

# Unit 3 – Periodic Table and Periodicity of Properties

## Exercise Questions

### Exercise Multiple Choice Question Answers:

- The atomic radii of the elements in Periodic Table:**  
(a) Increase from left to right in a period (b) Increase from top to bottom in a group  
(c) Do not change from left to right in a period (d) Decrease from top to bottom in a group
- The amount of energy given out when an electron is added to an atom is called:**  
(a) Lattice energy (b) ionization energy (c) Electronegativity (d) Electron affinity
- Mendeleev Periodic Table was based upon the:**  
(a) Electronic configuration (b) atomic mass  
(c) Atomic number (d) completion of a subshell
- Long form of Periodic Table is constructed on the basis of:**  
(a) Mendeleev Postulate (b) Atomic number  
(c) Atomic mass (d) Mass number
- 4<sup>th</sup> and 5<sup>th</sup> period of the long form of Periodic Table are called:**  
(a) Short periods (b) normal periods (c) Long periods (d) Very long periods
- Which one of the following halogen has lowest electronegativity?**  
(a) Flourine (b) chlorine (c) Bromine (d) Iodine
- Along the period, which one of the following decreases:**  
(a) Atomic radius (b) ionization energy (c) Electron affinity (d) Electronegativity
- Transition elements are:**  
(a) All gases (b) all metals (c) All non-metals (d) All metalloids
- Mark the incorrect statement about ionization energy:**  
(a) It is measured in  $\text{kJmol}^{-1}$  (b) It is absorption of energy  
(c) It decreases in a period (d) It decreases in a group
- Point out the incorrect statement about electron affinity:**  
(a) It is measured in  $\text{kJmol}^{-1}$  (b) It involves release of energy  
(c) It decreases in a period (d) It decreases in a group

### ANSWER KEY

1	b	3	b	5	c	7	a	9	c
2	d	4	b	6	d	8	b	10	c

## Exercise Short Questions Answers

### **Q.1 Why noble gases are not reactive?**

**Ans:** Noble gases are not reactive because they have their valence shells completely filled. They have 2 or 8 electrons in their valence shells. Their atoms do not have vacant spaces in their valence shell to accommodate more electrons. Therefore they do not gain, lose or share electrons.

### **Q.2 Why Cesium (at.no.55) requires little energy to release its one electron present in the outermost shell?**

Cesium requires little energy because it has greater atomic size, more shielding effect (due to presence of more electrons) and low ionization energy due to which the hold of inner nucleus on valence.

### **Q.3 How is periodicity of properties dependent upon number of protons in an atom?**

**Ans:** Number of protons in an atom represents atomic number of that element which increases regularly by one from element to element. So the arrangement of elements according to increasing atomic number shows the periodicity in the electronic configuration of the elements that leads to periodicity in their properties.

### **Q.4 Why shielding effect of electrons makes cation formation easy?**

**Ans:** The shielding effect of electrons makes the cation formation easy because it reduces the nuclear pull on the outermost electrons and they are less tightly held by the nucleus and can easily be lost from the outermost shell.

### **Q.5 What is the difference between Mendeleev's periodic law and modern periodic law?**

**Ans:**

<b>Mendeleevs periodic law</b>	<b>Modern periodic law</b>
Properties of the elements are periodic function of their atomic masses.	Properties of the elements are periodic function of their atomic numbers.
Atomic masses is less fundamental property and it is the basis of mendeleevs periodic law.	Atomic number is more fundamental property and it is the basis of modern periodic law.

### **Q.6 What do you mean by groups and periods in a Periodic Table?**

**Ans:** The horizontal rows of elements in a periodic table are called periods. The vertical columns in a periodic table are called group. There are 18 groups in the long form of the periodic table. They are studied from top to bottom.

### **Q.7 Why and how are elements arranged in 4<sup>th</sup> period?**

**Ans:** The elements (Na, Mg, Al, Si, P, S, Cl and Ar) are arranged in the 4<sup>th</sup> period because they are all having four electronic shells and are arranged by increasing atomic number

from left to right the period.

**Q.8 Why the size of atom does not decrease regularly in a period?**

**Ans:** The size of atom does not decrease regularly in a period. This irregularity in the transition metals is due to the involvement of d orbital. It provides poor shielding effect.

**Q.9 Give the trend of ionization energy in a period.**

**Ans:** ionization energy increases from left to right in a period and decreases from top to bottom in a group.

**Reason:**

It is because the size of atoms reduces and valence electrons are held strongly by the electrostatic force of nucleus.

### **Exercise Long Question Answers**

**Q.1 Explain the contributions of Mendeleev for the arrangement of elements in a Periodic Table.**

**Ans:** See Q. No. 3 (Subjective Part, Long Questions Answers)

**Q.2 Show why in a 'period' the size of an atom decreases if one moves from left to right.**

**Ans:** See Q. No. 11 (Subjective Part, Long Questions Answers)

**Q.3 Describe the trends of electronegativity in a period and in a group.**

**Ans:** See Q. No. 15 (Subjective Part, Long Questions Answers)

**Q.4 Discuss the important features of modern Periodic Table.**

**Ans:** See Q. No. 7 (Subjective Part, Long Questions Answers)

**Q.5 What do you mean by blocks in a periodic table and why elements were placed in blocks?**

**Ans:** See Q. No. 8 (Subjective Part, Long Questions Answers)

**Q.6 Discuss in detail the periods in Periodic Table?**

**Ans:** See Q. No. 9 (Subjective Part, Long Questions Answers)

**Q.7 Why and how elements are arranged in a Periodic Table?**

**Ans:** See Q. No. 5 (Subjective Part, Long Questions Answers)

**Q.8 What is ionization energy? Describe its trend in the Periodic Table?**

**Ans:** See Q. No. 13 (Subjective Part, Long Questions Answers)

**Q.9 Define electron affinity, why it increases in a period and decreases in a group in the Periodic Table.**

**Ans:** See Q. No. 14 (Subjective Part, Long Questions Answers)

**Q.10 Justify the statement, bigger size atoms have low ionization energy and have more shielding effect.**

**Ans:** Ionization Energy:

*The amount of energy required to remove the most loosely bound electron from the valence shell of an isolated gaseous atom is called ionization energy."*

**Shielding Effect:**

*"The decrease in the attractive force exerted by the nucleus on the valence shell electrons due to the presence of the electrons lying between the nucleus and valence shell is called shielding effect."*

As we move down the group more and more shells lie between the valence shell and the nucleus of the atom, these additional shells reduce the electrostatic force felt by the electron present in the outermost shell which results more shielding effect by such bigger size atoms. Resultantly the valence shell electrons can be released easily. Therefore bigger size atoms have more shielding effect and low ionization energies.