

REVIEW QUESTIONS

Q.1: Encircle the correct answer:

- (i) Number of periods in the periodic table are:
A. 8
B. 3
C. 16
D. 5
- (ii) Which of the following groups contain alkaline earth metals?
A. 1A
B. IIA
C. VIIA
D. VIIIA
- (iii) Which of the following elements belongs to VIIIA?
A. Na
B. Mg
C. Br
D. Xe
- (iv) Main group elements are arranged in _____ groups.
A. 6
B. 7
C. 8
D. 10
- (v) Period number of ${}_{13}^{27}\text{Al}$ is:
A. 1
B. 2
C. 3
D. 4
- (vi) Valence shell electronic configuration of an element M (atomic no. 14) is:
A. $2s^2 2p^1$
B. $2s^2 2p^2$
C. $2s^2 2p^1$
D. $4s^1$
- (vii) Which of the following elements you expect to have greater shielding

C. K

D. RD

(viii) As you move from right to left across a period, which of the following do not increase:

- A. electron affinity B. ionization energy
C. nuclear charge D. shielding effect

(ix) All the elements of Group IIA are less reactive than alkali metals. This is because these elements have:

- A. low ionization energies.
B. relatively greater atomic sizes
C. similar electronic configuration
D. decreased nuclear charge

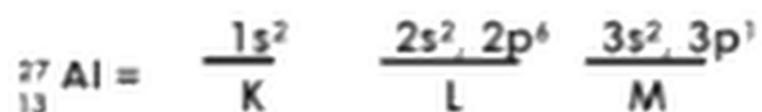
Answers:

1. B	2. B	3. D	4. C	5. C
6. B	7. D	8. D	9. B	

Q.2: Give short answers.

i. Write the valence shell electronic configuration of an element present in the 3 period and Group IIIA.

Ans: The element present in the period and Group IIIA is aluminum (Al).



Valence shells is M. Hence Valence shell configuration is $3s^2, 3p^1$

As $n = 3$, Al is present in the period. Since total number of electrons in the valence sub-shells are $2 + 1 = 3$, it must be present in Group IIIA.

ii. **Write two ways in which isotopes of an element differ.**

Ans: The number of neutrons in the nucleus differs, the atomic mass differs as well as the physical properties and the nuclear stability.

Note: The chemical properties remain the same

iii. **Which atom has higher shielding effect, L or Na?**

Ans: The valence-shell electron of $_{11}\text{Na}$ experience less attraction from the nucleus due to the presence of 10 inner-shell electrons as compares to $_{3}\text{Li}$ having 2 inner shell-electrons.

Na atoms will have greater shielding effect due to greater number of inner shell electrons as compare to Li.

iv. **Explain why, Na has higher ionization energy than K?**

Ans: Ionization energy decreases from top to bottom in a group. The size of sodium (3 shells) is smaller than potassium (4 shells):

Therefore, Na has higher ionization energy than K (group IA elements).

v. **Alkali metals belong to block in the periodic table, why?**

Ans: s-Block Elements:

Groups IA on the left side of the table constitute s-Block because outer shell valence electrons of these elements are present in s-orbital sub shell.

Q.3: Arrange the elements in each of the following groups in order of

(a) Li, Na, K**(b) a, Br, I****Ans: (a) Li, Na, K**

The ionization energy value decreases from top to bottom in a group. This is because the shielding effect in atoms increases as you descend. Greater shielding effects results in a weaker attraction of the nucleus for the valence electrons. So, they are easier to remove. This leads to decrease in ionization energy from top to bottom in a group. Therefore, increasing order of ionization energy is

Ionization energy of Li > Ionization energy of Na > Ionization energy of K

(Group IA elements)

(b) Cl, Br, I

The ionization energy value decreases from top to bottom in a group
Ionization energy of Cl > Ionization energy of Br > Ionization energy of

(Group VIA elements)

Q.4: Arrange the elements in each of the following in order of decreasing shielding effect.

(a) Li, Na, K**(b) Cl, Br, I****(c) Cl, Br****Ans: (a) Li, Na, K**

As we move from top to bottom in a group the number of electronic shells increase So the number of electrons in the inner shell also increase. As a result shielding effect increases Shielding effect of Li < shielding effect of Na < shielding effect of K

(Group VIIA elements)

(b) Cl, Br, I

As we move from top to bottom in a group the number of electronic shells increase. So, the number of electrons in the inner shell also increase. As a result, shielding effect increases.

Shielding effect of Cl < shielding effect of Br < shielding effect of I

(Group VIIA elements)

(c) Cl, Br

As we move from top to bottom in a group the number of electronic shells increase. So, the number of electrons in the inner shell also increase. As a result shielding effect increases.

Shielding effect of Cl < shielding effect of Br

(Group VIIA elements)

Q.5: Specify which of the following elements you would expect to have the greatest electron affinity.

S, P, Cl

Ans: (ii) Variation in a period:

As we move from left to right across a period, the electron affinity generally increases. This is due to increase in nuclear charge and decrease in atomic radius which binds the extra electron more tightly to the nucleus.

Therefore, Cl has greatest electron affinity as compare to S and P.

Q.6: Electronic configuration of some elements are given below, group the elements in pairs that would represent similar chemical properties.

A = $1s^2 2s^2$



Ans: F = $1s^2 2s^1$ (Li) and G = $1s^2 2s^2 2p^6 3s^1$ (Na) Group IA
 A = $1s^2 2s^2$ (Be) and H = $1s^2 2s^2 2p^6 3s^2$ (Mg) Group IIA
 C = $1s^2 2s^2 2p^3$ (N) and E = $1s^2 2s^2 2p^6 3s^2 3p^3$ (P) Group VA
 D = $1s^2$ (He) and B = $1s^2 2s^2 2p^6 3s^2 3p^6$ (Ne) Group VIIIA

Note: Elements having similar electronic configuration in their outer shells have similar chemical properties.

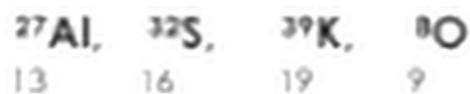
Q.7 Arrange the elements in groups and periods in Q. No. 6.

IA	IIA	IIIA	IVA	VA	VIA	VIIA	VIIIA

Solution:

IA		IIA		IIIA	IVA	VA	VIA	VIIA	VIIIA
						C			D 1s ²
F 2s ¹		A 2s ²				2s ² 2p ³			B 2s ² 2p ⁶
G 3s ¹		H 3s ²				E 3s ² 3p ³			

Q.8: For normal elements, the number of valence electrons of an element is equal to the group number. Find the group number of the following elements.



Ans: ²⁷Al:
13

Valance shell configuration 3s² 3p¹

Group number = 2 + 1 = 3 Therefore Al is present in group IIIA

³²S:

16

Valance shell configuration 3s² 3p⁴

Group number = 2 + 4 = 6 Therefore is present in group VIA

³⁹K:

19

Valance shell configuration 4s¹

Group number = 1 Therefore his present in group IA

80-

Valance shell configuration $2s^2 2p^4$

Group number = $2 + 4 = 6$ Therefore O is present in group VIA

Q.9 Write the valence shell electronic configuration for the following groups:

- Alkali metals
- Alkaline earth metals
- Halogens
- Noble gases

Ans:

- Alkali metals**

Valance shell configuration of all metals ns^1 .

- Alkaline earth metals**

Valance shell configuration of in metals is ns^2 .

- Halogens**

Valance shell configuration of halogens is ns^2np^5 .

- Noble gases**

Valance shell configuration of noble gases is ns^2np^6 .

Q.10: Write electron dot symbols for an atom of the following elements

(a) Be

(b) K

(c) N

(d) I

Ans: (a) Be



(a) K



(b) N



(c) I



Q.11: Write the valence shell electronic configuration of the atoms of the following elements.

(a) An element presents in period 3 of Group VA

(b) An element presents in period 2 of Group VIA

Ans:

(a) An element presents in period of Group VA

Valance shell electronic configuration of Phosphorus (P) is $3s^2 3p^3$

(b) An element presents in period 2 of Group VIA

Valance shell electronic configuration of Oxygen (O) is $2s^2 2p^4$

Q.12: Copy and complete the following table:

Atomic number	Mass number	No. of protons	No. of neutrons	No. of electrons
11			12	
		14	15	
	47		25	
	27			13

Ans:

Atomic number	Mass number	No. of protons	No. of neutrons	No. of electrons
11	23	11	12	11
14	29	14	15	14
22	47	22	25	22
13	27	13	14	13

Q.13: Imagine you are standing on the top of Neon-20 nucleus. How many kinds of sub-atomic particles you would see looking down into the nucleus and those you would see looking out from the nucleus.

Ans: Sub atomic particles present inside the nucleus of Neon-20 are,

Number of protons = 10

Number of neutrons = $A - Z = 20 - 10 = 10$

Sub atomic particles present outside the nucleus of Neon-20 are,

Number of electrons = 10

Q.14: Chlorine is a reactive element used to disinfect swimming pools. It is made up of two isotopes Cl-35 and Cl-37. Because Cl-35 is more than Cl-37, the atomic mass of chlorine is 35.5amu. is closer to 35 than 37. Write electronic configuration of each isotope of chlorine. Also write symbol for these isotopes (atomic number for chlorine is 17).

Ans: Electronic configuration of isotopes Cl-35 is: $1s^2 2s^2 2p^6 3s^2 3p^5$

Symbol for isotopes Cl-35:

^{35}Cl

Electronic configuration of isotopes Cl-37 is:



Symbol for isotopes Cl-37:



Q.15: In which block, group and period in the periodic table where would you place each of the following elements with the following electronic configurations?



Ans:



Valence shell is K therefore $n = 1$

Block = s-block element, Group Number = IA, Period Number = 2

The name of element is lithium (Li). Atomic number = 3



Valence shell is L therefore $n = 2$

Block = p-block element, Group Number = VIIA, Period Number = 2

The name of element is fluorine (F). Atomic number = 9



Block = s-block element, Group Number = IIA, Period Number = 3

The name of element is magnesium (Mg), Atomic number = 12

d. $1s^2$

Valence shell is K therefore $n = 1$

Block = p-block element, Group Number = VIIIA, Period Number = 1

The name of element is helium (He), Atomic number = 2.

THINK-TANK

Q.1: What types of elements have the highest ionization energies and what types of elements have the lowest ionization energies.

Ans: Noble gases (group VIA) have the highest ionization energies because they have complete outer most shells follow octet or duplet rule therefore it is difficult to remove an electron from the outer most shell.

On the other hand, Alkali metals (group IA) have greater size, therefore Alkali metals have lowest ionization energy.

Q.2 Two atoms have electronic configuration $1s^2 2s^2 2p^6$ and $1s^2 2s^2 2p^6 3s^1$. The ionization energy of one is 20801 KJ/mole and that of the other is 496 KJ/mole. Match each ionization energy with one of the given electronic configurations. Give reason for your choice.

Ans: Atom A = $1s^2 2s^2 2p^6$

Ionization energy = 2080 KJ mol⁻¹

Atom B = $1s^2 2s^2 2p^6 3s^1$

Ionization energy = 496 KJ mol⁻¹

Noble gases (group VIIIA) have the highest ionization energies because they have complete outer most shells (follows octet or duplet rule), therefore it is difficult to remove an electron from the outer most shell.

Therefore, in this case the value of ionization energy will be 2080 kJ/mol.

The electronic configuration $1s^2 2s^2 2p^6 3s^1$ (Na) shows the alkali metals (Group IA).

Alkali metals (group IA) have greater therefore Alkali metals have lowest ionization energy.

Therefore, in this case the value of ionization energy will be 496 kJ/mol

Q.3: Use the second member of each group from Group IA, IIA and VIIA to show that the number of valence electron on an atom of the element is the same as its group number.

Ans:

- i. Second member of group IA is (Li). Valance shell configuration of lithium is $2s^1$. Here valance electron of Lithium is 1 therefore its group number is also IA.
- ii. Second member of group IIA is (Mg). Valance shell configuration of magnesium is $3s^2$. Here valance electrons of magnesium are therefore group number is also IIA.
- iii. Second member of group VIIA SC Valance shell configuration of chlorine is $3s^2 3p^5$. Here valance electrons of chore are $2 + 5 = 7$ therefore its group number is also VIIA.

Q.4: Letter A, B, C, D, E, F indicates elements in the following figure:

							C	
A					B			
	D					E		
								F

- Which elements are in the same periods?
- Write valence shell electronic configuration of element D.
- Which elements are metals?
- Which element can lose two electrons?
- In which group E is present?
- Which of the element is halogen?
- Which element will form dipositive cation?
- Write electronic configuration of element E
- Which two elements can form ionic bond?
- Can element C form C_2 molecule?
- Which element can form covalent bonds?
- Is element F a metal or non-metal?

Solution:

- Which elements are in the same periods?

Ans: Elements A and B are in the same periods i.e. Period number 3.

b. Write valence shell electronic configuration of element D.

Ans: As element D lies in group IIA therefore valence shell configuration is $4s^2$.

The name of element is Calcium (Ca).

c. Which elements are metals?

Ans: Elements A (Group IA) and D (Group IIA) are metals because group IA represents alkali metals and group IIA represents alkaline earth metals.

d. Which element can lose two electrons?

Ans: Element D (Group IIA) can lose two electrons because element D contains two electrons in its valence shell.

e. In which group E is present?

Ans: Element E is present in group VA and the name of the element is Arsenic (As).

f. Which of the element is halogen?

Ans: Element F is halogen because it lies in group VIIA. The name of the element is Iodine (I).

g. Which element will form dipositive cation?

Ans: The element forms positive cation (+2) because it lies in group IIA and can lose two electrons.

Ans: As element E lies in group VA and name of the element is Arsenic (As). The atomic number of arsenic is 33. Electronic configuration of arsenic is



i. Which two elements can form ionic bond?

Ans: Elements (A and F), (D and C) can form ionic bond because element A belongs to group IA element D belongs to group IIA. Group IA and group IIA can lose electrons in their valance shell easily due to low ionization energy.

Whereas elements C and F belong to group VIA and VIIA respectively (highly electronegative atoms).

j. Can element form C_2 molecule?

Ans: Yes, element C can form C_2 molecule in this case belong to group VIA. The name of element is Oxygen (O). The molecule of oxygen is represented by O_2 ($O = O$).

k. Which element can form covalent bonds?

Ans: Elements C and F can form covalent bonds Element C belongs to group VIA and the name of element is oxygen. Oxygen forms double covalent bond ($O = O$). Element belongs to group VIIA and the name of elements Iodine. Iodine forms single covalent bond (I-I).

l. Is element F a metal or non-metal?

Ans: The element is nonmetal. Element belongs to group VIIA and the name of element is Iodine. Iodine forms single covalent bond (I-I).

Q.5: Electronic configurations of four elements are given below:

a. $1s^2 2s^1$

b. $1s^2 2s^2 2p^5$

c. $1s^2 2s^2 2p^6 3s^2$

d. $1s^2$

Which of these elements is?

- i. An alkali metals**
- ii. An alkaline earth metals**
- iii. A noble gas**
- iv. A halogen**

Solution:

i. An alkali metal:

Ans: $1s^2 2s^1$ is the electronic configuration of metal because the element has 1 electron in its valance shell (Group IA). The name of element is lithium (Li)

ii. An alkaline earth metal:

Ans: $1s^2 2s^2 2p^6 3s^2$ is the electronic configuration of alkaline earth metal because the element has 2 electrons in its valance shell (Group IIA). The name of element is Magnesium (Mg).

iii. A noble gas:

Ans: $1s^2$ is the electronic configuration of noble gas because the element has 2 electrons in its valance shell (Group VIA). The name of element is helium (He).

Ans: $1s^2 2s^2 2p^5$ is the electronic configuration of halogen because the element has

$2 + 5 = 7$ electron in its valance shell (Group VIIA). The name of element is fluorine (F).

Q.6: In what region of the periodic table you will find elements with relatively

a) high ionization energies

b) low ionization energies

Ans:

a) high ionization energies:

Noble gases (group VIIIA) have the highest ionization energies because they have complete outer most shells (follows octet or duplet rule), therefore it is difficult to remove an electron from their outer most shell.

Therefore, elements in the upper right of the periodic table have the highest ionization energy (Noble gases, p-block).

b) low ionization energies:

On the other hand, Alkali metals (group IA) have greater size, therefore Alkali metals have lowest ionization energy

Therefore, elements in the upper left of the periodic table have the lowest ionization energy. (Alkalis metals, s-block).

