

4. PERIODIC CLASSIFICATION OF ELEMENTS

<https://subarnam.com.np/>

Modern Periodic Law and Modern Periodic Table

Classification of elements into different groups, periods, and blocks

1. What is a group in the periodic table? 2
2. Write short notes on the characteristics of s, p, d, and f blocks of elements. 5
3. Name the four blocks of elements in the periodic table. Write their general electronic configuration: Mention at least three characteristics of each block. 5
4. X, Y, and Z represent elements of atomic numbers 1, 6, and 17, respectively.
 - a) Write down the electron structure respectively.
 - b) Place the element in the appropriate group of the periodic table.
5. The valence shell electronic configuration of two atoms A and B are $4s^1$ and $3s^2 3p^5$, respectively.
 - a) Write their atomic number.
 - b) Name their group in the periodic table. 2
6. Classify the first 30 elements of the periodic table into s, p, d, and f blocks. 3
7. A young British physicist, Henry Moseley, with the help of X-ray diffraction spectra in crystals, established the relationship between the properties of elements with atomic number.
 - a. State the modern periodic law given by Moseley.
 - b. How is the modern periodic table superior to Mendeleev's periodic table?
 - c. What are the rows and columns of the elements in the periodic table called?
 - d. Mention the number of elements in the 3rd and 4th period of the modern periodic table.
 - e. On what basis are elements classified into blocks?

IUPAC classification of elements

Nuclear charge and effective nuclear charge

8. Calculate the shielding effect(σ) for the last electron of the sodium atom. 1

Periodic Trend and Periodicity

(Study from the book and classwork copy)

9. What is periodicity and its causes? 2
10. "Periodicity in chemical properties is based on the atomic structure". Explain

Periodic Properties of Elements

11. Write short notes on periodic properties of the elements. 5

1 Atomic radius

12. Define atomic radius. 1
13. How do atomic radii vary in a period? 1
14. How does atomic size vary in a horizontal row of the periodic table? Explain how this variation arises? 2
15. How does atomic size vary in a group? 2
16. How do atomic radii vary in a group and why? 2
17. Why does atomic size increase when going down any family of the periodic table?
18. Why do atomic radii decrease across the period and increase in a group with the increase of atomic number? 2

Ionic radius

19. Is the potassium atom larger, smaller, or the same size as a potassium ion? Explain.
20. Why is the size of Cl^- larger than that of the Cl atom, whereas the size of the K^+ ion is smaller than that of the K atom? 2
21. Which among the following pairs would have a large size and why?
a) K or K^+ b) F or F^- . 2
22. The Mg^{2+} and Na^+ have the same number of electrons (ten). Which ion would you expect to have a smaller radius? Explain. 2
23. Which ion would you expect to have a larger size and why? Be^{++} or Li^+
24. Which ion would you expect to have a larger size, and why? Na^+ or Ne
25. Compare the size of F^- and Na^+ with the atomic size of Ne. 2
26. Which of the following is the smallest in size? N^{3-} , O^{2-} , I and Na^+ . Give appropriate reasons. 2

2 Ionization Energy/Ionization Potential (IE/IP)

27. Define ionization energy. 1
28. How do 'Nuclear charge' and 'Size of the atom' influence the magnitude of the ionization energy? 2
29. Write short notes on factors affecting the magnitude of ionization energy.
30. Explain three factors that affect the value of ionization energy. 3
31. What is meant by screening effect? 1
32. Ionization energy of N is greater than that of O. Give reason. 2
33. Why does the first ionization energy increase from left to right in a given period of the periodic table? 2
34. Why is the first ionization energy of Mg greater than that of Na? 2
35. Why is the ionization energy of lithium greater than that of sodium? 1
36. Write short notes on Ionization energy. 2.5
37. Explain why alkali metals have low ionization energies? 1

3 Electron Affinity (EA)

38. What is electron affinity? 1
39. Give one important factor that influences the magnitude of electron affinity. 1
40. Which one, N or O, has more electron affinity and why? 2
41. Predict which of the given has a larger electron affinity and why?
Cl or F. 2
42. How does electron affinity vary in a group? 2
43. The electron affinity values of some elements of group 1 and 17 are given in the following table:

Elements	Li	Na	K	Rb
EA (kJ mol^{-1})	-59.8	-53	-48.9	-46.9

Elements	F	Cl	Br	I	At
EA (kJ mol^{-1})	-328	-349	-324	-295	-270

- i. Define electron affinity.
- ii. Name two factors that affect the value of EA.
- iii. Why does EA decrease from Li to Rb?
- iv. Halogens (group VIIA or 17) have the highest electron affinities in a period. Give reasons.
- v. Why is there a rise of EA from fluorine to chlorine? 1+1+1+1+1

4 Electronegativity

44. Why do oxides O^{2-} and sulphides S^{2-} have negative charges? 2

45. Why do metals form positive and non-metals form negative ions? 2

46. Among the elements of the second period Li to Ne given in table.

Elements	Li	Be	B	C	N	O	F	Ne
----------	----	----	---	---	---	---	---	----

Pick out the element:

- i. with the highest first ionization energy
- ii. with the highest electronegativity
- iii. with the largest atomic radius
- iv. that is the highly reactive metal
- v. that is the highly reactive non-metal

5

...

<https://subarnam.com.np/>