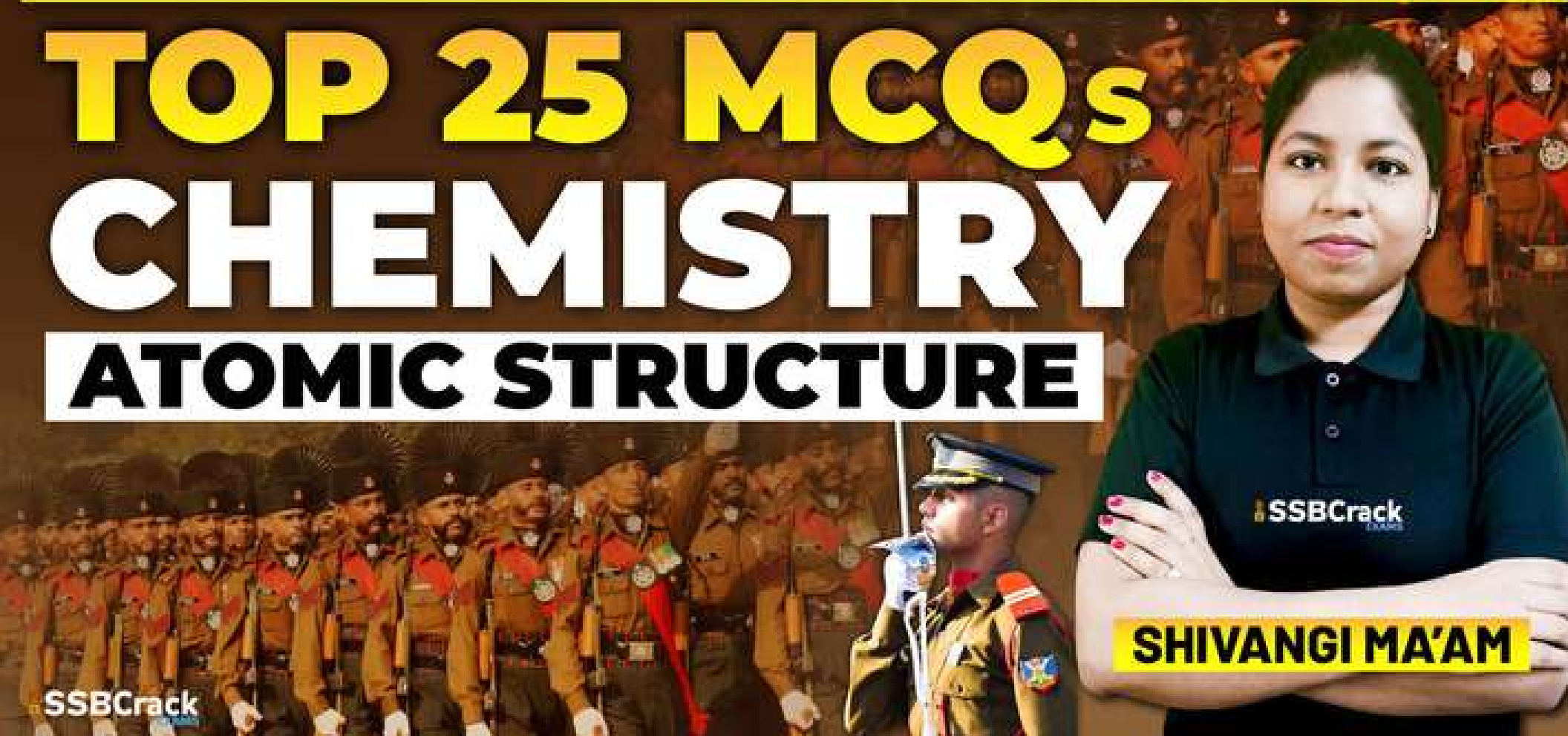


**NDA-CDS-AFCAT 2024**

**TOP 25 MCQs**

**CHEMISTRY**

**ATOMIC STRUCTURE**



**SHIVANGI MA'AM**

SSBCrack

# **A-particles Were Discovered By**

- a) J.J. Thomson
- b) A. Einstein
- c) E. Rutherford
- d) More than one of the above

# A-particles Were Discovered By

a) J.J. Thomson

b) A. Einstein

c) **E. Rutherford**

d) More than one of the above

- Rutherford is also known for the-
- Discovery of alpha and beta radioactivity and
- Discovery of the atomic nucleus (Rutherford model).
- He was also known for Rutherford scattering, Rutherford backscattering spectroscopy, Discovery of the proton, Rutherford Coining the term artificial disintegration.

**The electrons should be filled in energy subshells in order of increasing energy values, is the principle of**

- a) Aufbau
- b) Pauli's exclusion
- c) Hund's law
- d) More than one of the above

**The electrons should be filled in energy subshells in order of increasing energy values, is the principle of**

**a) Aufbau**

b) Pauli's exclusion

c) Hund's law

d) More than one of the above

- Aufbau principle-It states that the atomic orbitals which have lower energies are filled first.
- Then the electron goes to occupy the higher atomic energy levels.

## Which of the following electronic configuration obeys Hund's rule?

- a)  $1s^2, 2s^2, 2p_x^2, 2p_y^1, 2p_z^1$
- b)  $1s^2, 2s^2, 2p_x^2, 2p_y^2, 2p_z^0$
- c)  $1s^2, 2s^2, 2p_x^2, 2p_y^1, 2p_z^0$
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- d) More than one of the above

- According to the Hund's rule, first, electrons having same spins enters the orbitals of the same energy one by one.
- Pairing of electrons does not take place until all the available orbitals of same energy are singly filled, because in this state energy level of subshell is lower.

# Magnetic Quantum Number Determines

- a) Shape of orbitals
- b) Orientation of orbitals
- c) Total energy of an orbital
- d) More than one of the above



# Magnetic Quantum Number Determines

a) Shape of orbitals

**b) Orientation of orbitals**

c) Total energy of an orbital

d) More than one of the above

- Magnetic orbital quantum number
- Denoted by the symbol ' $m_l$ '.
- Gives information about the spatial orientation of the orbital concerning standard set of co-ordinate axis.

**The Element Having Tetra-atomic Atomicity Is \_\_\_\_\_ .**

a) Helium

b) Nitrogen

c) Phosphorous

d) Chlorine

**The Element Having Tetra-atomic Atomicity Is \_\_\_\_\_ .**

a) Helium

b) Nitrogen

**c) Phosphorous**

d) Chlorine

| <b>Atomicity of Some Elements</b> |                  |
|-----------------------------------|------------------|
| <b>Name</b>                       | <b>Atomicity</b> |
| Argon, Helium                     | Monoatomic       |
| Oxygen, Chlorine                  | Diatomic         |
| Nitrogen                          | Diatomic         |
| Phosphorous                       | Tetra – atomic   |
| Sulfur                            | Poly – atomic    |

# Who coined the word 'atom'?

- a) Democritus
- b) Thomson
- c) E Rutherford
- d) John Dalton

# Who coined the word 'atom'?

a) Democritus

b) Thomson

c) E Rutherford

d) John Dalton

| Scientist    | Discovered                          |
|--------------|-------------------------------------|
| Thomson      | Electron                            |
| E Rutherford | Discovered alpha and beta particles |
| John Dalton  | Father of Atomic Theory             |

# Who Was The First To Propose Atomic Theory?

a) J.J. Thomson

b) Rutherford

c) John Dalton

d) Neils Bohr

# Who Was The First To Propose Atomic Theory?

a) J.J. Thomson

b) Rutherford

**c) John Dalton**

d) Neils Bohr

|             |   |
|-------------|---|
| J. Thomson  | Discovered electron, a sub-particle of an atom.   |
| Rutherford  | an atom is composed of an empty space mostly with electrons orbiting in a set predictable path around a fixed positively charged nucleus(Proton+Neutron). |
| John Dalton | First to propose Atomic Theory  |
| Neils Bohr  | Atomic structure and the concept of energy of orbits and quantum theory   |

# Which Of The Following Are True For An Element?

(i) Atomic number = number of protons + number of electrons

(ii) Mass number = number of protons + number of neutrons

(iii) Atomic mass = number of protons = number of neutrons

(iv) Atomic number = number of protons = number of electrons

a) (i) and (ii)

b) (i) and (iii)

c) (ii) and (iv)

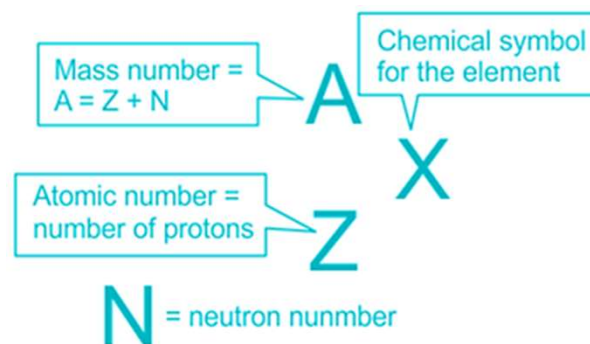
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- b) (i) and (iii)
- c) (ii) and (iv)**
- d) more than one of above



## **One Of The Important Postulations Of Dalton's Atomic Theory Is:**

- A. an atom is made up of electrons, protons and neutrons
- B. atom can be neither created nor destroyed
- C. atoms of the same element are not alike
- D. all elements are available naturally as atoms only

# One Of The Important Postulations Of Dalton's Atomic Theory Is:

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- C. atoms of the same element are not alike
- D. all elements are available naturally as atoms only

- John Dalton discovered atomic theory.
- As per the theory, all matter whether it is a mixture, compound, element, is consists of invisible particles called 'atoms'.

**What Is A Discrete Packet Of Energy Related To Electromagnetic Radiation (Light), In Which Energy Is  $E$  Which Is Proportional To Frequency Of Radiation  $\nu$ .**

a) Photon

b) Thermion

c) Neutron

d) More than one of the above

# What Is A Discrete Packet Of Energy Related To Electromagnetic Radiation (Light), In Which Energy Is $E$ Which Is Proportional To Frequency Of Radiation $\nu$ .

a) Photon

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d) More than one of the above

- A photon is a fundamental particle of light and other forms of electromagnetic radiation. It behaves both as a particle and as a wave, displaying characteristics of both.

**Alpha Particles Are \_\_\_\_\_.**

- a) twice the mass of beta particles
- b) negatively charged
- c) just like helium nuclei
- d) composite particles consisting of one protons and one neutrons

# Alpha Particles Are \_\_\_\_\_.

a) twice the mass of beta particles

b) negatively charged

**c) just like helium nuclei**

d) composite particles consisting of one protons and one neutrons

- Alpha particles consist of two protons and two neutrons bound together into a particle identical to a helium nucleus.
- An alpha particle is like a Helium nucleus that has no electrons and has a valency 2+.

# Which Of The Following Atomic Theory Is Also Known As Plum-pudding Model?

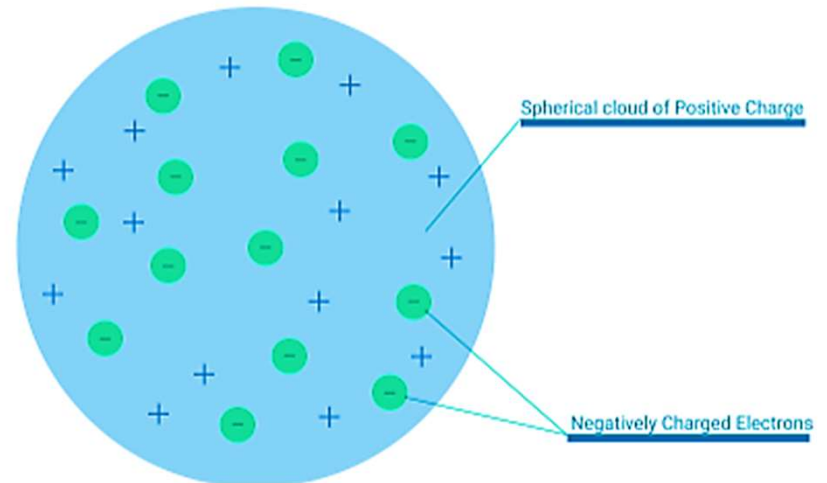
- a) Dalton's Atomic theory
- b) Thomson's atomic model
- c) Rutherford's atomic model
- d) Bohr's atomic model



# Which Of The Following Atomic Theory Is Also Known As Plum-pudding Model?

- a) Dalton's Atomic theory
- b) Thomson's atomic model**
- c) Rutherford's atomic model
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Thomson's Plum-Pudding Model



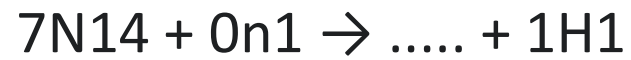
## **Which Of The Following Statement Is NOT Correct Regarding Rutherford's Nuclear Model Of An Atom?**

- a) The size of the nucleus is very large as compared to the size of the atom.
- b) The electrons revolve around the nucleus in circular paths.
- c) There is a positively charged center in an atom called the nucleus.
- d) Nearly all the mass of an atom resides in the nucleus.

# Which Of The Following Statement Is NOT Correct Regarding Rutherford's Nuclear Model Of An Atom?

- a) The size of the nucleus is very large as compared to the size of the atom.
- b) The electrons revolve around the nucleus in circular paths.
- c) There is a positively charged center in an atom called the nucleus.
- d) Nearly all the mass of an atom resides in the nucleus.
- Most of the space inside the atom is empty because most of the  $\alpha$ -particles passed through the gold foil without getting deflected.
  - Very few particles were deflected from their path, indicating that the positive charge of the atom occupies very little space.

# Complete The Reaction



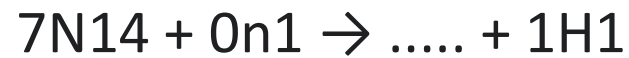
a)  ${}^6\text{C}^{14}$

b)  ${}^6\text{C}^{13}$

c)  ${}^6\text{C}^{12}$

d)  ${}^7\text{N}^{15}$

# Complete The Reaction



a) **6C14**

b) 6C13

c) 6C12

d) 7N15

- After the reaction, one Hydrogen is produced.
- To maintain the no of electrons, an atom with 6 electrons and mass = 14 must be produced.

# How Many Values Of Spin Quantum Number Is Possible?

- a) 2
- b) 3
- c) 4
- d) More than one of the above

# How Many Values Of Spin Quantum Number Is Possible?

a) 2

b) 3

c) 4

d) More than one of the above

- first electron filled in the orbital will have a spin of  $+1/2$ . The electrons start pairing up once all the orbitals are half-filled by one electron each.
- The second electron to fill the orbital will have a spin of  $-1/2$ .

# The Difference In Isotopes Of An Element Is

\_\_\_\_\_.

- a. Mass number
- b. Atomic number
- c. Number of electrons
- d. Number of protons



# The Difference In Isotopes Of An Element Is

---

a. Mass number

b. Atomic number

c. Number of electrons

d. Number of protons

- Isotopes are atoms of the same element that have different numbers of neutrons but the same number of protons and electrons.
- The difference in the number of neutrons between the various isotopes of an element means that the various isotopes have different masses.

**If An Element A Atom Has 18 Protons, It Follows That A Has 18 Electrons. So, The Number Of Electrons In An A+ Will Be -**

- a) 21
- b) 20
- c) 19
- d) 17

**If An Element A Atom Has 18 Protons, It Follows That A Has 18 Electrons. So, The Number Of Electrons In An A+ Will Be -**

a) 21

b) 20

c) 19

**d) 17**

- A+ ion will have one fewer electron than a neutral A atom. Given that the neutral A atom has 18 electrons, the A+ ion will have 17 electrons

**What Is The Maximum Number Of Electrons That The Third Orbit Or M-shell Can Have?**

a) 32

b) 8

c) 18

d) 2

# What Is The Maximum Number Of Electrons That The Third Orbit Or M-shell Can Have?

a) 32

b) 8

- The maximum number of electrons that can be accommodated in the M shell of an atom is 18.

**c) 18**

d) 2

**Atomic Number Of A Nucleus Is Z And Atomic Mass Is M. Find The Number Of Neutrons.**

a)  $M - Z$

b)  $M$

c)  $Z$

d)  $M + Z$

**Atomic Number Of A Nucleus Is  $Z$  And Atomic Mass Is  $M$ . Find The Number Of Neutrons.**

a)  $M - Z$

b)  $M$

c)  $Z$

d)  $M + Z$

- No. of neutrons = Total No. of nucleons – No. of protons

## **Isotopes Have :**

- a) Equal No. Of Neutrons
- b) Equal No. Of Protons
- c) Equal No. Of Neutrons But Unequal No. Of Protons
- d) None



## Isotopes Have :

a) Equal No. Of Neutrons

**b) Equal No. Of Protons**

c) Equal No. Of Neutrons But Unequal No. Of Protons

d) None

- It is defined as the atoms which have the same number of protons (or same atomic number) but have different neutrons.
- Example:  $^{35}_{17}\text{Cl}$  and  $^{37}_{17}\text{Cl}$  are isotopes of chlorine.

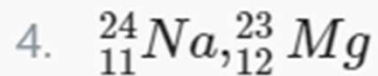
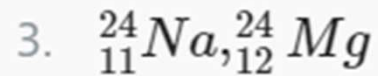
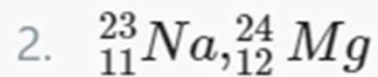
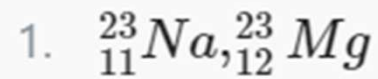
**Atoms of different elements with different atomic numbers, which have the same mass number are known as \_\_\_\_\_**

- a) isomers
- b) isotones
- c) isotopes
- d) isobars

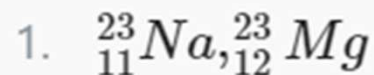
**Atoms of different elements with different atomic numbers, which have the same mass number are known as \_\_\_\_\_**

- a) isomers
- b) isotones
- c) isotopes
- d) isobars**

**Which among the following is a pair of isotones?**



## Which among the following is a pair of isotones?



- Isotones are nuclides that have the equal number of neutrons (N) but a different number of protons in them (Z).
- Example: Boron-12 and Carbon-13 both have seven neutrons (6).

**Ans: (2)**

# Alkali metals are assigned which group in the Modern Periodic Table?

- a) Second group
- b) Eighteenth group
- c) Third group
- d) First group

# Alkali metals are assigned which group in the Modern Periodic Table?

a) Second group

b) Eighteenth group

c) Third group

**d) First group**

- Group 1 elements in the Periodic table are known as Alkali metals
- They have  $ns^1$  outermost configuration and belong to the S-block Elements.
- They also have a strong tendency to donate their valence electrons in the outermost shell to form strong ionic bonds.
- It contains elements from Lithium (Li) to Francium (Fr).

# What is common among Lithium, Sodium and Potassium?

- a) These have one electron in their outermost shell
- b) They are alkaline earth metals
- c) These cannot form oxides
- d) These are inert elements



# What is common among Lithium, Sodium and Potassium?

a) These have one electron in their outermost shell

b) There are alkaline earth metals

c) These cannot form oxides

d) These are inert elements

- Lithium (Li), Sodium (Na), and Potassium (K) has one electron in their outermost orbits.
- They belong to group 1 and hence they are Alkali Metals and not alkali earth metal.
- Lithium can form lithium oxide, Sodium forms Sodium oxide and Potassium can form Potassium peroxide in the presence of oxygen.
- They are not Inert elements as they react with other compounds.

**\_\_\_\_\_ elements have the largest atoms.**

a) F

b) O

c) H

d) Li

## \_\_\_\_\_ elements have the largest atoms.

a) F

b) O

c) H

d) Li

- Lithium (Li) element has the largest atom.
- Largest atom is defined by its atomic radius i.e. the distance between nucleus to its outermost orbit/ valency shell.
- As we move from left to right in the periodic table the atomic radius decreases.
- But as we go down the period in the periodic table the atomic radius increases.
- Hence lithium has the largest atom and it is greater than Hydrogen (H), Oxygen (O) and Fluorine(F).

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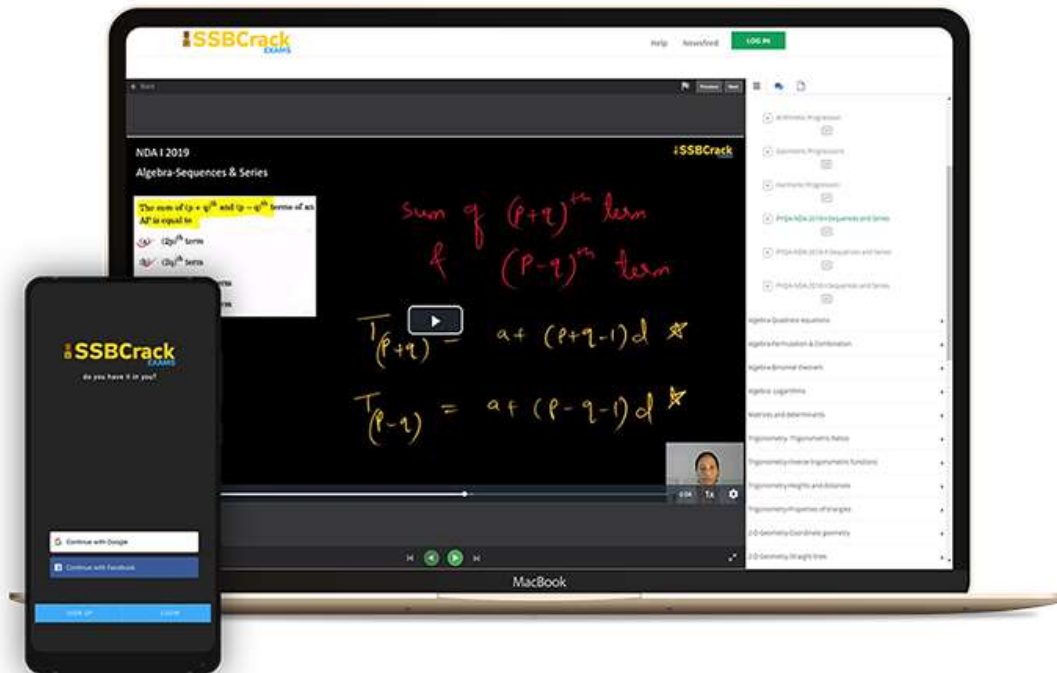
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