 4.5 : 1 (D) 5.5 : 1

42. The wavelength associated with a golf weighing 200g and moving at a speed of 5m/h is of the order

- (A)  $10^{-10} \text{ m}$  (B)  $10^{-20} \text{ m}$  (C)  $10^{-30} \text{ m}$  (D)  $10^{-40} \text{ m}$

54. If the work function of a metal is  $6.63 \times 10^{-19} \text{ J}$ , the maximum wavelength of the photon required to remove a photoelectron from the metal is \_\_\_\_\_ nm. (Nearest integer) [Given:  $h =$

#### Vector:

49. Let  $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ ;  $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$ ;  $\vec{c} = c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$  be three non-zero vectors such that  $\vec{c}$  is a unit vector perpendicular to both  $\vec{a}$  &  $\vec{b}$ . If the angle between  $\vec{a}$  &  $\vec{b}$  is  $\frac{\pi}{6}$ , then

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}^2 =$$

- (A) 0 (B) 1  
(C)  $\frac{1}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)$  (D)  $\frac{3}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)(c_1^2 + c_2^2 + c_3^2)$

14. Find the angle formed by  $2\vec{a} + \vec{b}$  and  $\vec{b}$ .

46. Let  $a, b, c \in \mathbb{R}$  be such that  $a^2 + b^2 + c^2 = 1$ . If  $a \cos \theta = b \cos \left( \theta + \frac{2\pi}{3} \right) = c \cos \left( \theta + \frac{4\pi}{3} \right)$ , where  $\theta = \frac{\pi}{9}$ , then the angle between the vectors  $a\hat{i} + b\hat{j} + c\hat{k}$  and  $b\hat{i} + c\hat{j} + a\hat{k}$  is : [JEE (Main)-2020]

- (1)  $\frac{\pi}{2}$  (2) 0 (3)  $\frac{\pi}{9}$  (4)  $\frac{2\pi}{3}$

23. Three lines

$$L_1 : \vec{r} = \lambda\hat{i}, \lambda \in \mathbb{R}$$

$$L_2 : \vec{r} = \hat{k} + \mu\hat{j}, \mu \in \mathbb{R} \text{ and}$$

$$L_3 : \vec{r} = \hat{i} + \hat{j} + v\hat{k}, v \in \mathbb{R}$$

are given. For which point(s) Q and L<sub>2</sub> can we find a point P on L<sub>1</sub> and a point R on L<sub>3</sub> so that P, Q and R are collinear ? [JEE (Advanced)-2019]

- (1)  $\hat{k} + \frac{1}{2}\hat{j}$  (2)  $\hat{k} + \hat{j}$  (3)  $\hat{k}$  (4)  $\hat{k} - \frac{1}{2}\hat{j}$

63. Let the vectors  $\vec{a} = (1+t)\hat{i} + (1-t)\hat{j} + \hat{k}$ ,  $\vec{b} = (1-t)\hat{i} + (1+t)\hat{j} + 2\hat{k}$  and  $\vec{c} = t\hat{i} + t\hat{j} + \hat{k}$ ,  $t \in \mathbb{R}$  such that for  $\alpha, \beta, \gamma \in \mathbb{R}$ ,  $\alpha\vec{a} + \beta\vec{b} + \gamma\vec{c} = \vec{0} \Rightarrow \alpha = \beta = \gamma = 0$ . Then, the set of all values of t is: [JEE (Main)-2021]

### Functions:

5. Let  $f: (-\infty, 2] \rightarrow [6, \infty)$  be defined as  $f(x) = 4x^2 - 16x + 22$  and  $g(x)$  is a function such that graphs of  $f(x)$  and  $g(x)$  are mirror image of each other with respect to line  $x - y = 0$ , then  $g(10)$  is equal to  
 (A) 1 (B) 2 (C) 3 (D) 4
2. For the function  $f(x) = \frac{x+1}{e^x-1}$ , if  $n(d)$  denotes the number of integers which are not in its domain and  $n(r)$  denotes the number of integers which are not in its range, then  $n(d) + n(r)$  is equal to  
 (A) 2 (B) 3 (C) 4 (D) Infinite
4. Let  $f: [0, a] \rightarrow S$  be a function defined by  $f(x) = 3\cos \frac{x}{2}$ . If the largest value of  $a$  for which  $f(x)$  has
5. If  $f(x) + 2f\left(\frac{1}{x}\right) = 3x, x \neq 0$  and  $S = \{x \in \mathbb{R}: f(x) = f(-x)\}$ ; then  $S$  : **[JEE - Main 2016]**  
 (A) contains exactly one element.  
 (B) contains exactly two elements.  
 (C) contains more than two elements  
 (D) is an empty set.
4. Classify the following functions  $f(x)$  defined in  $\mathbb{R} \rightarrow \mathbb{R}$  as injective, surjective, both or none .  
 (a)  $f(x) = \frac{x^2+4x+30}{x^2-8x+18}$   
 (b)  $f(x) = x^3 - 6x^2 + 11x - 6$   
 (c)  $f(x) = (x^2 + x + 5)(x^2 + x - 3)$