PERIODIC CLASSIFICATION OF ELEMENTS

1. **Account for the following :**
   (a) Elements C, N, O and F are placed in the second period of the periodic table.
   (b) Elements of group 17 are monovalent.

Answer:

(a) All these elements have two electron shells. Therefore, these are placed in the second period.
C (Z=6) 2, 4 ;
N (Z = 7) 2, 5 ;
O (Z = 8) 2, 6 ;
F (Z = 9) 2, 7

(b) All the elements included in the group 17 have 7 valence electrons in their atoms. These atoms need only one electron to acquire the electronic configuration of nearest noble gas atom. Therefore, these are monovalent

2. **Chlorine (atomic number 17) is more electronegative than sulphur (atomic number 16). Explain.**

Answer:

Chlorine (Z = 17) is placed after sulphur (Z = 16) in the same period i.e. third period. The size of chlorine is smaller than that of sulphur and its atom needs only one electron to have noble gas electronic configuration while sulphur atom needs two electrons. Therefore, chlorine has greater attraction for electrons than sulphur. It is more electronegative than sulphur.

3. **The atomic numbers of three elements X, Y and Z are 9, 11 and 17 respectively. Which of these two elements will show similar characteristics and why ?**

Answer:

The elements X and Z will show similar characteristics because they differ in their atomic numbers by 8 (9, 17). Both these are halogens and belong to group 17 (halogen family). These are fluorine (Z= 9) and chlorine (Z = 17) .

4.

Element (symbol)	**A**	**B**	**C**
Atomic no.	**5**	**7**	**10**

The atomic number of three elements are given below :
Write the symbol of the element which belongs to
(i) group 13,
(ii) group 15, of the periodic table. State the period of the periodic table to which these elements belong. Give reason for your answer.

Answer:

Electronic configuration of the elements A, B and C are as given :

Element (symbol)	A	B	C

Atomic no.	5 (2, 3)	7 (2, 5)	10(2, 8)

Element (Symbol) A B C

Atomic number 5 (2, 3) 7 (2, 5) 10(2, 8)

(i) Element A belongs to group 13 (Group No. = 10 + 3 = 13). It is boron (B)

(ii) Element B belongs to group 15 (Group No. = 10 + 5 = 15). It is nitrogen (N)

Both these elements belong to second period since they have two shells.

5. Write two reasons responsible for the late discovery of noble gases.

Answer:

(i) Noble gas elements were not present in earth crust as minerals like other elements and were present in air to a very small extent.

(ii) Their atoms have stable electronic configuration of their outermost shells also called valence shells. (2 in case of He and 8 for other elements). They do not combine with atoms of other elements.

That is why noble gas elements were discovered at a later stage.

6. Three elements A, B and C have atomic numbers 7, 8 and 9 respectively.

(a) What would be their positions in the modern periodic table ? (Mention group and period both)

(b) Arrange A, B and C in decreasing order of their size.

(c) Which one of the three elements is most reactive and why ?

Answer:

The electronic configuration of these elements are :

(a) A (Z = 7) 2, 5;

B (Z = 8) 2, 6;

C (Z = 9) 2, 7

Position of element A = 15th group and 2nd period

Position of element B = 16th group and 2nd period ‘

Position of element C = 17th group and 2nd period.

(b) In general, atomic size decreases along a period. Therefore, decreasing order of size is A > B > C

(c) The element C (Z = 9) is fluorine. It is the most reactive element since it needs only one electron to acquire a noble gas configuration.

7. The elements with atomic number 3 to 10 belong to the second period. Taking into account the trends in the general periodic properties, predict.

(a) The most electronegative element

(b) The most electropositive element

(c) The element belonging to noble gas family

(d) The element which constitutes large number of organic compounds.

Answer:

(a) The most electronegative element has atomic number (Z) = 9. It is fluorine (F).

(b) The most electropositive element has atomic number (Z) = 3. It is lithium (Li)

(c) The element belonging to noble gas family has atomic number (Z) = 10. It is neon (Ne)

(d) The element which constitutes large number of organic compounds has atomic number (Z) = 6. It is carbon (C).

8. "Elements in Periodic Table show periodicity of properties". List any four properties.

Answer:

Periodicity i.e., repetition of similar properties is shown by the elements present in a group and separated by definite gaps of atomic number. For example,

1. Elements in a group have same number of valence electrons and same valency.
2. Elements present in a group show similar chemical properties.
3. The atomic sizes of the elements in a group increase regularly.
4. The m.p. and b.p. of the elements in a group increase regularly.

9. The electronic configuration of three elements X, Y and Z are given below ;

X = 2 ; Y = 2, 6 ; Z = 2, 8, 2.

1. **Which element belongs to the second period ?**
2. **Which element belongs to the eighteenth group ?**
3. **Which element belongs to the second group ?**
4. **What is the valency of Y ?**
5. **Are Y and Z metals or non-metals ?**

Answer:

1. The element 'Y' belongs to second period.
2. The element 'X' belongs to eighteenth group also called zero group.
3. The element 'Z' belongs to second group.
4. Element 'Y' has valency equal to 2(8 -6 = 2).
5. The element 'Y' is a non-metal while element 'Z' is a metal.

10.

Element (symbol)	**A**	**B**	**C**	**D**	**E**
Atomic no.	**7**	**10**	**12**	**4**	**19**

The atomic numbers of elements A, B, C, D and E are given below :

From the above table, answer the following questions

(a) Which two elements are chemically similar ?

(b) Which is an inert gas ?

(c) Which element belongs to 3rd period of periodic table ?

(d) Which element among these is a non-metal ?

Answer:

Element (symbol)	A	B	C	D	E
Atomic no.	7 (2,5)	10 (2,8)	12 (2,8,2)	4 (2,2)	19 (2,8,8,1)

The electronic configuration of the elements are as follows :

Element	A	B	C	D	E
Atomic no.	7(2, 5)	10 (2, 8)	12 (2, 8, 2)	4 (2, 2)	19 (2, 8, 8, 1)

(a) Elements C and D are chemically similar since they have same number of valence electrons.
(b) Element B is an inert gas element since it has complete octet.
(c) Element C belongs to third period since it has three shells.
(d) Element A is a non-metal since it has five valence electrons.

11. Using the part of the periodic table given below, answer the questions that follow.

Group ⇒ Period ⇓	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**Zero**
1	**H**							**He**
2	**Li**	**Be**	**B**	**C**	**N**	**O**	**F**	**Ne**
3	**Na**	**Mg**	**Al**	**Si**	**O**	**S**	**Cl**	**Ar**
4	**K**	**Ca**						

(i) Na has physical properties similar to which elements and why ?
(ii) Write the electronic configuration of N and P.
(iii) State one property common to fluorine and chlorine.
Answer:
(i) Na has physical properties similar to Li and K. All the three elements have one electron each in the valence shell of their atoms. These are known as alkali metals. However, the element hydrogen has different physical properties.
(ii) Electronic configuration of N (Z = 7) = 2, 5
Electronic configuration of P (Z = 15) = 2, 8, 5
(iii) Both the elements have seven electrons in the valence shells as their atoms and have valency equal to one.
Fluorine (Z = 19) 2, 7 ;
Chlorine (Z = 17) 2, 8, 7.

12. Atomic radii of the elements present in second period are given :

Element :	B	Be	O	N	Li	C
Atomic radii (pm) :	88	111	66	74	152	77

1. Arrange them in decreasing order of their atomic radii.
2. Are these elements arranged in the pattern of a period in the periodic table ?
3. Which elements have the largest and the smallest atoms ?
4. How does the atomic radius change as you move from left to right in a period ?
Answer:
1. The decreasing order of atomic radii is :
Li(152) > Be (111) > B (88) > C(77) > N(74) > O(66)
2. No, the arrangement of the elements is not systematic. The correct arrangement is as given above.
3. The element Li has the largest atoms while the element O has the smallest atoms.
4. The atomic radii of the elements decrease in moving from left to the right.

13. "The atomic number of Cl is 17. On the basis of this information, answer the questions that

follow :

(a) Write the electronic configuration of Cl.

(b) Find its valency.

(c) To which group does it belong ?

(d) Identify the type of ion it will form.

(e) Write down the formula of the compound it forms with other elements.

Answer:

(a) Electronic configuration of Cl (Z = 17) = 2, 8, 7.

(b) Valency of Cl = 8 – 7 = 1

(c) Group to which Cl belongs =17 id) Type of ion formed by Cl = Anion (Cl–).

(e) Formula of compound with other elements (M) = MCl_x

∴ Here x is the valency of the element.

14. The list of the elements present in the same period but in different groups is given :

1 2 13 14 15 16 17 18

(a) Do these groups represent modern periodic table ?

(b) Which element will belong to oxygen family ?

(c) Which element will not take part in chemical combination ?

(d) The elements belonging to which groups will form ionic bonds most readily ?

Answer:

(a) Yes, these groups of elements represent modern periodic table.

(b) The element present in group 16 belongs to oxygen family.

(c) The element included in group 18 (noble gas elements) will not take part in chemical combination.

(d) The elements belonging to group 1 and group 17 will form ionic bonds most readily.

15. An element E has following electronic configuration :

(a) To which group of the periodic table does element E belong ?

(b) To which period of the periodic table does element E belong ?

(c) State the number of valence electrons present in element E.

(d) State the valency of the element E.

Answer:

The element with atomic no. (Z) = 16 is sulphur (S).

(a) It belongs to group 16 of the periodic table,

(b) It belongs to third period since it has three shells.

(c) The element has six valence electrons.

(d) The valency of the element is 2 (8 – 6 = 2).

16.

1 **Lithium**	**2**	**13**	**14** **carbon**	**15**	**16** **Oxygen**	**17**	**108** **Neon**
X			**S**		**P**	**Q**	
Y						**R**	

Z						**T**	

From the part of the periodic table given, answer the following questions.

(a) Which is the most reactive metal ?

(b) Name the family of L, Q, R, T.

(c) Name one element of group 2 and 15,

(d) Name one member of group 18 other than neon.

(e) Give the name of the element S placed below carbon in group 14.

Answer:

(a) The element Z is the most reactive metal.

(b) The elements are present in group 17. The family is that of halogens.

(c) One element belonging to group 2 is calcium (Ca) while one present in to group 15 is nitrogen (N).

(d) The element argon (Ar) is also present in group 18.

(e) The element is silicon (Si)