Molar series

In

Chemistry

Final revision (Open book questions)

For second secondary 2020

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Chapter 1 (Atomic structure)

1- Scientist who didn't postulate that matter is composed of atoms is ……..

○	a- Greek philosopher.
○	b- Dalton.
●	c- Aristotle.
○	d- Bohr.

2- All of the following postulates are from Dalton's theory , except ……

●	a- Atoms of elements are composed of protons , neutrons and electrons.
○	b- The masses of the atoms of the same element are similar.
○	c- Atom can not be divided.
○	d- Each element is composed of tiny particles which are called atoms.

3- Which example agrees with Dalton's postulates?

○	a- Atoms found in the sample of chlorine are similar to atoms found in sample of sulphur.
○	b- The properties of the molecules of hydrogen and oxygen differ from their properties in water molecules .
○	c- Hydrogen can combine with oxygen to form water in more than one ratio.
●	d- Atoms of magnisium are tiny.

4- In the electric discharge experiments , cathode rays deflect away from the metallic plate which is negatively charged , because they are……..

○	a- Not material particles.
○	b- Positively charged .
●	c- Negatively charged.
○	d- Emitted from all bodies.

5- All of the following are among the properties of cathode rays , except ……

○	a- Stream of electrons.
○	b- Charged particles.
●	c- Moves at the speed of light.
○	d- Deflect with the effect of a magnetic field.

6- Cathode rays ……

○	a- Have mass only.
○	b- Charged only.
○	c- Do not have either mass or charge.
●	d- Have mass and charge.

7- Rutherford's model of atom……

○	a- Is the recently accepted model of atom.
○	b- Assumed that the atom is solid.
○	c- Explained the unique atomic spectrum of the different elements.
●	d- Assumed that the charge of the electrons equals the charge of the nucleus .

8- Rutherford' laboratory experiment proved that……..

●	a- Protons are not uniformaly distributed inside the nucleus.
○	b- Electrons are negatively charged particles.
○	c- Electrons are positively charged particles.
○	d- The atom contains protons , neutrons and electrons.

9- The failure of the atomic model of Rutherford is attributed to that is did not explain……

●	a- The nature of the movement of the electrons around the nucleus.
○	b- The presence of a nucleus in the atom .
○	c- The presence of attraction forces between the protons and the electrons.
○	d- The presence of a space between the nucleus and the electrons.

10- Which of the following statements is incorrect?

●	a- The line spectrum of hydrogen atom is formed of four inseparable colours .
○	b- Electrons have dual nature.
○	c- Bohr's atomic model introduced the concept of quantum to determine the energy of the electrons .
○	d- In case of not gaining or losing energy , the atom is described to be stable.

11- On approaching one of lithium salts to the non-luminous region of bunsen flame , it is coloured red , this is explained by that the electrons in the excited atoms of lithium……

○	a- Are lost from the atoms.
○	b- Their number increases.
●	c- Return to the ground state.
○	d- Transfer to higher levels.

12- Bohr's atomic model……

○	a- Suggested that the electron occupies a definite energy level only.
○	b- Explained the line spectrum of hydrogen atom only.
○	c- Predicted the different energy levels in different multi-electron atoms.
●	d- (a) and (b) together.

13- When a photon of light with wavelength 486 nm transfers from an electron in the principal level (n=4) in hydrogen atom , this electron transfers to the principal level……

○	a- n=1.
●	b- n=2.
○	c- n=3.
○	d- n=5.

14- The line spectrum of hydrogen atom consists of four coloured lines , which of them has the smaller frequency?

○	a- green
○	b- blue.
●	c- red.
○	d- violet.

15- Among the postulates of Bohr's atomic model is……

○	a- Electrons can acquire any amount of energy .
○	b- It is impossible to determine the path of the electron precisely.
●	c- The energy of the electrons in different energy levels are determined through the concept of quantum.
○	d- (a) and (c) together.

16- Which of the following statements does not agree with the postulates of Bohr's atomic model?

○	a- The concept of quantum is introduced.
○	b- The electron which is nearest to the nucleus is the lowest in energy.
○	c- Electrons revolve around the nucleus in different orbits.
●	d- It is impossible to determine the position and the speed of the electron together precisely.

17- On comparing the position of the electron in its ground state , with its position in the excited state , it is ……..

○	a- In the second energy level.
○	b- In the nucleus .
●	c- Closer to the nucleus.
○	d- Farther from the nucleus.

18- Each of the following is among the properties of the electrons , except that is ……

○	a- A material particle.
○	b- Has wave properties.
●	c- Loses energy when it transfers from one energy level to another.
○	d- Deflect by the effect of a magnetic field.

19- The electron which is excited to the fourth energy level ……

○	a- Remains in the same new energy level.
●	b- Returns to its ground state in one jump.
○	c- Returns to its ground state in one jump or several jumps.
○	d- Transfers to a higher energy level .

20- "The actual path of the last electron in iron atom can not be precisely determined" . the previous statement is an application of ……

○	a- Hund's rule.
○	b- Bohr's base.
●	c- Uncertainty priciple.
○	d- The dual nature of electron.

21- What is(are) the quantum number(s) whose value(s) never be zero?

○	a- Principal.
○	b- Subsidiary.
○	c- Spin.
●	d- (a) and (c) together.

22- What is the quantum number whose value never be zero or not an integral number?

○	a- Principal.
○	b- Subsidiary.
○	c- Magnetic.
●	d- Spin.

23- Which of the following quantum numbers values represent an electron in one of the orbitals of 3p sublevel?

○	a- n=3 , l=2 , m_l=-1.
○	b- n=3 , l=0 , m_l=0.
●	c- n=3 , l=1 , m_l=0.
○	d- n=3 , l=0 , m_l=+1.

24- What is the largest number of electrons can be found in the same atom and have the two quantum numbers (n=4 , l=1) ?

○	a- 2.
●	b- 6.
○	c- 8.
○	d- 10.

25- The electrons of 5d sublevel in one of the atoms can not have the magnetic quantum number……..

○	a- +1.
○	b- -1.
○	c- +2.
●	d- +3.

26- The electron which has the four quantum numbers : (n=4 , l=3 , ml=+2 , ms=+1/2) is found in the sublevel ……

○	a- 3d.
●	b- 4f.
○	c- 5p.
○	d- 6s.

27- The electrons which are found in the energy level K……

○	a- Have the same quantum number (n) only.
○	b- Have the same quantum number (l) only.
○	c- Have the same quantum number (ml) only.
●	d- All the previous.

28- Electron (X) has the following quantum numbers : (n=3 , l=2 , ml=-1 , ms=-1/2) , what are the quantum numbers of the electron (Y) which has the same energy of the electron (X) , but it differs from the electron (X) in the spinning motion? respictively

●	a- 3 , 2 , -1 , +1/2.
○	b- 3 , 1 , -1 , -1/2.
○	c- 3 , 2 , 0 , +1/2.
○	d- 2 , 1 , 0 , +1/2.

29- Which of the following quantum numbers includes a mistake?

○	a- n=2 , l=1 , m_l=+1.
○	b- n=4 , l=2 , m_l=+1.
●	c- n=3 , l=3 , m_l=-2.
○	d- n=3 , l=0 , m_l=0.

30- Which of the following quantum numbers don't includes a mistake?

●	a- n=5 , l=3 , m_l=-3.
○	b- n=3 , l=1 , m_l=-2.
○	c- n=4 , l=0 , m_l=+1.
○	d- n=3 , l=2 , m_l=-3.

31- The two electrons which have the same l , ms values , are located in the same ……

●	a- Sublevel but not necessarily in the same principal level.
○	b- Principal level but in two different sublevels.
○	c- Orbital.
○	d- Principal level but in different orbitals.

32- Which of the following statements is correct?

○	a- It is possible to determine the position and the speed of the electron together precisely at the same time .
○	b- The sizes of the orbitals of the same atom are similar
○	c- The electron can be found in the spaces between the energy levels.
●	d- The two electrons of helium don't have the same four quantum numbers .

33- Which of the following represents the possible quantum numbers of the last electron in nitrogen atom ?

●	a- n=2 , l=1 , m_l=+1 , ms=+1/2.
○	b- n=2 , l=1 , m_l=+1 , ms=-1/2.
○	c- n=2 , l=1 , m_l=-1 , ms=+1/2.
○	d- n=2 , l=1 , m_l=-1, ms=-1/2.

34- Which is easier , losing an electron from 3d or from 4s ?

○	a- 4s is more easy as it is closer to the nucleus than 3d.
○	b- 4s is less easy as it is closer to the nucleus than 3d.
●	c- 4s is more easy as it is farther from the nucleus than 3d.
○	d- 4s is less easy as it is farther from the nucleus than 3d.

35- What is the correct order of orbitals in titanium atom according to the increase of energy?

○	a- 3s < 3p < 3d < 4s .
●	b- 3s < 3p < 4s < 3d.
○	c- 3s < 4s < 3p < 4d.
○	d- 4s < 3s < 3p < 3d.

36- Which of the electrons that have the following quantum numbers has higher energy?

○	a- 3 , 2 , 1 , +1/2.
○	b- 4 , 2 , -1 , +1/2.
○	c- 4 , 1 , 0 , -1/2.
●	d- 5 , 0 , 0 , +1/2.

37- The element whose atomic number is 14 , its elctrons are distributed in …… orbitals.

○	a- 16.
○	b- 12.
○	c- 8.
●	d- 7.

38- In iron element Fe_{26} , the number of the half filled orbitals is equal to the value of the ……. Quantum number of the last electron .

●	a- Principal.
○	b- subsidiary.
○	c- Magnetic.
○	d- Spin.

39- What is the electronic configuration which represents an excited atom?

○	a- $F_9 : 1s^2 , 2s^2 , 2p^0$.
○	b- $N_7 : 1s^2 , 2s^2 , 2p^3$.
●	c- $Li_3 : 1s^2 , 2p^1$.
○	d- $He_2 : 1s^2$.

40- Which of the following agree with Pauli's principle?

○	a- 
○	b- 
○	c- 
●	d- 

41- Orbitals of the same energy sublevel are……

○	a- Different in energy.
●	b- Similar in energy.
○	c- Similar in enegy but different in shape.

42- When the electrons of an excited atom turn back to its original level , ……emitted .

○	a- Beta particles.
○	b- Alpha particles.
●	c- line spectra.
○	d- Cathode rays .

Chapter 2 (Modern periodic table)

1- which of the following elements is located in the same period of silicon in the modern periodic table ?

○	**a- Ge_{32}.**
○	**b- Sc_{21}.**
●	**c- Na_{11}.**
○	**d- Sr_{38}.**

2- The only noble gas that does not end with ns^2 , sp^6 is ……

○	**a- radon.**
○	**b- neon.**
●	**c- helium.**
○	**d- krypton.**

3- an element with atomic number 42 , the number of its half filled orbitals is ……

○	**a- 1.**
○	**b- 4.**
○	**c- 5.**
●	**d- 6**

4- what is the number of periods in the periodic table in which the elements from hydrogen to argon are located ?

○	**a- 2.**
●	**b- 3.**
○	**c- 4.**
○	**d- 8.**

5- the element which is located at the top right of the modern periodic table is of the ……elements.

○	**a- representative.**
●	**b- noble.**
○	**c- main transition.**
○	**d- metallic.**

6- the electronic configuration of an element is : [Xe] , $6s^2$, $4f^{14}$, $5d^7$, this element is an ……element .

●	**a- main transition.**
○	**b- inner transition.**
○	**c- noble.**
○	**d- representative.**

7- the first element in d-block elements is……

○	**a- Ca_{20}.**
○	**b- Cr_{24}.**
●	**c- Sc_{21}.**
○	**d- Cu_{29} .**

8- the electronic configuration of an alkali earth metal is ……..

○	**a- [Ar] , $4s^1$, $3d^5$.**
○	**b- [Ar] , $4s^2$, $3d^6$.**
●	**c- [Rn] , $7s^2$.**
○	**d- [Xe] , $6s^2$, $4f^7$.**

9- the electronic configuration of silver is ……

○	**a- [Ar] , $4s^2$, $4d^9$.**
●	**b- [Kr] , $5s^1$, $4d^{10}$.**
○	**c- [Kr] , $5s^2$, $3d^9$.**
○	**d- [Ar] , $4s^1$, $4d^{10}$.**

10- Magnisium ion $_{12}^{24}Mg^{+2}$ contains……..

●	**a- 12 protons , 10 electrons .**
○	**b- 24 protons , 26 electrons .**
○	**c- 12 protons , 13 electrons .**
○	**d- 24 protons , 14 electrons .**

11- the electronic configuration of iron(III) $_{26}Fe^{+3}$ is ……

○	**a- [Ar] , $3d^1$, $4s^2$.**
○	**a- [Ar] , $3d^6$, $4s^2$.**
●	**a- [Ar] , $3d^5$.**
○	**d- [Ar] , $3d^6$.**

12- the highest number of unpaired electrons is in ……

○	**a- Fe.**
○	**b- Fe^{+2}.**
●	**c- Fe^{+3}.**
○	**d- Fe^{+4}.**

13- the atomic radius of flourine F9 is smaller than the atomic radius of carbon c6 because…….

○	a- the quantum numbers of the electrons of F are smaller than those of C.
○	b- the repulsion between the electrons of a completely filled orbitals is stronger than that between the electrons of the half filled orbitals .
●	c- the effective nuclear charge of flourine is larger than carbon.
○	d- flourine is heavier than carbon.

14- the correct arrangement of increasing the ionic radius is ……

○	a- $Mg^{+2}<Al^{+3}<Na^{+}$
○	b- $Mg^{+2}< Na^{+}<Al^{+3}$.
●	c- $Al^{+3}<Mg^{+2}<Na^{+}$.
○	d- $Na^{+}<Mg^{+2}<Al^{+3}$.

15- in the equation : X^{0} + Energy ⟶ $X^{+} + e^{-}$, the absorbed energy …….. the energy of level Q.

○	a- equal to .
●	b- more than.
○	c- less than.
○	d- all of the previous.

16- the difference between the two values of first and second ionization energy is very large in case of atoms of ……..element .

○	a- Ne^{10}.
○	b- Mg^{12}.
○	c- Al^{13}.
●	d- K^{19}.

17- in the third period , on moving from sodium to argon , …….. increase .

○	a- atomic number and atomic size.
●	b- atomic number and electronegativity .
○	c- electronegativity only .
○	d- atomic number and ionization potential .

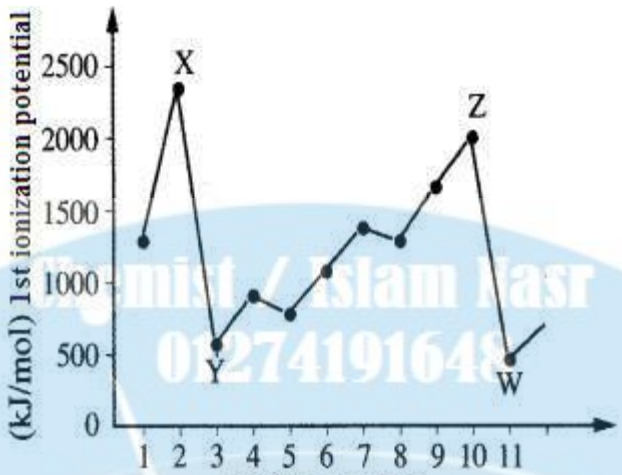
18- which of the following ions has larger radius ?

○	a- F^{-}.
○	b- Na^{+}.
●	c- O^{-2}.
○	d- Mg^{+2}.

19- which of the following information Berzelius might relied on his classification of the elements ?

○	a- atomic number of the elements.
○	b- electronic configuration of the elements.
●	c- degree of electricity and heat conductivity.
○	d- the quantum numbers of the last electron in each element.

20- which of the illustrated elements in the opposite figure has higher tendency to lose valence electrons?



○	a- X.
○	b- Y.
○	c- Z.
●	d- W.

21- Arsenic As_{33} and Antimony Sb_{51} are similar in ……..

○	a- both of them are located in the fourth period only.
●	b- both of them are located in (5A) group only.
○	c- their electric conductivity is higher than that of metals only.
○	d- all of the previous.

22- what is the anion that forms the strongest oxygenated acid?

○	a- SO_4^{-2}.
○	b- ClO_2^-.
○	c- ClO_3^-.
●	d- ClO_4^-.

23- Nitrogen gas is less active than flourine gas , because …… .

○	a- the boiling point of nitrogen is less than that of flourine.
○	b- the molar mass of nitrogen is less than that of flourine.
●	c- the atomic radius of nitrogen is larger than that of flourine.
○	d- the electronegativity of nitrogen is higher than that of flourine.

24- PH value equals 0.2 in the strong acidic solutions like ……

●	a- $SO_2(OH)_2$.
○	b- $PO(OH)_3$.
○	c- $Ca(OH)_2$.
○	d- $Al(OH)_3$.

25- Why does aluminum oxide disappear on adding a little amount of it to sodium hydroxide solution with stirring ?

○	a- because aluminum Al_{13} is located in the same period of sodium Na_{11}.
○	b- because aluminum oxide reacts as a base with sodium hydroxide.
○	c- because the basic property decreases in the same period by increasing the atomic number.
●	d- because aluminum oxide reacts as an acid with sodium hydroxide.

26- which of the following oxygenated acids is stronger?

○	a- HOCl.
○	b- HNO_2 .
○	c- H_2SO_3.
●	d- HNO_3.

27- which of the following changes an oxidation process occurs to vanadium?

○	a- $VO_2 \longrightarrow V_2O_3$.
○	b- $V_2O_5 \longrightarrow VO_2$.
○	c- $V_2O_3 \longrightarrow VO$.
●	d- $V_2O_3 \longrightarrow V_2O_5$.

28- In which of the following equations the underlined substance acts as a reducing agent?

○	a- $\underline{CaO}+H_2O \longrightarrow Ca(OH)_2$.
○	a- $\underline{CO_2}+C \longrightarrow 2CO$.
○	a- $\underline{CuO}+H_2 \longrightarrow Cu+H_2O$.
●	d- $\underline{3CO}+Fe_2O_3 \longrightarrow 2Fe+3CO_2$.

29- Which of the following elements is easier to be oxidized ……

○	a- Sulphur.
●	b- Magnesium.
○	c- Boron.
○	d- Argon.

30- which of the following elements includes nonmetal , metal and metalliod……

○	a- H , Zn , I.
○	b- Zn , I , Br.
○	c- Zn , Cu , Si.
●	d- I , Zn , Si.

31- when element X reacts with oxygen , it produces the oxide XO . when this oxide dissolves in water , it produces solution which is coloured blue by adding drops of sunflower stain?

○	a- Na.
●	b- Ba.
○	c- S.
○	d- N.

32- what is the formula of oxide of the element M , which is located in 3A group in the periodic table?

●	a- M_2O_3 .
○	b- M_3O_2.
○	c- MO.
○	d- M_3O_4.

33- when NO_2 reacts and is converted to N_2O_4 , the oxidation number of nitrogen……..

○	a- increases by 2.
○	b- increases by 4.
○	c- increases by 8.
●	d- does not change.

34- in which of the following coversions the oxidation number of nitrogen doesn't change ?

○	a- $NO_3^- \longrightarrow NO$.
○	b- $N_2O_4 \longrightarrow NO_3$.
●	c- $NH_3 \longrightarrow (NH_4)^+$.
○	d- $NO_2 \longrightarrow N_2O_5$.

35- what it is the oxidation number of phosphorus in perphosphate ion $(P_2O_7)^{-4}$?

○	a- +10.
○	b- +7.
○	c- +3.5.
●	d- +5.

36- which of the following oxides when its mixture dissolves in water , it yields a neutral solution?

●	a- Al_2O_3 , MgO.
○	b- Na_2O , MgO.
○	c- Na_2O , P_4O_{10}.
○	d- SO_3 , P_4O_{10}.

Essay questions

1- How we can convert iron metal to gold , due to Aristotle concept?

2- Explain the extent of agreement of both Pauli exlusion priciple and Hund's rule on the following :

3- $Y^+_{(g)} + Energy \longrightarrow Y^{++}_{(g)} + \bar{e}$

a- what does the energy represent in the previous equation?

b- which is larger in radius Y^+ or Y^{++} . Why?

4- determine the oxidizing and reducing agent in the following reaction:

$$2H_2S + SO_2 \longrightarrow 2H_2O + S$$

5- Calculate the oxidation number of Zinc in (sodium zincate)?

6- why does Caesium hydroxide ionized as base , and $ClO_3(OH)$ as acid?

Best wishes,

Mr/ Islam Nasr

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