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## SCIENCE WORKSHEET SOLVED

# PERIODIC CLASSIFICATION OF ELEMENTS

### QUESTION BANK

#### (i) Multiple choice questions

1. According to Mendeleev's Periodic Law, the elements were arranged in the periodic table in the order of
  - (a) increasing atomic number
  - (b) decreasing atomic number
  - (c) increasing atomic masses
  - (d) decreasing atomic masses
2. Which of the following statement(s) about the Modern Periodic Table are incorrect
  - (i) The elements in the Modern Periodic Table are arranged on the basis of their decreasing atomic number
  - (ii) The elements in the Modern Periodic Table are arranged on the basis of their increasing atomic masses

(iii) Isotopes are placed in adjoining group (s) in the Periodic Table

(iv) The elements in the Modern Periodic Table are arranged on the basis of their increasing atomic number

(a) (i) only

(b) (i), (ii) and (iii)

(c) (i), (ii) and (iv)

(d) (iv) only

3. On the basis of electronic configuration of  $sX$ , the group number and period of the element 'X' is:

(a) Group 15 period 2

(b) Group 13 period 2

(c) Group 19 period 5

(d) Group 13 period 5

4. 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

5. Elements P, Q, R and S have atomic numbers 11, 15, 17 and 18 respectively. Which of them are reactive non-metals?

(a) P and Q

(b) P and R

(c) Q and R

(d) R and S

6. Which of the following elements has 2 shells and both are completely filled?

(a) Helium

(b) Neon

(c) Calcium

(d) Boron

7. Which of the following are the characteristics of isotopes of an element?

(i) Isotopes of an element have same atomic masses

(ii) Isotopes of an element have same atomic number

(iii) Isotopes of an element show same physical properties

(iv) Isotopes of an element show same chemical properties

(a) (i), (iii) and (iv)

(b) (ii), (iii) and (iv)

(c) (ii) and (iii)

(d) (ii) and (iv)

8. Three elements B, Si and Ge are

(a) metals

(b) non-metals

(c) metalloids

(d) metal, non-metal and metalloid respectively

9. Which of the given elements A, B, C, D and E with atomic number 2, 3, 7, 10 and 30 respectively belong to the same period?

(a) A, B, C

(b) B, C, D

(c) A, D, E

(d) B, D, E

10. Where would you locate the element with electronic configuration 2, 8 in the Modern Periodic Table?

(a) Group 8

(b) Group 2

(c) Group 18

(d) Group 10

11. Newlands relation is called

(a) Musical Law

(b) Law of Octaves

(c) Periodic Law

(d) Atomic Mass Law

12. The properties of Eka-aluminium predicted by Mendeleev are the same as the properties of later discovered element:

(a) Scandium

(b) Germanium

(c) Gallium

(d) Aluminium

13. The arrangement of elements in the Modern Periodic Table is based on their

(a) increasing atomic mass in the period

(b) increasing atomic number in the horizontal rows

(c) increasing atomic number in the vertical columns

(d) increasing atomic mass in the group

14. Element 'X' forms a chloride with the formula  $XCl_2$ , which is a solid with high melting point. X would most likely be in the same group of the periodic table as:

- (a) Si
- (b) Mg
- (c) Al
- (d) Na

15. What is the atomic number of element of period 3 and group 17 of the Periodic Table?

- (a) 10
- (b) 4
- (c) 17
- (d) 21

16. An element X from group 2 of the Periodic Table reacts with Y from group 17 to form a compound. Give the formula of the compound.

- (a)  $XY_2$
- (b) XY
- (c)  $X_2Y$
- (d)  $(XY)_2$

17. A metal 'M' is in the first group of the Periodic Table. What will be the formula of its oxide?

- (a) MO
- (b)  $M_2O$
- (c)  $M_2O_3$
- (d)  $MO_2$

18. An element X has mass number 40 and contains 21 neutrons in its atom. To which group of the Periodic Table does it belong?

- (a) Group 1
- (b) Group 4
- (c) Group 2
- (d) Group 3

19. What is the other name for group 18th elements?

- (a) Noble gases
- (b) Alkali metals
- (c) Alkali earth metals
- (d) Halogens

20. The atom of an element has electronic configuration 2, 8, 7. To which of the following elements would it be chemically similar?

- (a)  ${}_7N$
- (b)  ${}_{15}P$

(c)  ${}_{11}\text{Na}$

(d)  ${}_{9}\text{F}$

## (ii) Case based Questions

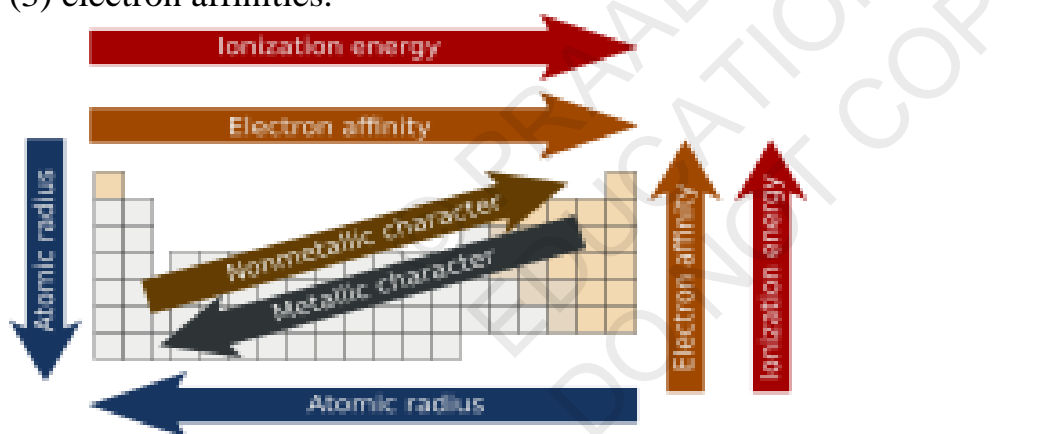
Q1 Today, 118 elements are known, the first 94 of which occur in nature. Of the 94 natural elements, eighty are stable. The periodic table is a graphic description of the periodic law, which states that the properties and atomic structures of the chemical elements are a periodic function of their atomic number.

Elements are placed in the periodic table by their electron configurations, which exhibit periodic recurrences that explain the trends of properties across the periodic table. As we go across a period from left to right, we add a proton to the nucleus and an electron to the valence shell with each successive element. As we go down the elements in a group, the number of electrons in the valence shell remains constant, but the principal quantum number increases by one each time.

An understanding of the electronic structure of the elements allows us to examine some of the properties that govern their chemical behavior. These properties vary periodically as the electronic structure of the elements changes.

They are

- (1) size (radius) of atoms and ions,
- (2) ionization energies, and
- (3) electron affinities.



1. Which of the following set of elements is written in order of their increasing metallic character?

(a) Na, Li, K

(b) C, O, N

(c) Mg, Al, Si

(d) Be, Mg, Ca

2. Which of the following is the correct order of the atomic radii of the elements oxygen, fluorine and nitrogen?

(a)  $\text{O} < \text{F} < \text{N}$

(b)  $\text{N} < \text{F} < \text{O}$

(c)  $\text{O} < \text{N} < \text{F}$

(d)  $\text{F} < \text{O} < \text{N}$

3. What happens to tendency to gain electron in a period?

- (a) Increases,
- (b) Decreases,
- (c) Remaining same,
- (d) First increases then decreases.

4. Which of the following elements would lose an electron easily?

- (a) Mg
- (b) Na
- (c) K
- (d) Ca

5. Atomic size decreases from left to right in a period because

- (a) Effective nuclear charge increases
- (b) Number of shells remains the same
- (c) Force of attraction between the nucleus and valence electrons increases
- (d) All of these

Q2. Atoms of eight elements A, B, C, D, E, F, G and H have the same number of shells but different number of electrons in their outermost shell. It was found that elements A and G combine to form an ionic compound. This compound is added in a small amount to almost all vegetable dishes during cooking. Oxides of elements A and B are basic in nature while those of E and F are acidic. The oxide of D is almost neutral.

Based on the above information answer the following questions:

- (1) To which group or period of the Periodic Table do the listed elements belong?
- (2) What would be the nature of compound formed by a combination of elements B and F?
- (3) Which two of these elements could definitely be metals?
- (4) Which one of the eight elements is most likely to be found in gaseous state at room temperature?
- (5) If the number of electrons in the outermost shell of elements C and G be 3 and 7 respectively, write the formula of the compound formed by the combination of C and G.

### (iii) Assertion Reason type Questions

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (A) Both assertion and reason are true and the reason is the correct explanation of assertion.
- (B) Both assertion and reason are true and the reason is not the correct explanation of assertion.
- (C) Assertion is true but the reason is false.
- (D) Both assertion and reason are false.
- (E) Assertion is false but reason is true.

1. **Assertion:** Properties of an atom and its corresponding ion remains the same.

**Reason:** Electronic configurations of both atom and ion remain same.

2. **Assertion:** Elements in the same vertical column have similar properties.

**Reason:** The properties of elements are periodic functions of their atomic numbers.

3. **Assertion:** Fluorine is more reactive than Chlorine.

**Reason:** The chemical reactivity of non-metals increases down the group.

4. **Assertion:** Group 18 elements are inert.

**Reason:** They have completely filled valence shell.

5. **Assertion:** Isotopes of an element were given separate places in Mendeleev's periodic table.

**Reason:** Isotopes of an element have different atomic masses.

6. **Assertion :** In Mendeléeve Periodic Table, cobalt was placed before nickel.

**Reason :** The atomic mass of cobalt is less than nickel

7. **Assertion :** According to Mendeleev, periodic properties of elements is a function of their atomic number.

**Reason :** Atomic number is equal to the sum of number of protons and neutrons.

8. **Assertion:** Li, Na, K belong to Dobereiner's triads

**Reason:** The atomic mass of Na is the average of atomic masses of Li and K

9. **Assertion :** Atomic size decreases along a period.

**Reason :** Effective nuclear charge increases as the atomic number increases resulting in the increased attraction of electrons to the nucleus

10. **Assertion:** Mendeleev left some gaps in his Periodic Table

**Reason:** Mendeleev believed that some elements would be discovered later

## DESCRIPTIVE QUESTIONS OF 1 MARK (PART A- ANSWER THE FOLLOWING QUESTIONS IN ONE SENTENCE)

1. What is the basis for arrangement of elements in the Mendeleev periodic table?
2. If Lithium, sodium and potassium form a Dobereiner's triad, and if the atomic masses of Li and K are 7 and 39, respectively, Predict the atomic mass of sodium?
3. Name the two elements for which temporary names were given as Eka-aluminium and Eka-silicon and spaces were left by Mendeleev in his table even before their discovery.
4. Write the formulae of chlorides of Eka-silicon and Eka-aluminium, the elements predicted by Mendeleev.
5. State Mendeleev periodic law
6. How does atomic size vary from left to right in a period?
7. State one reason for placing Mg and Ca in the same group of the periodic table.
8. Name any three metalloids.
9. State the modern periodic law of classification of elements.
10. Write the number of groups or vertical columns and periods or horizontal rows in the modern periodic table.

## SHORT ANSWER TYPE QUESTIONS [2 MARKS]

11. (a). On moving from left to right in the second period when happens to the number of valence electrons?  
(b). How does reactivity of metals vary down a group?
12. The elements of the second period of the Periodic Table are given below: Li Be B C N O F  
(a) Give reason to explain why atomic radii decrease from Li to F.  
(b) Identify the most (i) metallic and (ii) non-metallic element.
13. The elements of the third period of the Periodic Table are given below:  
Na, Mg, Al, Si, P, S, Cl, Ar  
(a) Which atom is bigger, Na or Mg? Why?  
(b) Identify the most (i) metallic and (ii) non-metallic element in Period 3.
14. Mention three achievements of Mendeleev's periodic table and one defect.
15. How can the valency of an element be determined if its electronic configuration is known? What will be the valency of an element of atomic number 9 (nine)?

## SHORT ANSWER TYPE QUESTIONS (3 MARKS)

16. (a). How does the electronic configuration of an atom of an element related to its position in the modern periodic table? Explain with one example.  
(b) Find the group and period of element with  $Z=12$ ?



17. The atomic numbers of three elements, X, Y and Z are 9, 11 and 17 respectively. Which two of these elements will show similar chemical properties? Why?

18. How does the metallic character of elements change along a period of the periodic table from the left to the right and in a group from top to bottom. Why?

19. How does the valency of elements vary (a) in going down a group, and (b) in going from left to right in a period of the periodic table

20(a) In the Mendeleev's Periodic table, why does Argon with atomic mass 39.9 appear before Potassium having atomic mass 39.1? (b) Why is atomic number a more important property than atomic mass?

### 5 MARK QUESTIONS

21. a. Calcium is an element with atomic number 20.

(i) Is it a metal or non-metal?

(ii) Will its size be more or smaller than that of potassium?

(iii) Write the formula of its chloride.

b. 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'.

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

<b>1</b> <b>Lithium</b>	<b>2</b>	<b>13</b>	<b>14</b> <b>Carbon</b>	<b>15</b>	<b>16</b> <b>Oxygen</b>	<b>17</b> <b>L</b>	<b>18</b> <b>Neon</b>
X			S		P	Q	
Y						R	

Z						T	
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- Which is the most reactive metal?
- Name the family of L, Q, R, T.
- Name one element of group 2 and 15,
- Name one member of group 18 other than neon.
- Give the name of the element S placed below carbon in group 14.

23. Two elements X and Y belong to group 1 and 2 respectively in the same period of periodic table. Compare them with respect to:

- the number of valence electrons in their atoms;
- their valencies;
- metallic character;
- the sizes of their atoms;
- the formulae of their oxides;
- the formulae of their chlorides.

24. An element is placed in 2nd Group and 3rd Period of the Periodic Table, burns in presence of oxygen to form a basic oxide.

- Identify the element
- Write the electronic configuration
- Write the balanced equation when it burns in the presence of air
- Write a balanced equation when this oxide is dissolved in water
- Draw the electron dot structure for the formation of this oxide

25. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

- Where in the periodic table are elements X and Y placed?
- Classify X and Y as metal (s), non-metal (s) or metalloid (s)
- What will be the nature of oxide of element Y? Identify the nature of bonding in the compound formed
- Draw the electron dot structure of the divalent halide

26. Atomic number of a few elements are given below 10, 20, 7, 14

- (a) Identify the elements
- (b) Identify the Group number of these elements in the Periodic Table
- (c) Identify the Periods of these elements in the Periodic Table
- (d) What would be the electronic configuration for each of these elements?
- (e) Determine the valency of these elements

27. Mendeleev ' predicted the existence of certain elements not known at that time and named two of them as Eka-silicon and Eka-aluminum.

- (a) Name the elements which have taken the place of these elements
- (b) Mention the group and the period of these elements in the Modern Periodic Table.
- (c) Classify these elements as metals, non-metals or metalloids
- (d) How many valence electrons are present in each one of them?

28. (a) Electropositive nature of the element(s) increases down the group and decreases across the period

- (b) Electronegativity of the element decreases down the group and increases across the period
- (c) Atomic size increases down the group and decreases across a period (left to right)
- (d) Metallic character increases down the group and decreases across a period.

On the basis of the above trends of the Periodic Table, answer the following about the elements with atomic numbers 3 to 9.

- (a) Name the most electropositive element among them
- (b) Name the most electronegative element
- (c) Name the element with smallest atomic size
- (d) Name the element which is a metalloid
- (e) Name the element which shows maximum valency

29. An element X which is a yellow solid at room temperature shows catenation and allotropy. X forms two oxides which are also formed during the thermal decomposition of Ferrous sulphate crystals and are the major air pollutants.

- (a) Identify the element X
- (b) Write the electronic configuration of X
- (c) Write the balanced chemical equation for the thermal decomposition of Ferrous sulphate crystals?

(d) What would be the nature (acidic/ basic) of oxides formed?

(e) Locate the position of the element in the Modern Periodic Table.

30. An element X of group 15 exists as diatomic molecule and combines with hydrogen at 773 K in presence of the catalyst to form a compound, ammonia which has a characteristic pungent smell.

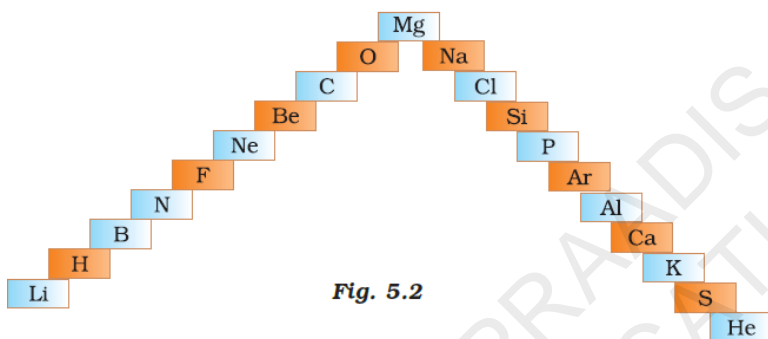
(a) Identify the element X. How many valence electrons does it have?

(b) Draw the electron dot structure of the diatomic molecule of X. What type of bond is formed in it?

(c) Draw the electron dot structure for ammonia and what type of bond is formed in it?

31. a) In this ladder (Figure 5.2) symbols of elements are jumbled up. Rearrange these symbols of elements in the increasing order of their atomic number in the Periodic Table.

(b) Arrange them in the order of their group also.



### Answers to Section (i) - mcqs

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	b	b	d	c	b	d	C	b	c	b	c	b	b	c	a	b	a	a	d

### Answers to Section (ii) – Case based qns

#### Q1

1	2	3	4	5
d	d	a	c	d

Q2: 1. A and B belong to group 1 and 2 because they form basic oxides.

C belongs to group 13 as it has 3 valence electrons.

D belongs to group 14 as it forms almost neutral oxide.

E and F belong to group 15 and 16 as they form acidic oxides,

G belongs to group 17 as it has 7 valence electrons and

H belongs to group 18.

They belong to 3rd period of the Periodic Table because AG is NaCl, added in a small amount to almost all vegetable dishes during cooking and Na and Cl belong to 3rd period.

2. Ionic compounds will be formed because 'B' is metal and 'F' is non-metal. 'B' can lose two electrons and 'F' can gain two electrons.
3. A and B are definitely metals as they form basic oxides.
4. G and H are gaseous at room temperature.
5. CG<sub>3</sub> is the formula of the compound formed by combination of C and G.

**Answers to section (iii) – Assertion Reason based qns**

1	2	3	4	5	6	7	8	9	10
D	B	C	A	E	C	D	A	C	A

**Section (iv) – one mark questions (Descriptive)**

1. Increasing order of atomic mass and similarity in chemical properties
2. Sum of atomic masses of extreme elements =  $7 + 39 = 46$ . Average atomic mass =  $46/2 = 23$ . So sodium will have atomic mass = 23
3. Gallium and Germanium
4. Formula of Chloride of Eka Silicon is  $\text{GeCl}_4$  and that of Eka Aluminium is  $\text{GaCl}_3$
5. Properties of elements are a periodic function of their atomic masses.
6. Atomic size decreases from left to right in a period.
7. They have same number of valence electrons and similar chemical properties.
8. Boron, Silicon and Germanium.
9. It states that "the properties of the elements are periodic functions of their atomic numbers."
10. There are 18 vertical columns or groups and seven horizontal rows or periods in the modern periodic table.

**Section (iv) – 2 marks questions (Descriptive)**

- 11 a. Number of valence electrons increases from left to right in the second period  
b. Reactivity of metals goes on increasing down a group.
- 12 (a) It is because nuclear charge increases due to increase in atomic number, therefore, force of attraction between nucleus and valence electrons increases, i.e. effective nuclear charge increases, hence atomic radii decrease from Li to F.  
(b) (i) Most metallic element is 'Li' as it can lose electrons easily due to larger atomic size.  
(ii) Most non-metallic element is 'F' because it can gain electrons easily due to smallest atomic size.
13. (a) Sodium is bigger than magnesium as it has lesser nuclear charge so there is less force of attraction between nucleus and valence electrons and less effective nuclear charge. It is, therefore, bigger in size.  
(b) (i) Sodium is the most metallic as it can lose electrons easily due to its larger atomic size,

(ii) Chlorine is the most non-metallic element because it can gain electrons easily due to its smallest atomic size.

14. Merits (a) It could classify all the elements discovered at that time.

(b) It helped in discovery of new elements.

(c) It helped in correction of atomic mass of some of the elements.

Defect; 1. All isotopes of an element do not find position in this table.

15. It is the combining capacity of the element.

Generally, valency = number of valence electron or  $8 - \text{number of valence electron}$ .

If the element has 1, 2, 3, 4 valence electrons, its valency will be 1, 2, 3, 4 respectively.

If the element has 5, 6, 7, 8 valence electrons, its valency will be 3, 2, 1, 0.

Element with atomic number 9 has electronic configuration 2, 7. So, its valency will be 1.

### Section (iv) – 3 marks questions (Descriptive)

16. (a) The position of element depends upon number of valence electrons which depend upon electronic configuration. Those elements which have same valence electrons, occupy same group. Eg; those elements which have one valence electron belong to group 1. Elements with two valence electrons belong to group 2. Period number is equal to number of shells. If valence electrons are equal to 1, it belongs to group 1. If it has 2 shells, it belongs to second period, e.g. if element 'X' has atomic number 11, its electronic configuration is 2, 8, 1. It has one valence electron, it belongs to group 1 and it has three shells therefore, it is in third period.

(b)  $Z=12$  and the configuration is 2, 8, 2. So it should belong to 2nd group and 3rd period.

17. Electronic configuration of X, Y and Z will be: X (9) : 2, 7 Y (11) : 2, 8, 1 Z (17) : 2, 8, 7

X and Z will show similar chemical properties due to same number of valence electrons.

18. The metallic character goes on decreasing along a period from left to right because atomic size goes on decreasing therefore, tendency to lose electrons decreases. But in a group from top to bottom metallic character goes on increasing due to increase in size from top to bottom giving a tendency to lose electrons which are loosely held.

19. (a) Valency remains the same in a group.

(b) Valency first goes on increasing from left to right in a period till middle of period, then decreases.

20. (a) It is because Mendeleev arranged elements giving more importance to the similarity in chemical properties of an element with the remaining members of the group. So Argon, being an inert gas was placed along with inert gases and Potassium being an alkali metal is placed along with the other alkali metals. So Argon and Potassium are examples of anomalous pair.

(b) Atomic number gives us the electronic configuration which gives the number of valence electron which decides the chemical nature of the element.

21. a. The electronic configuration of calcium ( $Z = 20$ ) is 2, 8, 8, 2.

(i) Since it has only two valence electrons, it is present in group 2. It is a metal.

(ii) Both potassium (K) and calcium (Ca) are present in fourth period. Since atomic size decreases along a period, calcium is smaller in size.

(iii) The valency of calcium is 2. The formula of its chloride is  $\text{CaCl}_2$ .

b. Atomic number of the element 'X' =  $35 - 18 = 17$

Gp17, period-3

22. (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 group 15 is nitrogen (N).

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

(e) The element is silicon (Si)

23. X and Y belong to same period, X belongs to group '1'. Y belongs to group '2'.

(i) Valence electron in X is 1 whereas valence electrons in Y are 2.

(ii) The valency of X is 1 whereas valency of Y is 2.

(iii) X is more metallic than Y because metallic character decreases on moving from left to right in a period.

(iv) The size of X is more than Y because size of the atom decreases on moving from left to right in a period.

(v) Oxide of X =  $\text{X}_2\text{O}$ , Oxide of Y =  $\text{YO}$

(vi) Chloride of X =  $\text{XCl}$ , Chloride of Y =  $\text{YCl}_2$

24.

(a) Magnesium

(b) Electronic configuration is 2, 8, 2.

(c)  $2\text{Mg} + \text{O}_2 \longrightarrow 2\text{MgO}$

(d)  $\text{MgO} + \text{H}_2\text{O} \longrightarrow \text{Mg}(\text{OH})_2$

(e)  $\text{Mg} \longrightarrow \text{Mg}^{2+} + 2e^-$

2, 8, 2      2, 8

$\text{O} + 2e^- \longrightarrow \text{O}^{2-}$

2, 6                      2, 8

$(\text{Mg})^{2+}$   $(:\ddot{\text{O}}:)^{2-}$  is electron dot structure.

25.

- (a) 'X' is in group 17 and 3rd period, 'Y' is in group 2 and 4th period.
- (b) 'X' is non-metal and 'Y' is a metal.
- (c) 'Y' forms basic oxide. It has ionic bonding in the compound formed.
- (d)  $\text{:}\ddot{\text{X}}\text{:}\cdot\cdot\text{Y}\cdot\cdot\ddot{\text{X}}\text{:}$  is the electron dot diagram.

26.

Atomic number	Element (a)	Group no. (b)	Period (c)	Electronic configuration (d)	Valency (e)
10	Neon	18	2nd Period	2, 8	Zero
20	Calcium	2	4th Period	2, 8, 8, 2	2
7	Nitrogen	15	2nd Period	2, 5	3
14	Silicon	14	3rd Period	2, 8, 4	4

27. (a) Eka- silicon is Germanium (Ge)

Eka- aluminium is Gallium (Ga)

(b) Eka- silicon – group 14 & period 3

Eka- aluminium – Group 13 & period 3

(c) Eka- silicon - metalloid

Eka- aluminium – metal

(d) Valence electron present in Eka- silicon is 4

Valence electron present in Eka- aluminium is 3

28.

- (a) Lithium (3)
- (b) Fluorine (9)
- (c) Fluorine (9)



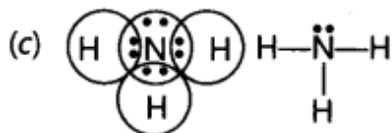
- (d) Boron (5)  
 (e) Carbon (6). Its valency is 4.

29.

- (a) 'X' is sulphur.  
 (b) Electronic configuration of 'X' is 2, 8, 6.  
 (c)  $2\text{FeSO}_4(s) \xrightarrow{\text{heat}} \text{Fe}_2\text{O}_3(s) + \text{SO}_2(g) + \text{SO}_3(g)$   
 (d)  $\text{SO}_2$  and  $\text{SO}_3$  are acidic oxides.  
 (e) It belongs to Group 16 and 3rd period.

30

- (a) 'X' is nitrogen. It has 5 valence electrons.  
 (b)  $:\text{X}:::\text{X}:$ , it has triple covalent bond,  
 i.e.  $:\text{X}\equiv\text{X}:$



The bond formed is covalent bond.

31. (a) H, He, Li, Be, B, C, N, O, F, Ne, Mg, Al, Si, P, S, Cl, Ar, K, Ca

- (b) Group 1: H, Li, Na, K  
 Group 2: Be, Mg, Ca  
 Group 13: B, Al  
 Group 14: C, Si  
 Group 15: N, P

Group 16: O, S

Group 17: F, U

Group 18: He, Ne, Ar

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