CHAPTER 2

Structure of Atom

CBSE · Chemistry · Class 11

WHAT THIS CHAPTER DOES

Boards prep that builds confidence, not anxiety.

TODAY'S MISSION

Today's Mission

WHY THIS MATTERS

Why this chapter matters

TOPIC

A

Part A — Discovery of Sub-atomic Particles

TOPIC

Three particles, three discoveries

POINT 1	POINT 2	POINT 3	POINT 4

TOPIC

Particle data — memorise these constants

TOPIC

B

Part B — Early Atomic Models

TOPIC

Thomson vs Rutherford — two atoms compared

POINT 1	POINT 2	POINT 3

TRY IT · SOLVE BEFORE YOU PEEK

Quick Test — alpha-scattering

In Rutherford's experiment, only 1 in 20,000 alpha particles bounced back. What does this tell us about the nucleus?

SOLUTION

ANSWER 3

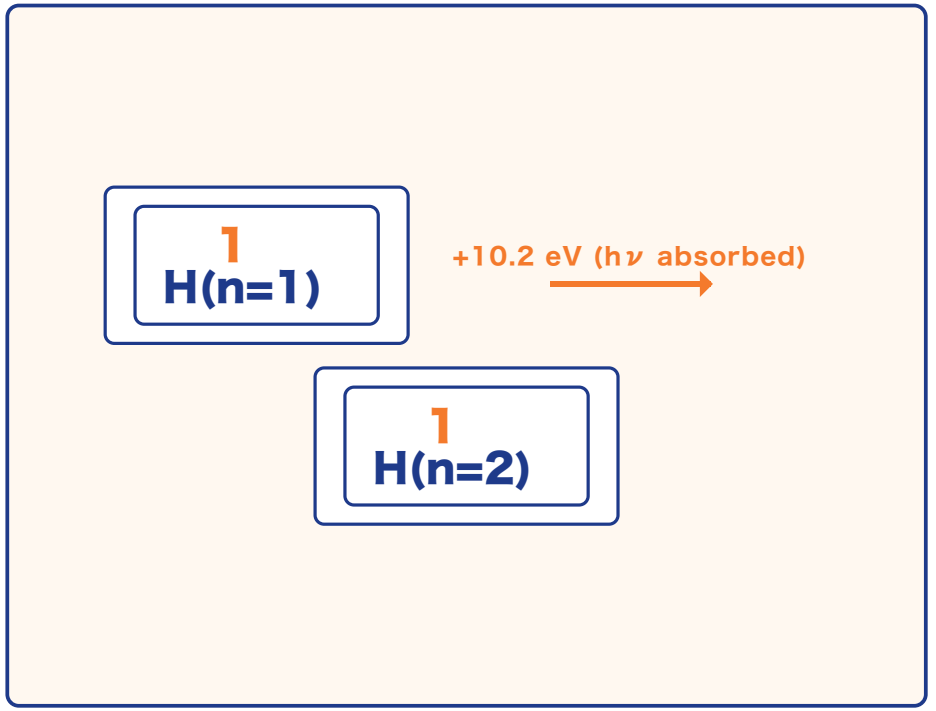
TOPIC

C

Part C — Bohr's Model & H-Spectrum

WORKED EXAMPLE

Worked Example 1 — Bohr energy of n=2 level



TOPIC

H-Spectrum — five series at a glance

WORKED EXAMPLE

Worked Example 2 — First Balmer line wavelength

TOPIC

Bohr postulates — memorise in 30 seconds

TOPIC

D

Part D — Dual Nature & Uncertainty

TOPIC

Two paradigm shifts: de Broglie + Heisenberg

POINT 1	POINT 2	POINT 3	POINT 4

WORKED EXAMPLE

Worked Example 3 — de Broglie wavelength of electron

TOPIC

E

Part E — Quantum Numbers & Configurations

TOPIC

Four quantum numbers — the electron's address

TOPIC

Three filling rules

TOPPER TEMPLATE · MARK-BY-MARK

Topper template — Electronic configuration of Cr (Z=24)

1. **PREDICT BY AUFBAU**
2. **APPLY STABILITY EXCEPTION**
3. **FINAL ANSWER**
4. **SAME LOGIC FOR CU (Z=29)**

PYQ PATTERNS

PYQ patterns — what examiners ask

MARKS DISTRIBUTION

Sub-topic mark distribution

TOPPER TEMPLATE · MARK-BY-MARK

Calculate wavelength/energy/frequency of a spectral line in H-atom

1	**IDENTIFY SERIES + TRANSITION** 1 m	First Balmer line: transition from n=3 to n=2. Series ends at n=2 (visible region).
2	**APPLY RYDBERG / BOHR FORMULA** 1 m	1/lambda = R_H * (1/n1^2 - 1/n2^2) = 1.097e7 * (1/4 - 1/9) = 1.097e7 * (5/36) m^-1 = 1.524e6 m^-1.
3	**COMPUTE LAMBDA + VERIFY REGION** 1 m	lambda = 1/1.524e6 = 6.563e-7 m = 656.3 nm. Lies in visible (red) region — H-alpha line. ✓

TOPPER TEMPLATE · MARK-BY-MARK

State Bohr's postulates (3 marks)

1	**POSTULATE 1: STATIONARY ORBITS** 1 m	Electrons revolve around the nucleus in certain fixed circular paths called stationary states or orbits. In these orbits, electrons do NOT radiate energy.
2	**POSTULATE 2: QUANTISATION OF ANGULAR MOMENTUM** 1 m	Angular momentum of an electron in an allowed orbit is an integral multiple of h/(2*pi), i.e., mvr = n*h/(2*pi), where n = 1, 2, 3, ... is the principal quantum number.
3	**POSTULATE 3: QUANTISED EMISSION/ ABSORPTION** 1 m	Energy is emitted or absorbed ONLY when an electron jumps between orbits. dE = E_high - E_low = h*nu (Planck's relation).

TOPPER TEMPLATE · MARK-BY-MARK

Define / give four quantum numbers (2-3 marks)

1	**PRINCIPAL (N) AND AZIMUTHAL (L)** 1 m	n = 1,2,3...: gives shell, size and energy. l = 0,1,...(n-1): gives subshell shape — s (l=0), p (l=1), d (l=2), f (l=3).
2	**MAGNETIC (M_L) AND SPIN (M_S)** 1 m	m_l = -l, ...0,..., +l: gives orientation of orbital in space, (2l+1) values. m_s = +1/2 or -1/2: gives spin direction of electron.
3	**APPLY TO SPECIFIC ELECTRON (E.G., LAST E- OF CL)** 1 m	Cl (Z=17): 1s^2 2s^2 2p^6 3s^2 3p^5. Last e- in 3p: n=3, l=1, m_l = -1 or 0 or +1, m_s = +1/2 or -1/2 (any consistent set acceptable).

PYQ PATTERNS

Top PYQ patterns to drill

#1	Calculate energy / wavelength / frequency of a transition in H-atom using Bohr's formula E_n = -13.6/n^2 eV (Lyman or Balmer line) (3 marks)	90%
#2	State postulates of Bohr's model OR explain limitations of Bohr's model (why it fails for He, Li) (3 marks)	75%
#3	Write the four quantum numbers for a given electron / give n, l, m_l, m_s for last electron of an element (e.g., Cl, K, Cr) (2 marks)	70%
#4	Calculate de Broglie wavelength of a particle / verify Heisenberg uncertainty for an electron given Dx or Dv (2 marks)	55%
#5	Photoelectric effect	calculate KE of ejected electron, work function W0, or threshold frequency given incident light (3 marks) — 50%

RECAP · MEMORISE THESE

90-second recap

WHAT'S NEXT

Next class

Practice now

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