

Periodic Classification of Elements

5



Objective Section _____ (1 marks each)

Q. 1. An element 'X' is forming an acidic oxide. Its position in modern periodic table will be

- (a) Group 1 and Period 3
- (b) Group 2 and Period 3
- (c) Group 13 and Period 3
- (d) Group 16 and Period 3

[CBSE OD, Set 1, 2020]

Ans. (d) Group 16 and Period 3

Q. 2. Consider the following statements about an element 'X' with number of protons 13.

- (A) It forms amphoteric oxide
 - (B) Its valency is three
 - (C) The formula of its chloride is XC_3
- The correct statement (s) is/are
- (a) only (A)
 - (b) only (B)
 - (c) (A) and (C)
 - (d) (A), (B) and (C)

[CBSE OD, Set 1, 2020]

Ans. (d) (A), (B) and (C)



Very Short Answer Type Questions _____ (2 marks each)

Q. 1. Define electropositivity.

[CBSE OD, Set 1, 2020]

Ans. Electropositivity is the measure of the ability of elements (mainly metals) to donate their valence electrons to form positive ions. The elements that can easily lose electrons to form positive ions are called electropositive elements. For example : Metals such as aluminium, sodium etc.

Q. 2. The atomic radii of first group elements are given below:

Group-I element	Atomic Radii (pm)
Na	86
K	231

Rb	244
Cs	282

State the reason behind the observed trend in the above elements.

[CBSE OD, Set 1, 2020]

Ans. The above trend is observed because the atomic radii increases down the group, because new shells are being added as we go down the group. This increases the distance between the outermost electrons and the nucleus so that the atomic size increases in spite of the increase in nuclear charge.



Short Answer Type Questions-I _____ (2 marks each)

Q. 1. Write the name, symbol and electronic configuration of an element X whose atomic number is 11.

[CBSE Delhi, Set 2, 2019]

Ans. The element whose atomic number is 11 is Sodium. Its symbol is Na.

Electronic configuration – 2, 8, 1

Valency 1

Q. 2. Can the following groups of elements be classified as Dobereiner's triad:

- (a) Na, Si, Cl
- (b) Be, Mg, Ca

Atomic mass of Be-9, Na-23, Mg-24, Si-28, Cl-35, Ca-40. Justify your answer in each case. [CBSE Delhi, Set 2, 2019]

Ans. (a) Na, Si, Cl cannot be classified as Dobereiner's triad because here the elements do not belong to the same group and have different electronic configuration.

Na – 2, 8, 1; Si – 2, 8, 4 and Cl – 2, 8, 7

(b) Be, Mg, Ca are the elements of Dobereiner's triad because the mass of Mg is the arithmetic mean of the

other two elements i.e., Be and Ca =

$$\frac{9+40}{2} = 24.5$$

Q. 3. How it can be proved that the basic structure of the Modern Periodic Table is based on the electronic configuration of atoms of different elements?

[CBSE Delhi, Set 1, 2019]

Ans. Modern periodic law states that the physical and chemical properties of an element are the periodic function of the atomic number of that element.

Electronic configuration of the elements play an important role in the placement of element in the modern periodic table. The valence shell electron of an element

decides its position in a particular group or period for example: if the configuration of an element is 2, 1 it means that it belongs to the 2nd period and 1st group.

The element will be Li = 2, 1.

Q. 4. The electronic configuration of an element is 2, 8, 4. State its:

(a) group and period in the Modern Periodic Table.

(b) name and write its one physical property. [CBSE Delhi, Set 1, 2019]

Ans. (a) If the configuration is 2, 8, 4 it means that it belongs to 3rd period and 14th group.

(b) The name of element is Silicon.

It is a non metal so it is a poor conductor of electricity.



Short Answer Type Questions-II

(3 marks each)

Q. 1. Three elements X, Y and Z have atomic numbers 7, 8 and 9 respectively.

[CBSE OD, Set 2, 2020]

(a) Arrange them in the decreasing order of their atomic radii.

(b) Which of the three is most electronegative? Why?

(c) Write the formula of compound formed between

(i) X and Y (ii) X and Z

Ans. (a) The elements can be arranged according to the decreasing order of atomic radii as follows: $X > Y > Z$.

Size of the atom decreases when moving from left to right in a period. This is due to an increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of the atom.

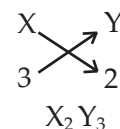
(b) Z is most electronegative since electro-negativity increases from left to right in periodic table. As the effective nuclear charge acting on the valence shell electrons increases across a period, the tendency to lose electrons will decrease.

(c) (i) When X combines with Y:

Valency of X = 3

Valency of Y = 2

Cross-multiplying the valences



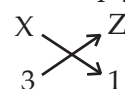
The compound formed is X_2Y_3 .

(ii) When X combines with Z

Valency of X = 3

Valency of Z = 1

Cross-multiplying the valences



The compound formed is XZ_3 .

Q. 2. Based on the group valency of elements write the molecular formula of the following compounds giving justification for each:

(i) Oxide of first group elements.

(ii) Halide of the elements of group thirteen, and

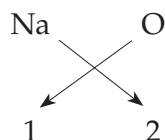
(iii) Compound formed when an element, A of group 2 combines with an element, B of group seventeen.

[CBSE Delhi, Set 1, 2019]

Ans. (i) A_2O ; For example: Sodium is a group one element (Na) so its configuration is (2, 8, 1) and its valency is 1.

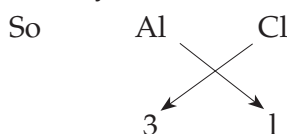
Oxide has a valency of 2.

So their formula would be formed as:



Formula for sodium oxide is Na_2O .

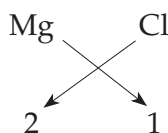
- (ii) AX_3 ; For example: Halide is any halogen with Group 17 means if we take Aluminium (Al) its configuration is (2, 8, 3) valency of Al is 3, valency of Cl is 1.



Formula would be AlCl_3 (Aluminium chloride)

- (iii) AB_2 ; For example: Element of group 2 with Magnesium (Mg) (2, 8, 2) its valency would be 2.

Element of group 17 would be Cl (2, 8, 7) valency would be 1.



Formula would be MgCl_2 - (Magnesium Chloride)

- Q. 3. Write the number of periods and groups in the Modern Periodic Table. How does the metallic character of elements vary on moving (i) from left to right in a period, and (ii) down a group? Give reason to justify your answer.**

[CBSE OD, Term 2, Set 1, 2017]

Ans. In the modern periodic table, there are 18 vertical columns known as Groups and 7 horizontal rows known as Periods.

Metallic character: It is defined as the tendency of an atom to lose electrons.

- Across the period *i.e.*, from left to right, metallic character decreases.
- Down the group *i.e.*, from top to bottom, metallic character increases.

Reason: Across the period, the effective nuclear charge increases, thus decreasing its atomic radius. This favours the electronegativity and therefore the tendency to lose electrons is low. This accounts for the decrease in the metallic character. As we move down the group, the number of

shells keep on increasing and therefore the atomic size increases and electronegativity decreases. This enhances the ability to lose electrons and therefore the metallic character increases.

- Q. 4. Na, Mg and Al are the elements of the 3rd period of the Modern Periodic Table having group number 1, 2 and 13 respectively. Which one of these elements has the (a) highest valency, (b) largest atomic radius, and (c) maximum chemical reactivity? Justify your answer stating the reason for each.**
[CBSE OD, Term 2, Set 1, 2017]

Ans. Sodium (Na), At. number 11, 2, 8, 1
Magnesium (Mg), At. number 12, 2, 8, 2
Aluminium (Al), At. number 13, 2, 8, 3
(a) The element having the highest valency is Al, as it has 3 valence electrons.
(b) The element with the largest atomic radius is Na as left to right atomic radius decreases.
(c) The element with maximum chemical reactivity is Na as metallic character decreases left to right.

- Q. 5. What is periodicity in properties of elements with reference to the Modern Periodic Table? Why do all the elements of the same group have similar properties? How does the tendency of elements to gain electrons change as we move from left to right in a period? State the reason of this change.**
[CBSE OD, Term 2, Set 3, 2017]

Ans. The occurrence of the elements with similar properties after certain regular intervals when they are arranged in increasing order of atomic number is called periodicity. The periodic repetition of the properties is due to the recurrence of similar valence shell configuration after regular interval.

The elements in a group have same valence electrons thus similar chemical properties. In a period, tendency to gain electrons increases from left to right. This tendency increases because the hold of nucleus on the outermost electrons becomes weak thus it becomes easy to eject the electron.

- Q. 6.** Write the names given to the vertical columns and horizontal rows in the Modern Periodic Table. How does the metallic character of elements vary on moving down a vertical column? How does the size of atomic radius vary on moving left to right in a horizontal row? Give reason in support of your answer in the above two cases.
[CBSE Delhi, Term 2, Set 1, 2017]

Ans. Vertical columns in Modern periodic table are called groups and horizontal rows are called periods. As we move down the group metallic character increases as the atomic size increases, the force of attraction between nucleus and outermost shell decreases so tendency to lose ions increases. When we move left to right in period, the number of electrons in the same shell increases leading to greater electrostatic attraction between nucleus and outermost electron. This increased attraction pulls the outermost electron closer to the nucleus, thereby decreasing the atomic size.

- Q. 7.** An element P (atomic number 20) reacts with an element Q (atomic number 17) to form a compound. Answer the following questions giving reason:

Write the position of P and Q in the Modern Periodic Table and the molecular formula of the compound formed when P reacts with Q.

[CBSE Delhi, Term 2, Set 1, 2017]

Ans. P = 20 : Electronic configuration 2, 8, 8, 2
Q = 17 : Electronic configuration 2, 8, 7
P = Period 4 and Group 2
Q = Period 3 and Group 17
Hence formula of the compound formed between P and Q is PQ_2 .

- Q. 8.** Name any two elements of group one and write their electronic configurations. What similarity do you observe in their electronic configurations? Write the formula of oxide of any of the aforesaid element.

[CBSE Delhi, Term 2, Set 2, 2016]

Ans. Two elements of group are sodium (Na) and potassium (K) their electronic configuration;
Na = 2, 8, 1
K = 2, 8, 8, 1

Similarity: Both have one valence electron, formula of their oxide: Na_2O , K_2O

- Q. 9.** An element 'X' belongs to 3rd period and group 16 of the Modern Periodic Table.
(a) Determine the number of valence electrons and the valency of 'X'.
(b) Molecular formula of the compound when 'X' reacts with hydrogen and write its electron dot structure.
(c) Name the element 'X' and state whether it is metallic or non-metallic.

[CBSE OD, Term 2, Set 1, 2016]

Ans. X = 2, 8, 6

(a) Valence electrons are 6

$$\text{Valency} = 8 - 6 = 2$$

(b) Formula = H_2X



(c) X is sulphur, it is a non-metal.

- Q. 10.** An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also write group number, period number and valency of 'X'.

[CBSE OD, Term 2, Set 1, 2016]

Ans. Atomic no. of X = mass number – Number of neutrons

$$= 35 - 18 = 17$$

Electronic configuration = 2, 8, 7

Group number = 17

Period number = 3

Valency = 1

- Q. 11.** Three elements 'X', 'Y' and 'Z' have atomic numbers 7, 8 and 9 respectively.

- (a) State their positions (Group number and period number both) in the Modern Periodic Table.
(b) Arrange these elements in the decreasing order of their atomic radii.
(c) Write the formula of the compound formed when 'X' combines with 'Z'.

[CBSE OD, Term 2, Set 2, 2016]

Ans. (a) X (7) = 2, 5 Group 15, Period 2
Y (8) = 2, 6 Group 16, Period 2
Z (a) = 2, 7 Group 17, Period 2.
(b) $X > Y > Z$
(c) XZ_3

- Q. 12.** The position of eight elements in the Modern Periodic Table is given below where atomic numbers of elements are given in the parenthesis.

Period No.		
2	Li (3)	Be (4)
3	Na (11)	Mg (12)
4	K (19)	Ca (20)
5	Rb (37)	Sr (38)

- Write the electronic configuration of Ca.
- Predict the number of valence electrons in Rb.
- What is the number of shells in Sr?
- Predict whether K is a metal or a non-metal.
- Which one of these elements has the largest atom in size?
- Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms.

[CBSE OD, Term 2, Set 3, 2016]

- Ans. (i) Electronic configuration of Ca = 2, 8, 8, 2
(ii) Number of valence electrons in Rb = 1
(iii) Number of shells in Sr = 5
(iv) K is a metal
(v) Rb is the largest element in size
(vi) Be < Mg < Ca < Rb

Q. 13. An element 'X' belong to 3rd period and group 13 of the Modern Periodic Table.

- Determine the valence electrons and the valency of 'X'.
- Molecular formula of the compound formed when 'X' reacts with an element 'Y' (atomic number = 8).
- Write the name and formula of the compound formed when 'X' combines with chlorine.

[CBSE OD, Term 2, Set 3, 2016]

- Ans. X = 13; Electronic configuration = 2, 8, 3
(a) Valence electron and valency = 3
(b) Y = 8; Electronic configuration = 2, 6
valency 2.
 X_2Y_3
(c) XCl_3

Q. 14. Calcium is an element with atomic number 20. Stating reason answer each of the following questions:

- Is calcium a metal or non-metal?
- Will its atomic radius be larger or smaller than that of potassium with atomic number 19?

(iii) Write the formula of its oxide.

[CBSE Delhi, Term 2, Set 1, 2016]

- Ans. (i) Calcium is a metal, since it loses electrons.
(ii) Radius of calcium is smaller than potassium as atomic size decreases in a period from left to right in periodic table.
(iii) CaO.

Q. 15. An element 'M' with electronic configuration (2, 8, 2) combines separately with $(NO_3)^-$, $(SO_4)^{2-}$ and $(PO_4)^{3-}$ radicals. Write the formula of the three compounds so formed. To which group and period of the Modern Periodic Table does the elements 'M' belong? Will 'M' form covalent or ionic compounds? Give reason to justify your answer.

[CBSE Delhi, Term 2, Set 1, 2016]

- Ans. (i) (a) $M(NO_3)_2$, (b) MSO_4 , (c) $M_3(PO_4)_2$.
(ii) M belongs to second group and third period.
(iii) M will form ionic bond as it loses electrons.

Q. 16. Two elements 'A' and 'B' belong to the 3rd period of Modern periodic table and are in group 2 and 13 respectively. Compare their following characteristics in tabular form:

- Number of electrons in their atoms
- Size of their atoms
- Their tendencies to lose electrons
- The formula of their oxides
- Their metallic character
- The formula of their chlorides

[CBSE Delhi, Term 2, Set 3, 2016]

Ans.

S. No.	Property	A	B
(a)	Number of electrons in their atoms	4, 12 & 20	5, 13 & 21
(b)	Size of their atoms	Bigger	Smaller
(c)	Their tendencies to lose electron	More	Less
(d)	The formula of their oxides	AO	B_2O_3
(e)	Their metallic character	More metallic	Less metallic
(f)	The formula of their chlorides	ACl_2	BCl_3

- Q. 17.** Two elements 'P' and 'Q' belong to the same period of the modern periodic table and are in Group-1 and Group-2 respectively. Compare their following characteristics in tabular form:
- The number of electrons in their atoms
 - The sizes of their atoms
 - Their metallic characters
 - Their tendencies to lose electrons
 - The formula of their oxides
 - The formula of their chloride

[CBSE OD, Term 2, Set 1, 2015]

Ans.

S. No.	Property	P	Q
(a)	No. of electrons in the atom	3, 11, 19	4, 12, 20
(b)	Size of atom	Bigger	Smaller
(c)	Metallic character	More metallic	Less metallic
(d)	Tendency to lose electrons	More	Less
(e)	Formula of oxide	P ₂ O	QO
(f)	Formula of their chlorides	PCl	QCl ₂

- Q. 18.** Taking the example of an element of atomic number 16, explain how the electronic configuration of the atom of an element relates to its position in the modern periodic table and how valency of an element is calculated on the basis of its atomic number.

[CBSE OD, Term 2, Set 1, 2015]

Ans. Electronic configuration = 2, 8, 6
 Period = 3, since it has 3 shells
 Group = 16, since numbers of valence electrons are 6.
 Valency = 8 – 6 = 2

- Q. 19.** The elements ${}_4\text{Be}$, ${}_{12}\text{Mg}$ and ${}_{20}\text{Ca}$, each having two valence electrons in their valence shells, are in periods 2, 3 and 4 respectively of the modern periodic table. Answer the following questions associated with these elements, giving reason in each case:

- In which group should they be?
- Which one of them is least reactive?
- Which one of them has the largest atomic size?

[CBSE OD, Term 2, Set 2, 2015]

Ans. ${}_4\text{Be} = 2, 2$
 ${}_{12}\text{Mg} = 2, 8, 2$
 ${}_{20}\text{Ca} = 2, 8, 8, 2$
 (a) Group 2, they have 2 valence electrons.
 (b) Be, reactivity increases in a group.
 (c) Ca, atomic size increases in a group.

- Q. 20.** Given below are some elements of the modern periodic table. Atomic number of the element is given in the parentheses: A(4), B(9), C(14), D(19), E(20)

- Select the element that has one electron in the outermost shell. Also write the electronic configuration of this element.
- Which two elements amongst these belong to the same group? Give reason for your answer.
- Which two elements amongst these belong to the same period? Which one of the two has bigger atomic radius?

[CBSE OD, Term 2, Set 3, 2015]

Ans. Element Electronic configuration

A = 2, 2
 B = 2, 7
 C = 2, 8, 4
 D = 2, 8, 8, 1
 E = 2, 8, 8, 2

- D = 19; Electronic configuration 2, 8, 8, 1
- A and E, as they have same number of valence electrons.
- A and B, D and E as their number of shells are same, A is bigger than B and D is bigger than E.

- Q. 21.** How many groups and periods are there in the modern periodic table? How do the atomic size and metallic character of elements vary as we move:

- down a group and
- from left to right in a period

[CBSE Delhi, Term 2, Set 1, 2015]

Ans. 18 groups and 7 periods
 (a) Atomic size increases and metallic character increases.
 (b) Atomic size decreases and metallic character decreases.

- Q. 22.** From the following elements:

${}_4\text{Be}$, ${}_{9}\text{F}$, ${}_{19}\text{K}$, ${}_{20}\text{Ca}$

- Select the element having one electron in the outermost shell.

(ii) Two elements of the same group.

Write the formula and mention the nature of the compound formed by the union of ${}_{19}\text{K}$ and element X(2, 8, 7).

[CBSE Delhi, Term 2, Set 1, 2015]

Ans. (i) Potassium K

(ii) Be and Ca

KX and the compound is ionic in nature.

Q. 23. Na, Mg and Al are the elements of the same period of Modern Periodic

Table having one, two and three valence electrons respectively. Which of these elements (i) has the largest atomic radius, (ii) is least reactive? Justify your answer stating reason for each case.

[CBSE Delhi, Term 2, Set 2, 2015]

Ans. Na: atomic size decreases from left to right due to increase in the nuclear charge.

Al: The tendency to lose electron decreases left to right.

Long Answer Type Questions _____ (5 marks each)

Q. 1. The position of certain elements in the Modern Periodic Table are shown below.

Group → ↓ Period	1	2	3 to 12	13	14	15	16	17	18
1	G								H
2	A			I			B		C
3		D			E				F

Using the above table answer the following questions giving reasons in each case:

(i) Which element will form only covalent compounds?

(ii) Which element is a non-metal with valency 2?

(iii) Which element is a metal with valency 2?

(iv) Out of H, C and F which has largest atomic size?

(v) To which family does H, C and F belong? [CBSE Delhi, Set 1, 2020]

Ans. (i) E: Silicon will only form covalent compounds due to property of groups 14 elements to can share their valence electrons to form bonds.

(ii) B: Oxygen is a non-metal with valency 2 as groups 16 elements have 6 electrons in outermost shell, which are gained by non-metals to complete octet.

(iii) D: Magnesium is a metal with valency 2 as group 2 elements have 2 electrons in their outermost shell, which are lost by metals to acquire stability.

(iv) F has the largest atomic size out of H, C and F because down the group atomic size increases.

(v) H, C and F belongs to inert or noble gas.

Q. 2. Define atomic size. Give its unit of measurement. In the modern periodic table what trend is observed in the atomic radius in a group and a period and why is it so? [CBSE Delhi, Set 1, 2020]

Ans. The term atomic size refers to the radius of an atom. Atomic size is the distance between the centre of the nucleus and the outermost shell of an isolated atom. Atomic size is measured in picometer. Atomic radius decreases on moving from left to right along a period. This is due to an increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of the atom. Atomic size increases down the group. This is because new shells are being added as we go down the group. This increases the distance between the outermost electrons and the nucleus so that the atomic size increases in spite of the increase in nuclear charge.

Q. 3. (a) List any three observations which posed a challenge to Mendeleev's Periodic law.

(b) How does the metallic character of elements vary on moving from

- (i) left to right in a period,
- (ii) from top to bottom in a group of the Modern Periodic Table?

Give reason for your answer.

[CBSE OD, Set 1, 2019]

Ans. (a) Three observations which posed a challenge to Mendeleev's Periodic law are:

- (i) The position of isotopes could not be explained.
- (ii) Wrong order of atomic masses of some elements could not be explained.
- (iii) A correct position could not be assigned to hydrogen in the periodic table.

(b) (i) On moving from left to right in a period, the metallic character of elements decreases because electropositive character decreases due to increase in nuclear charge and decrease in atomic radius which causes nucleus to hold electrons more tightly.

(ii) On going down in a group of the periodic table, the metallic character of elements increases because electropositive character of elements increases with the increase in size of the atom.

Q. 4. The electrons in the atoms of four elements A, B, C and D are distributed in



Topper's Answers

three shells having 1, 3, 5 and 7, electrons respectively in their outermost shells. Write the group numbers in which these elements are placed in the Modern Periodic Table. Write the electronic configuration of the atoms of B and D, and the molecular formula of the compound formed when B and D combine.

[CBSE OD, Set 1, 2019]

Ans. A — 1st group.

B — 13th group.

C — 15th group.

D — 17th group.

Electronic configuration

B → Atomic number = 13.

K L M

2 8 3

D → Atomic number = 17

K L M

2 8 7

The molecular formula of the compound when B and D combine is BD₃.

Q. 5. (a) Define groups in the Modern Periodic Table. How do valency, atomic size and metallic character vary in a group?

(b) The atomic number of an element is 14. Examine if this element will have metallic properties or not. Give reason to justify your answer.

[CBSE, 2019]

19. (1) The vertical columns present in the modern periodic table having elements with similar valencies and chemical properties are called Groups.

(2) For eg. Alkali metals Group 1

H	- Hydrogen
Li	Lithium
Na	Sodium
K	Potassium
Rb	Rubidium
Cs	Cesium
Fr	Francium

(3) Valency

As we move down a group, valency remains same.
eg. all alkali metals are monovalent.

(4) Atomic size

Atomic size is the distance from the centre of nucleus to the last shell.

As we move down a group, the atomic size increases as number of shells increase.

eg. $H \rightarrow 1$
 $Li \rightarrow 2, 1$
 $Na \rightarrow 2, 8, 1$ etc.

⑤ metallic character

As we go down a group, the chemical reactivity of metals ~~increases~~ increases as it is easier for a bigger atom to lose electrons due to weaker electrostatic forces. eg. Francium is more metallic than Lithium.

But in non-metals, it decreases as it is easier for a smaller atom on top to gain electrons due to strong electrostatic forces than a bigger atom. eg. Fluorine is more non-metallic than Astatine.

b)

Atomic number = 14

electronic configuration = 2, 8, 4

element = Silicon

This element has semi properties of both metals and non-metals,

∴ It is a metalloid.

It has 4 valence electrons due to which it can neither gain nor lose electrons as it would become unstable.

∴ It forms covalent bonds.

- Q. 6. (a) The modern periodic table has been evolved through the early attempts of Dobereiner, Newland and Mendeleev. List one advantage and one limitation of all three attempts.
- (b) Name the scientist who first of all showed that atomic number of an

element is a more fundamental property than its atomic mass.

(c) State Modern Periodic law.

[CBSE, 2018]

Answer: 17

(i) Dobereiner's method of classification
Advantage: He, for the first time grouped metals on the basis of their similar chemical properties. He could find 3 Dobereiner's Triad which had a special characteristic:-

When arranged in increasing atomic masses, the atomic mass of middle element was equal to average of atomic masses of other two. This

Li - 6.9 u

Na - 23 u

K - 39.1 u

→ This encouraged others to classify elements on basis of chemical properties and atomic masses.

Disadvantage: He could only place 9 such elements in 3 triads & thus, wasn't efficient for a study of them.

(ii) Newland's law of octaves - Classification of Newland
Advantage: He could place 56 elements known at that time in his classification & also for first time, studied periodic recurrence of properties. In his classification, properties of every 8th element resembled to that of first.

Disadvantage: His system worked only for lighter elements & properties matched only for elements till 'Calcium'. Also, he placed some elements like 'Co & Ni' even in same slot.

(iii) Mendeleev's classification
Advantage: He arranged elements on basis of increasing atomic masses & similar formulae for hydrides & oxides. He also left gaps in his tables which encouraged for discovery of new elements like eka-boron, eka-aluminium etc.

Disadvantage: He placed some elements with more atomic mass prior to ones having less atomic mass for similarity of properties but couldn't justify it.

Ex: He placed 'Te' (127.6u) before 'I' (126.9u).

(b) Henry Moseley showed atomic no. as a more fundamental property.

(c) Modern Periodic law states that "properties of elements are periodic function of their atomic no. (number)".

Ans. (a) (i) Dobereiner:

Advantages: Elements of Group 3 having similar properties they were called as the Dobereiner triads. He arranged them in order of increasing atomic mass and the mass of middle element was equal to the average of the other two elements.

Limitation: He was able to identify only 4 triads but he failed in his attempt to group 15; nitrogen, phosphorus and arsenic because atomic mass of phosphorus is not the average of other two.

(ii) Newland:

Advantages: He arranged the elements in horizontal rows in order of increasing atomic mass. The property of every 8th element was similar to the 1st element.

Limitation: His arrangement was only applicable to lighter elements.

(iii) Mendeleev:

Advantage: He arranged the elements in order of their increasing atomic mass and he corrected the mass of beryllium from 4.5 to 13.5u.

Limitation: Position of hydrogen and isotopes were not justified in his periodic table.

(b) Henry Moseley showed that atomic number of an element is a more fundamental property than its atomic mass.

(c) Modern periodic law states that "the properties of elements are a periodic function of their atomic number. Repetition of properties is due to the same outer electronic configuration."