PRAADIS EDUCATION

CHEMISTRY XI

PERIODIC CLASSIFICATION OF ELEMENTS

OBJECTIVE QUESTIONS

Genesis of Periodic Classification

1. _____ gave the idea for the first time to classify elements as per their properties.
a) Mendeleev
b) Dobereiner
c) Newland
d) John

Answer: b
Explanation: In the early 1800s, a German chemist named Dobereiner came up with the idea of classifying elements as per their properties. LAter in 1829, he noticed a similarity in triads (a group of 3 elements). This is how he classified.

2. In triads, the average weight of the 1^{st} and the 3^{rd} element are equal to the second one.
a) True
b) False

Answer: a
Explanation: As per Dobereiner Triads, the above statement". In triads, the weight the 2^{nd} element is about halfway between weights of 1^{st} and 3^{rd} elements." For example, consider a triad of Li, Na, and K with atomic weight 7, 23 and 39 respectively.

3. Which of the following is not Dobereiner triad?
a) Li, Na, and K
b) He, Na and Ar
c) Ca, Sr and Ba
d) CL, Br and I

Answer: b
Explanation: According to Dobereiner, in triads, the average weight the 1st and the 3rd element are equal to the second one. Li, Na, and K; Ca, Sr and Ba; CL, Br and I satisfy the above conditions. But He, Na and Ar don't follow the law of Dobereiner Triads.

4. The property of every eight elements is similar to that of the 1st element. This is proposed by _____
a) Thomson
b) Dobereiner
c) Mendeleev
d) John Alexander Newland

Answer: d
Explanation: In the year 1865, an English chemist named John Alexander Newland proposed the law of octaves. It stated that when elements are arranged in their increasing atomic weights, the property of every eight elements is similar to that of the 1st element.

5. Newland's law of Octaves is only valid until calcium.
a) False
b) True

Answer: b
Explanation: Yes, the above statement is true. according to John Alexander Newland, when elements are arranged in their increasing atomic weights, the property of every eight elements is similar to that of 1st element. But it's only true till calcium, so its failed.

6. The periodic functions of the _____ are the properties of respective elements.
a) Atomic Weights
b) Atomic Number
c) Chemical properties
d) No of protons

Answer: a
Explanation: According to Russian chemist named Dmitri Mendeleev who got the credits for the development of the modern periodic table, the periodic functions of the atomic weights are the properties of respective elements.

7. Eka Aluminium is _____
a) Germanium
b) Gallium
c) Silicon
d) Copper

Answer: b
Explanation: At the time of Mendeleev, Gallium was not discovered. So he predicted Gallium's properties and left a space for it, by naming it Aka Aluminium. The properties he predicted were almost the same as GAllium's properties.

8. What are the atomic weights of Aka Silicon and Germanium?
a) 72, 72.6
b) 68, 70
c) 70, 72
d) 68, 72.6

Answer: a
Explanation: At the time of Mendeleev, Germanium was not discovered. So he predicted Germanium's properties and left a space for it, by naming it Aka Silicon. So he predicted Aka silicon's atomic weight as 70, but the Germanium's atomic weight is 72.

9. In Mendeleev's periodic classification, what is the number of groups?
a) 12
b) 8
c) 7
d) 6

Answer: b
Explanation: A Russian chemist named Dmitri Mendeleev classified elements based on chemical and physical properties in ascending order of their atomic weights. The number of groups was 8 and there were 12 series.

10. The ideal gases were in ____ group of Mendeleev's periodic table.
a) 3^{rd}
b) 4^{th}
c) 1^{st}
d) 2^{nd}

Answer: c
Explanation: Dmitri Mendeleev classified elements based on chemical and physical properties in ascending order of their atomic weights. Noble gases were placed in the first group of Mendeleev's periodic table

Modern Periodic Law and the Present Form of the Periodic Table

1. _____ observed the X-rays' characteristics.
a) Henry Moseley
b) Mendeleev
c) Pauli
d) Newland

Answer: a
Explanation: Henry Moseley was an English physicist whose is know for modification of Mendeleev's periodic table as he found out that

atomic number is more prominent than atomic weight by his observation in regularities in characteristics in X-rays.

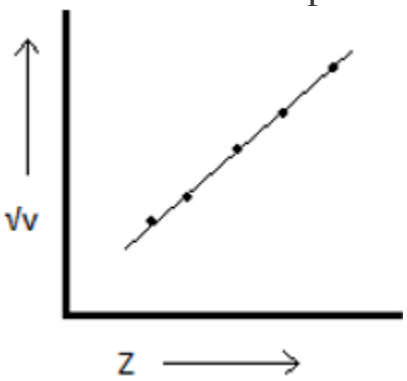
2. The graph of v√ Vs Z gives a straight line.
a) True
b) False

Answer: a
Explanation: In the above statement v represents the frequency of X-rays emitted and Z depicts atomic number, but not the mass number. Henry Moseley found out that atomic number is more prominent than atomic weight by this graph.

3. The physical and chemical properties of an element are the periodic function of its _____
a) Atomic mass
b) Element behaviour
c) No of electrons
d) Atomic number

Answer: d
Explanation: The above statement that the periodic function of the atomic number states the physical and chemical properties of that element is the modern periodic law is changed according to Henry Moseley by these experiments.

4. What does Z represent in the above graph?



a) Atomic mass
b) Atomic number

c) Frequency
d) Wavelength

Answer: b
Explanation: The above graph states Henry Moseley's law, where v represents the frequency of X-rays emitted and Z depicts atomic number. It states that the atomic number is more prominent than atomic weight in case of periodic classification.

5. Henry Moseley's law is given by the equation $v\sqrt{} = a(Z - b)$. What do a and b represent here?
a) The proportionality constant, screening constant
b) Screening constant, proportionality constant
c) Absorption constant, proportionality constant
d) screening constant, Boltzmann constant

Answer: a
Explanation: In the equation $v\sqrt{} = a(Z - b)$, a represents proportionality constant and b represents screening constant.a and b are independent by not depending on the target's nature. The above equation is the result of Henry Moseley's law of the modern periodic table.

6. The horizontal rows in Mendeleev's periodic table were called as _____
a) periods
b) groups
c) series
d) rows

Answer: c
Explanation: A Russian chemist named Dmitri Mendeleev classified elements based on chemical and physical properties in ascending order of their atomic weights. The number of groups was 8 (vertical columns) and there were 12 series (horizontal rows).

7. In the modern long-form of periodic table, the horizontal rows and the vertical columns are called as _____ and _____ respectively.
a) groups, periods
b) periods, groups
c) rows, columns
d) columns, rows

Answer: b
Explanation: In the most convenient and widely used periodic table of the long-form that is the modern version, the horizontal rows and the vertical columns are called as periods (series as per Mendeleev) and groups respectively.

8. The period's number corresponds to the highest _____
a) Azimuthal quantum number
b) Spin quantum number
c) Magnetic quantum number
d) Principal quantum number

Answer: d
Explanation: As seen in the most convenient and widely used periodic table of the long-form that is the modern version, the horizontal rows that depict period number represent the highest principal quantum number of the atoms in the period.

9. Which was the incomplete period in the long-form of the modern periodic table?
a) 7^{th} period
b) 4^{th} period
c) 6^{th} period
d) 2^{nd} period

Answer: a
Explanation: The 7^{th} period follows the rule that the elements fill their 7s subshell first and then 5f, 6d and 7p (Plutonium is the exception). As the

elements weren’t discovered completely, it was called the incomplete period.

10. Which of the following period is the shortest one?
a) 1
b) 3
c) 2
d) 4

Answer: a
Explanation: The first period is known as the shortest period among the seven periods of the periodic table this is because it contains only two elements; one of the two elements is hydrogen which belongs to alkali metal group and the other is the Helium which is a noble gas.

Periodic Table Classification – Nomenclature of Elements with Atomic Numbers > 100

1. Which of the following is not the name of the 104^{th} element?
a) Rutherfordium
b) Kurchatovium
c) Unnilquadium
d) Neptunium

Answer: d
Explanation: For claiming credit for discovering 104^{th} element, the Americans named it Rutherfordium and the Soviets named it Kurchatovium. While it’s named Unnilquadium as per IUPAC nomenclature. Neptunium is the 93^{rd} element.

2. In olden days, as a privilege to the discoverer, the elements were named as they suggested by IUPAC.
a) True
b) False

Answer: a
Explanation: Traditionally, IUPAC ratified the name selected by the discoverer. But later this led to the problem because the synthesis of these elements required costly equipment and laboratory as the elements with higher atomic numbers are highly unstable.

3. The element _____ is also known as Unnilunium.
a) Nobelium
b) Mendelevium
c) Hassium
d) Flerovium

Answer: b
Explanation: As per the notations of the IUPAC nomenclature, the 101^{st} element is named as Unnilunium. When the Einstenium was bombarded with alpha particles, Mendelevium was discovered and named after Dmitri Mendeleev.

4. What's the name of the 109th element as per the nomenclature?
a) Unnilennium
b) Unnilunium
c) Ununnillium
d) Ununennium

Answer: a
Explanation: As per IUPAC nomenclature, 0 – nil, 1 – un, 2 – bi, 3 – tri, 4 – quad, 5 – pent, 6 – hex, 7 – sept, 8 – oct and 9 – enn. Here it's 109 so 1 – un, 0 – nil and 9 – enn, combining them its unnilennium (adding "-ium" after it).

5. What's the symbol of the element Unnilquadium?
a) Unl
b) Unq
c) Uns
d) Ubn

Answer: b
Explanation: Unnilquadium is a combination of un, nil, and quad i.e. 1, 0 and 4 as per IUPAC nomenclature. Its symbol is formed by joining the first letters. So combining u from uni, n from nil and q from quad, we get Unq.

6. For the 115th element _____ is the name as per IUPAC nomenclature and _____ is the official name.
a) Unnilquadium, Mendelevium
b) Unnilunium, Rutherfordium
c) Ununpentium, Moscovium
d) Moscovium, Ununpentium

Answer: c
Explanation: As per IUPAC nomenclature, the roots are as follows: 0 – nil, 1 – un, 2 – bi, 3 – tri, 4 – quad, 5 – pent, 6 – hex, 7 – sept, 8 – oct and 9 – enn. So 115 is Ununpentium and the official name is Moscovium was named after the Moscow Oblast in which Joint Institute for Nuclear Research is situated.
7. The elements, Unnilhexium and Seaborgium are the same.
a) True
b) False

Answer: a
Explanation: Unnilhexium is the 106^{th} element as per IUPAC nomenclature, as the roots are un, nil, and hex which means 1, 0 and 6. The 106^{th} element's official name is Seaborgium. Seaborgium is a synthetic element that is named after Glenn T. Seaborg.

8. What's the atomic number of the element Copernicium?
a) 111
b) 112
c) 113
d) 114

Answer: b
Explanation: The element of Copernicium's atomic number is 112. it is otherwise called as Ununbium as per the IUPAC nomenclature. The name Copernicium is given after the astronomer Nicolaus Copernicus. It's a d-block transactinide element that belongs to Group-12.

9. What are the roots of 1, 1, and 9 respectively as per the IUPAC nomenclature, and find out its symbol?
a) un, bi, and quad; Ubq
b) nil, bi, and sept; Ubs
c) un, un, and enn; Uue
d) un, bi, and enn; Ube

Answer: c
Explanation: As per IUPAC nomenclature, the roots are as follows: 0 – nil, 1 – un, 2 – bi, 3 – tri, 4 – quad, 5 – pent, 6 – hex, 7 – sept, 8 – oct and 9 – enn. So the roots for 1, 1 and 9 are un, un, and enn. Hence the symbol of the elements is Uue.

10. What is the atomic number of the element unniloctium?
a) 106
b) 118
c) 108
d) 116

Answer: c
Explanation: As per IuPAC nomenclature of periodic elements greater than 100, Un means 1, nil means 0 and oct means 8, so the element numbered 108 is unniloctium. It's chemical names is Hassium and is represented by the symbol "Hs". It is highly radioactive in nature and man made.

Electronic Configurations of Elements and the Periodic Table

1. The electrons’ distribution into the atomic orbitals is called as _____
a) Electronic order
b) Electronic distribution
c) Electronic filing
d) Electronic configuration

Answer: d
Explanation: When electrons are distribution into the orbitals of the atoms by following Aufbau’s principal, Hund’s rule maximum multiplicity and Pauli’s exclusive principle, the order they are filled is represented by the electronic configuration.

2. The location of any element in the periodic table is determined by the _____ of the filled last orbital.
a) Spin quantum number
b) Quantum numbers
c) Azimuthal quantum number
d) Magnetic quantum number

Answer: b
Explanation: Quantum numbers are responsible for an element’s position in the periodic table. For example, as we know the principal quantum number defines the main energy level i.e. shell. The last orbital principal quantum number is the periodic number of the element.

3. How many electrons are there in the L-shell of Boron?
a) 3
b) 2
c) 1
d) 4

Answer: a
Explanation: The atomic number of Boron is 5 and it contains two elements in the K-shell and three elements in the L-shell as well as 4

electrons in s-orbital and 1 electron and p-orbital. The element preceding Boron is beryllium and the element succeeding Boron is carbon.

4. What are the d-block elements called?
a) Inner transition elements
b) Alkali earth metals
c) Transition elements
d) Noble gases

Answer: c
Explanation: The d-block elements are called transition elements as the electrons are energetically filled. The exact meaning of transition elements is that elements have either partially or fully filled subshell or can actively cations by losing electrons.

5. 3d transition series starts from _____ and ends with _____
a) Zinc, Scandium
b) Scandium, Zinc
c) Vanadium, Nickel
d) Argon, Zinc

Answer: b
Explanation: In the 3d transition series, the have either partially or fully filled 3d orbitals. The 3d transition state starts from Scandium (Z = 21) having electronic configuration as $3s^2 3d^1$ and ends with Zinc (Z = 30) whose electronic configuration is $3s^2 3d^{10}$.

6. Which block elements are known as inner transition elements?
a) s-block
b) p-block
c) d-block
d) f-block

Answer: d
Explanation: Inner transition elements are f-block i.e. 4f and 5f. They include elements from 57 to 71 and 89 to 103. The 4f elements are

lanthanoids (57 – 71) and 5f are actinides (89 – 113). Most of the actinides are radioactive.

7. The Lanthanoid series is the same as the Actinoid series.
a) True
b) False

Answer: b
Explanation: Both the Lanthanoid series and the Actinoid series make up Inner transition elements, but they are not the same. The 4f elements are lanthanoids (Z = 57 to Z = 71) and 5f are actinides (Z = 89 to Z = 113).

8. Write the correct electronic configuration of Neon.
a) $1s^2 2s^2 2p^6$
b) $1s^2 2s^2$
c) $1s^2 2p^6$
d) $2s^2 2p^6$

9. Group I elements are called as _____
a) Alkali metals
b) Noble gases
c) Chalcogens
d) Halogens

Answer: a
Explanation: Group I elements are known as Alkali metals as they have a great ability to form strong bases i.e. alkalies. Alkalies are the strong bases with the ability to neutralize strong acids. They consists of Lithium(Li), Sodium(Na), Potassium(K), Rubidium(Rb), Cesium(Cs) and Francium(Fr).

10. The fourth period ends with the element _____
a) Helium
b) Argon
c) Neon

d) Krypton

Answer: d
Explanation: Every period ends with a noble gas, as the element at the end of the period is with the fully filled orbitals. The 4^{th} period has an outer shell as O i.e. n = 4. So the configuration is $[Ar]4s^2 3d^{10} 4p^6$, that is Krypton.

Electronic Configurations and Types of Elements: s, p, d and f Blocks

1. Name the element that belongs to s-block but is placed in the p-block.
a) Hydrogen
b) Helium
c) Argon
d) Aluminum

Answer: b
Explanation: Helium's electronic configuration is $1s^2$. As the last electron is filled in s-orbital, it belongs to s-block. Since the 1^{st} shell cannot accommodate any orbital than s, $1s^2$ is completely filled orbital, hence making it, a noble gas. Noble gases are placed in p-block.

2. _____ has both the characteristics of Alkali metals and halogens.
a) Helium
b) Chlorine
c) Sodium
d) Hydrogen

Answer: d
Explanation: As per the outer shell configuration of hydrogen (that is $1s^1$), it has only one electron in s-orbital making it eligible as an Alkali

metal. It requires only 1 electron to obtain a noble gas configuration, which is a characteristic of halogen.

3. ns^1 and ns^2 are the outer shell configurations of elements in s-block.
a) True
b) False

Answer: a
Explanation: Yes, ns^1 and ns^2 are the outer shell configurations of elements in s-block. The reason behind this is that they are ready to lose 1 electron or 2 electrons depending on the group number and have low ionization enthalpies.

4. The p-block elements along with s-block elements are called as _____ elements.
a) Inner transition
b) Representative
c) Radioactive
d) Transition

Answer: b
Explanation: The p-block elements comprise of elements from group-13 to group-18 while s-block elements are 1^{st} and 2nd groups. They two together form “Representative elements” or “Main group elements”.

5. What happens to the non-metallic nature as we move from left to right in groups?
a) Increases
b) Decreases
c) Remains constant
d) Irregular

Answer: a
Explanation: Non-metallic nature is defined as a tendency to gain electrons thus having high negative electron gain enthalpies, but the 18th

group has no reactivity. So the non-metallic nature increases from left to right in groups leaving noble gases.

6. The outer shell electronic configuration of transition block elements is given by _____
a) $(n-1)d^{1-10}ns^2$
b) $(n-1)d^{1-10}(n-1)s^{0-2}$
c) $(n-1)d^{1-10}ns^{0-2}$
d) $nd^{1-10}ns^{0-2}$

Answer: c
Explanation: Transition block elemts are d-block elements. The electrons fill in the d-orbital, and s-orbital orbital gets varied for maintaing stability of atoms. Therefore the outer shell electronic configuration of transition block elements is given by $(n-1)d^{1-10}ns^{0-2}$.

7. Which of the following is not true about transuranium elements?
a) Atomic number > 92
b) Elements after Uranium
c) Decay radioactively as they are unstable
d) Example is Thorium

Answer: d
Explanation: The elements after Uranium (Z = 92) are known as transuranium elements, they are unstable and decay radioactively into other elements. But the atomic number of Thorium is 90, hence it is not a transuranium element.

8. Chalcogens are the elements of Group _____
a) 18
b) 16
c) 12
d) 2

Answer: b
Explanation: Group 16 consists of elements that belong to chalcogens

also known as the oxygen family. The elements of this group are oxygen (O), sulfur (S), selenium (Se), tellurium (Te), and Polonium (Po). They are called so because they are mostly found in earth's crust.

9. Which of the following is not a Metalloid?
a) Germanium
b) Silicon
c) Aluminum
d) Tellurium

Answer: c
Explanation: Metalloids are those with both the properties of metals and non-metals. They are also known as Semi-metals. They are 8 metalloids known till date, namely boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te), polonium (Po) and astatine (At).

10. Metals consist of _____% of the elements known.
a) 78
b) 32
c) 22
d) 68

Answer: a
Explanation: Elements are classified into metals, non-metals, and metalloids based on their properties. While 78% of the elements that are known today are metals. Metallic nature is prominent on the left side of the periodic table.

Periodic Trends in Properties of Elements

1. Atomic radii _____ along the periods.
a) Increases
b) Decreases
c) Remains constant

d) Irregular

Answer: b
Explanation: Atomic radii decreases along the periods because as the number of electrons increases in the same shell of the atom, the effective nuclear attraction increases, thereby reducing the distance between the outer shell and the nucleus i.e. decreasing atomic radii.

2. O^{2-}, F^{-}, Na^{+} and Mg^{2+} are called as _____
a) Isoelectronic species
b) Isoneutral species
c) Isotopes
d) Isobars

Answer: a
Explanation: O^{2-}, F^{-}, Na^{+} and Mg^{2+} are known as isoelectronic species as they all have the same no. of electrons(10). Isotopes contain the same no. of protons but a different number of neutrons. Isobars have the same mass number but a different atomic number.

3. $X_{(g)} \rightarrow X^{+}_{(g)} + e^{-}$. What does this chemical reaction need to occur?
a) Catalyst
b) Electron affinity
c) Electropositivity
d) Ionization energy

Answer: d
Explanation: The minimum amount of energy that is required to remove an electron from an atom is called Ionization enthalpy. It is expressed in the units KJ/mol. Electron affinity is the change in the energy when we add an electron to a neutral atom. Electropositivity is a metallic characteristic. A catalyst speeds up the reaction.

4. What is the correct order of electronegativity among the following options?
a) Li<Na<K<Rb<Cs

b) Li<K<Na<Rb<Cs
c) Li>Na>K>Cs>Rb
d) Li>Na>K=Rb>Cs

Answer: d
Explanation: Electronegativity is the measure of the ability to attract shared electrons to itself of an atom in a chemical compound. The values of electronegativities of Li, Na, K, Rb and Cs are 1, 0.9, 0.8, 0.8 and 0.7 respectively.

5. Ionization energies are always positive.
a) True
b) False

Answer: a
Explanation: As the ionization energy is the minimum amount of energy that is required to remove an electron from an atom. As the energy is always needed for the removal of an electron from an atom, the values of ionization energies are always positive.

6. What is the oxidation state of Mn in $KMnO_4$?
a) 5
b) 6
c) 7
d) 4

Answer: c
Explanation: The total charge of the compound $KMnO_4$ is zero as it is a neutral and stable compound. As we know the oxidation states of K and O are +1 and -2 respectively. So +1 + Mn charge + 4(-2) = 0; Mn charge = 7.

7. The relationship between Li, Mg and Be, Al is called the _____ relationship.
a) Diagonal
b) Periodic

c) Group
d) Triangle

Answer: a
Explanation: The Elements Li and Mg, Be and Al are similar to each other in the case of formation of different compounds in a similar composition. They have a sort of similar behaviour with each other, so they are said to be in a diagonal relationship as per their place in the periodic table.

8. N_2O is a _____
a) Tear gas
b) Laughing gas
c) Acid
d) Base

Answer: c
Explanation: N_2O is called laughing gas as it has euphoric effects after being inhaled. It is one of the World Health Organization's Essential Medicines. it is used for recreational and anaesthetic purposes mostly.

9. Which of the following is superoxide?
a) K_2O
b) Na_2O
c) MgO
d) KO_2

Answer: d
Explanation: In the superoxide of the element, the oxygen's oxidation state is given by -1/2. In peroxides, the oxidation state of oxygen is -1 as in case of hydrogen peroxide. The oxygen's oxidation state in KO_2 is -1/2.

10. What can be tested using a litmus paper?
a) Acidic nature only
b) Basic nature only

c) Both acidic nature and basic nature
d) Nothing

Answer: c
Explanation: A litmus paper is a dye that is extracted from lichens. It used to test acidic nature and basic nature of a substance. Red colour indicates acidic nature and blue colour indicated basic nature. Neutral litmus paper is purple in colour.