

Chemistry Worksheet Class 10 on Chapter 5 Periodic Classification of Elements with Answer- Set 3

Q1. How many elements are there in the fifth period of the periodic table?

- (a) Eighteen
- (b) Thirty-two
- (c) Eight
- (d) None of the above

Answer: (a) There are eighteen elements in the fifth period of the periodic table.

Q2. Fourteen elements after lanthanum are known as

- (a) Lanthanides
- (b) Actinides
- (c) d- block elements
- (d) None of the above

Answer: (a) Fourteen elements after lanthanum are known as Lanthanides.

Q3. What is the electronic configuration of Al^{3+} ion?

- (a) 2, 8
- (b) 2, 8, 1
- (c) 2, 8, 2
- (d) 2, 8, 3

Answer: (a) The electronic configuration of Al^{3+} ion is 2, 8.

Q4. Which group elements are also known as transition metals?

- (a) s block elements
- (b) p block elements
- (c) d block elements
- (d) f block elements

Answer: (c) d block elements are also known as transition metals.

Q5. A metal belongs to the first group of the modern periodic table. What is the formula of its oxide?

- (a) MO
- (b) MO_2
- (c) M_2O
- (d) None of the above

Answer: (c) M_2O is the formula of a metal belonging to the first group of the modern periodic table.

Q6. What is the basis for classifying elements of the Mendeleev periodic table?

Answer: Mendeleev classified the elements based on their fundamental property, i.e. atomic mass and chemical properties. He reacted the elements with hydrogen and oxygen, and the formulae of the elements' hydrides and oxides were considered a basic property for their classification.

Q7. Let X be an element with an Atomic number equivalent to nineteen. What is the formula of its chloride?

Answer: The atomic number 19 indicates that the electronic configuration of the element is 2,8,8,1. The number of electrons in the valence shell is 1. Thus its valency is 1. So the formula of its chloride will be XCl. Moreover, we know that potassium has an atomic number equivalent to nineteen. Therefore the exact molecular formula will be KCl.

Q8. The atomic number of elements U, V, X, Y and Z are given below.

Element	U	V	X	Y	Z
Atomic Number	7	10	12	4	19

From the above table, answer the following questions.

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

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

Answer: (i) Element X belongs to the 3rd period. Its electronic configuration is 2, 8, 2, from which we can see that there are three shells present in it. So it belongs to the 3rd period.

(ii) Element U is a non-metal. Its atomic number is 7, so its electronic configuration will be 2,5. It contains five valence electrons, so it belongs to the 15th group and will lie on the right side of the second period. On moving from left to right in a period, the non-metallic character increases. Thus, U is a non-metal.

Q9. An element belongs to group 17. It is present in the third period, and its atomic number is 17. What is the element's atomic number belonging to the same group and present in the fifth period?

Answer: The element with atomic number 17 is chlorine. It belongs to the 17th group of the periodic table. The element belonging to the 5th period of the same group is iodine which has an atomic number of 53.

Q10. Name any two elements having valency two concerning oxygen.

Answer: Two elements that can show a valency of two concerning oxygen are calcium and barium.

Q11. What is the principle of Mendeleev's periodic table?

Answer: Mendeleev classified the elements based on their fundamental property, i.e. atomic mass and chemical properties. He reacted the elements with hydrogen and oxygen, and the formulae of the elements' hydrides and oxides were considered a basic property for their classification.

Q12. What is a valence electron?

Answer: The electron present in the outermost shell of an atom is known as a valence electron.

Q13. Name an element with double the number of electrons in its L shell than that present in its M shell.

Answer: The innermost shell is the K shell, followed by the L shell and then comes the M shell. We can write an electronic configuration that satisfies the given condition as 2,8,4. We can see that the number of electrons present in the L shell is double the number of electrons present in the M shell. It is possible for an element with an atomic number equivalent to 14. Thus the element is Silicon.

Q14. Why was the position of hydrogen not fixed in Mendeleev's periodic table?

Answer: The position of hydrogen was not specified in Mendeleev's periodic table because the electronic configuration of hydrogen is similar to that of alkali metals. Like alkali metals, it reacts with halogens, oxygen and sulphur to form compounds of similar formulae. E.g., H_2S and Na_2S . On the other hand, hydrogen reacts with metals and non-metals, just like halogens. Due to this abnormal behaviour of hydrogen, Mendeleev was unable to fix a specific position for it.

Q15. Name any two elements forming oxides of the types XO_3 .

Answer: Two elements that can form oxides of type XO_3 are chromium (Cr) and sulphur (S). The formulae of their oxides are CrO_3 and SO_3 .

Q16. The position of the five elements in the periodic table is shown below.

	Group 1	Group 2	Group 15	Group 16
Period 1		A		B
Period 3	C		D	E

Answer the following questions.

(i) Identify the element which will form basic oxide?

(ii) Identify the element which will show valency three?

(iii) Identify the element which will show the greatest tendency to gain electrons?

Answer: (i) Since C and A lie in the 15th and 2nd groups, these can readily lose electrons and thus form basic oxides.

(ii) We know that elements of the 15th group need only three electrons to complete their octet configuration and thus show valency 3. So, D will show valency 3.

(iii) We know that tendency to gain electron or electron gain enthalpy increases going right along the period and decreases going down the group. Thus, B will show the highest tendency to gain electrons.

Q17. The position of the five elements in the periodic table is shown below.

	Group 1	Group 2	Group 15	Group 16

Period 1		A		B
Period 3	C		D	E

Answer the following questions.

- (i) What is the number of valence electrons in B?
- (ii) Identify the element which will have the smallest atomic radii?
- (iii) Identify the element which will be most metallic?

Answer: (i) Since we know that elements in the 16th group have 6 electrons in their outermost shell, i.e. the valence electrons are 6. Therefore, we can say that B has six valence electrons.

(ii) We know that elements in the lower period have a smaller radius than others as they have less number of shells. Also, along the period, the size of the atom decreases as the effective nuclear charge on outer electrons increases. So, B will have the smallest size as it lies in the 1st period and 16th group.

(iii) We know that the metallic character increases going down the group and decreases right along the period. Thus C will be the most metallic of all.

Q18. A non-metal A, the largest constituent of air, combines with hydrogen on heating in the presence of Fe (as a catalyst) and forms a gas B. When this gas B is treated with H_2SO_4 , compound C is formed, which is broadly used as chemical fertiliser.

- (i) Identify A, B and C.
- (ii) Locate the position of A in the modern periodic table.
- (iii) Which elements are present before and after element A?
- (iv) Write the electronic configuration of element A.

Answer: (i) The largest non-metal constituent of air is nitrogen (N_2), and it is present as N_2 gas. It reacts with hydrogen in the presence of a Fe catalyst to give Ammonia (NH_3). Ammonia reacts with conc. H_2SO_4 to give ammonium sulphate $(NH_4)_2SO_4$.

Thus A = Nitrogen (N_2)

B = Ammonia (NH_3)

C = Ammonium sulphate $(NH_4)_2SO_4$.

- (ii) Element A is Nitrogen. It lies in the 2nd period and 15th group of the modern periodic table.
- (iii) Carbon comes before nitrogen, and oxygen comes after nitrogen in the 2nd period.
- (iv) The atomic number of nitrogen is 7. So, its electronic configuration is 2, 5.

Q19. A teacher in Xth class, during teaching, explains the importance of music in our daily life. She was telling her students that in the Indian music system, there are seven musical notes in a scale sa, re, ga, ma, pa, da, ni. And in the west, notations used are do, re, mi, fa, so, la, ti. Whole frequency intervals of tones separate the notes in a scale. Every eighth note is similar to the first one, and it is the first note of the following scale. A musician uses these notes for composing the music for a song.

Read the above passage carefully and answer the following questions accordingly.

- (i) Is the situation discussed above similar to something in chemistry? Explain.
(ii) What are the limitations of the above principle in the case of chemistry?
(iii) What values will you infer from the above passage?

Answer: (i) The above situation is similar to "Newlands's law of octaves". Newland arranged the known elements in increasing order of atomic mass. He found that every eighth element had properties similar to the first one. He compared it to the octaves found in music.

(ii) The limitations of "Newland's law of octaves" are as follows:

- This law was only applicable to calcium. After calcium, every eighth element didn't possess properties similar to the first one.
- Newland assumed that no more elements would be discovered in future, but new elements were discovered later on which couldn't fit in this law.
- Newland put two distinct elements in the same slot.

(iii) The value we can infer from the above passage is that music is vital in our lives.

Q20. The school has an assembly of students standing in rows, which is straight, horizontally, and vertical. Each class stands in a single line with schools. Each class has a unique name, e.g. class 1st, 2nd, 3rd ... etc. In general, the height of students in class 1st is most petite, and 12th is most prominent. Every student sings the prayer at the same time.

Read the above passage carefully and answer the following questions given below.

- (i) Do you find any similarity between rows of assembly with the periodic table of elements? Explain any two points.
(ii) How can you compare students' qualities with periodic table elements?
(iii) What values are taught during the assembly of school?

Answer: (i) Yes, we find the following similarities between periodic table rows and assembly rows:

- In periodic table rows, elements are arranged in increasing order of atomic numbers. Just like in assembly rows, students are made to stand in increasing order of their classes.
- Just like the height in assembly rows, the atomic size in groups also changes in the periodic table.