NEC

CHEMISTRY

By.A.Aravinthan B.Sc.(Hons) Spl.Che.

Part I

1) Which of the following group in the periodic table has element/s in all three physical states?

   1. 12 2. 15 3. 16 4. 17 5. 18

2) Which pair has different geometrical shapes?

   1. CO_2,HCN 2. PO_4^{3-},SO_2Cl_2 3. NO_3^-,BF_3 4. HOCl,H_2S 5. PCl_3,FCl_3

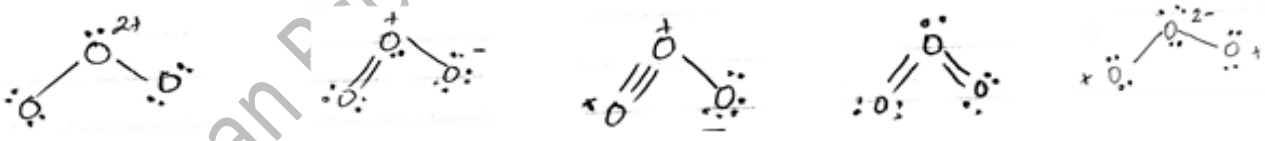
3) The number of protons , neutrons and electrons in the ion $^{52}_{24}Cr^{3+}$ respectively are,

	P	n	e
1.	24	28	21
2.	24	28	24
3.	52	24	28
4.	28	24	28
5.	24	52	21

4) The energy sublevel with which of the following quantum number descriptions can contain the most electrons?

   1. n=2,l=1 2. n=3,l=2 3. n=4,l=3 4. n=5,l=3,m=+1 5. n=5,l=0

5) The most acceptable Lewis structure for the O_3 molecules is?



6) Which of the following elements has the highest ionisation enthalpy?

   1. C 2. P 3. F 4.N 5. Cl

7) Which of the following would have the highest melting point?

   1. Nacl 2. BCl_3 3. $AlCl_3$ 4. S_2Cl_2 5. $SeCl_4$

8) Which of the following is same in $^{14}NO^{16}$ and $^{12}CO^{18}$?

   1. Total number of valence electron
   2. Total number of proton
   3. Molecular weight
   4. Number of bonds
   5. Total number of neutron

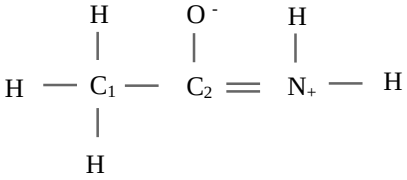
A.Aravinthan B.Sc.(Hons)Spl.Chem,PGDE 0771275275

www.lkedu.lk

9) Elements Q,Z,X,R and Y have electro negative values 2.5,1.5,0.7,4 & 1.0 respectively which of the following bond contains higher ionic character.

1. X-Y 2. X-R 3. Z-Q 4. Z-R 5. Q-R

10) Which of the following statement is / are correct relates to the ion of



a) C_1 and C_2 are present in same hybridization state
b) Four repulsion units are always present around the N atom
c) Four repulsion units are always present around the O atom
d) Shape of the ion relates to the C_1 is tetrahedral

1. Only a,b 2. Only b,c 3. Only a,b,c 4. Only c,d 5. Only b,c,d

11) Which experiment led to the belief that the atom contained an extremely small, positively charged nucleus?

1. Millikan's oil drop experiment
2. Rutherford's scattering experiment
3. Thomson's cathode ray tube experiment
4. Moseley's experiment on X-ray emission by metals
5. None of the above

12) Hybridization of the central atom of the following species are given respectively?

CO_3^{2-}, N^+H_4, NO_3^-, $^+CH_3$

1. Sp^2, Sp^2, Sp^3, Sp^3
2. Sp^3, Sp^2, Sp^3, Sp
3. Sp, Sp^2, Sp^3, Sp^3
4. Sp^2, Sp^3, Sp^2, Sp^2
5. Sp^3, Sp, Sp^2, Sp^2

13) Which statement is incorrect regarding the atomic emission spectrum of hydrogen?

1. The highest frequency appears in UV range
2. Energy difference for the electronic transition from 3^{rd} energy level to 2^{nd} energy level of H-atom is equal to the energy of red color in electromagnetic spectrum.
3. Line spacing in Balmer series increases towards the highest wave length end of the spectrum
4. Ionization energy of H equals to the energy of the lowest frequency line in lyman series
5. Line spacing of the 2 lines with lowest frequency in Balmer series equals to the line spacing 2^{nd} and 3^{rd} lines in lyman series.

A.Aravinthan Bsc (Hons)Spl Chem,PGDE 0771275275
www.lkedu.lk

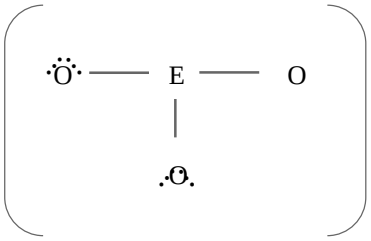
14) The combination possible for a chemical bond between any two atoms is,

1. 2δ (sigma) bonds and π (pi) bonds
2. 1δ (sigma) bonds and π (pi) bonds
3. 3π (pi) bonds
4. 2δ (sigma) bonds
5. 3δ (sigma) bonds

15) Which is the wrong statement regarding with cathode rays?

1. They are originated from the cathode region
2. They have energy
3. They are deflected away from the anode region
4. e/m ratio of cathode ray is a constant
5. They have ability to make the excitation / ionization in the other elements.

16)



In this structure given above E is an element belonging to the p-block of the periodic table to which group does element E belong?

1. Group 13/IIIA
2. Group 14/IVA
3. Group 15/VA
4. Group 16/VIA
5. Group 17/VIIA

17) What is the total number of resonance structure that can be drawn for the HN_3 molecule? [skeleton of the molecule H-N-N-N]

1. 2 2. 3 3. 4 4. 5 5. 6

18) In which of the following two molecules have an unpaired electron each?

1. NO & CO
2. SO_2 & NO
3. NO & NO_2
4. NO & N_2O
5. SO_2 & ClO_3

19) Which of the following molecules has the lowest dipole moment?

1. HCN 2. NO 3. H_2S 4. $BeCl_2$ 5. SO_2

20) Which of the following process is / are endothermic?

a. $Mg_{(g)} \longrightarrow Mg^{+}_{(g)} + e$

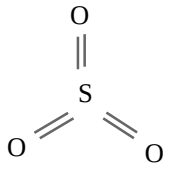
b. $N^{-}_{(g)} + e \longrightarrow N^{2-}_{(g)}$

A.Aravinthan Bsc (Hons)Spl.Chem,PGDE 0771275275
www.lkedu.lk

c. $Cl_{(g)} + e \longrightarrow Cl^-_{(g)}$

d. $O_{(g)} \longrightarrow O^+_{(g)} + e$

21) Which of the following statement / s is / are correct about the Lewis structure of SO_3 that is given below?



a. Valency of Sulphurr is 6

b. Each oxygen atom has two/one pairs of electrons

c. Sulphur has an octet

d. Valency of all the oxygen atoms is +4

22) Which of the following statement is / are not true regarding graphite?

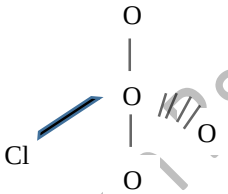
a. All the carbon atoms in graphite are Sp^3 hybridized

b. It has a high melting point

c. It is a conductor of electricity

d. It is used as a fuel in industry

	Ist statement	IIst statement
23)	Atoms of ClF_3 all Lie in the same plane	The central atom is Sp^2 hybridized
24)	Ice floats on water	Any liquid that freezes into solid becomes less dense
25)	Each bond angle in the Molecule is equal to 109° 5’	The carbon atom in this molecules is Sp^3 hybridised



Part II A – Structured Question

I.

(a) Arrange the following in the increasing order of the property indicated in parenthesis.

1. He,O,Mg,Cl (atomic radion)

   _____

2. Na,Mg,Ne,Al (2nd ionization)

   _____

A.Aravintha.B.Sc (Hons)Spl.Chem,PGDE 0771275275
www.lkedu.lk

3. H_2S, H_2O, H_2Se (boiling point)

_____

4. CO, CO_2, CH_4 (Electronegativity of C atom)

_____

5. NO_2^+, NO_3^-, NO_2^- (N-O bond length)

_____

6. $SF_6, CH_2=CH_2, NH_3$ (number of atom on the same plane)

_____

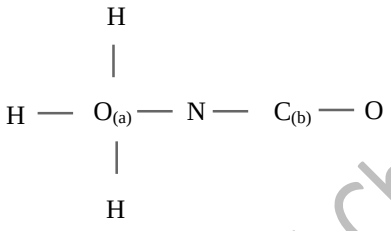
7. CH_4, CH_3, CH_3 (bond angle)

_____

8. HF, NH_3, H_2O (Dipole moment)

_____

(b) CH_3NCO is known as methyl is ocyanide the skeleton for the above molecule is



According to the above molecule answer the following questions

1. Give the most suitable Lewis structure for the above stated molecule

_____

_____

2. Reduce the shapes around the labelled atoms $C_{(a)}$, $C_{(b)}$ and N using VSEPR theory.

_____

_____

3. Draw the suitable resonance structures for the above molecule and explain the stabilities of them.

_____

_____

4. Indicate the hybridization and electron pair geometry of the labelled atoms $C_{(a)}$, $C_{(b)}$ and N.

Atom	Hybridization	Electron pair geometry around the atom
$Cl_{(a)}$		
$Cl_{(b)}$		
N		

A.Aravinthan Bsc (Hons)Spl.Chem,PGDE 0771275275

www.lkedu.lk

5. Sketch the shape of the Lewis structure drawn in part (i) above indicating approximate values of the bond angles.

_____

_____

6. Identify the atomic/hybrid orbitals involved in the formation of the following δ-bonds in the Lewis structures drawn in part(i) above.

   $C_{(a)}$ ——— H bond _____of $C_{(a)\ and}$ _____ of H

   $C_{(a)}$ ——— N bond _____of $C_{(a)\ and}$ _____ of N

   $C_{(b)}$ ——— O bond _____of $C_{(b)\ and}$ _____ of O

II.

(a)

(1) State two evidences to show the electrical nature of matter

_____

_____

(2) Explain the term ISO tope

_____

_____

(3) Give the five characters of cathode rays?

_____

_____

(4) What are the observations in Rutherford's atomic model experiment?

_____

_____

A.Aravinthan Bsc (Hons)Spl.Chem,PGDE 0771275275

www.lkedu.lk

(5) Complete the following table

	Electron	Proton	Neutron
Symbol			
Charge			
Mass			
Charge relative to proton			
Mass relative to proton			

(b)

(1) Write the electronic configuration of the following in the form $1S^2\ 2S^2\ 2P^6$……...

1. $1S^P$……
2. $_{26}Fe^{2+}$…….....
3. $_{24}Cr$……
4. $_{29}Cu$……..
5. $_{16}S^{2-}$……..

(2) Rays emitted (A) due to electron transition and energy transition 1 to 6 energy level of principal quantum number are given below

(n=1 ⟷ n=2) => A1 (n=1 ⟷ n=5) => A5

(n=2 ⟷ n=3) => A2 (n=2 ⟷ n=6) => A6

(n=2 ⟷ n=5) => A3 (n=2 ⟷ n=4) => A7

(n=1 ⟷ n=3) => A4 (n=1 ⟷ n=4) => A8

1. Draw a spectrum line for the above transition in the following diagram

_____ n=6

_____ n=5

_____ n=4

_____ n=3

_____ n=2

_____ n=1

→

Energy

_____

_____

→

Wave number increases

A.Aravinthan Bsc (Hons)Spl.Chem,PGDE 0771275275

www.lkedu.lk

2. Write down the lines derived from lymen series in spectrum line drawn by you

_____

_____

3. Give the lines and colors include in visible range in spectrum line drawn by you

_____

_____

4. Give the lines similar to the H^{α}?

_____

_____

III.

(a) Mention the bond type where ever a bond exists and the intermolecular force if any in each pf the following substances.

The symbol that should be used for indicating bond type and intermolecular force are given below.

Symbol		**bond type**
I	-	Ionic bond
P.C	-	Polar Covalent bond
N.P.C	-	Non-Polar Covalent bond
D-D	-	Dipole-Dipole Interaction
H	-	Hydrogen bond
M	-	Metallic

A.Aravinthan Bsc (Hons)Spl.Chem,PGDE 0771275275

www.lkedu.lk

Substances	Bond Type	Intermolecular force
1. CHF_3		
2. $CL_{2(S)}$		
3. $HBr_{(L)}$		
4. $KBr_{(S)}$		
5. $H_{2(S)}$		
6. $HF_{(S)}$		
7. Na		
8. Ar		

(b) Fill the blanks in the following table selecting the most appropriate words/ parades from only those given below the table under categories ZY & Z for the respective columns.

Material	X- Type Of Material	X-Particles Occupying Lattice Positions	Z-Interaction Between The Particles
1. $SiO_{2(S)}$			
2. ICE			
3. CsBr			
4. $I_{2(S)}$			
5. Ag			
6. Diamond			
7. Dry Ice			

X - Homoatomic lattice, Heteroatomic lattice, nonpolar molecular lattice, Polar molecular lattice, Ionic lattice, Metallic lattice, Giant molecule lattice & amorphous material.

Y - Atoms, Positive ions, Negative ions, Positive & Negative ions, Molecules, elections.

A.Aravinthan Bsc (Hons)Sol Chem,PGDE 0771275275
www.lkedu.lk

Z - Hydrogen bond, vanderwaals interactions, electros etic interaction and covalent bonds.

IV.

(a) Element A, B, C, D are irregular consecutive noon transition elements in the periodic table. Radius of those elements value found in the form $r_A < r_B < r_C < r_D$ value of elements B in the first 5 consecutive ionization energy are 802, 2426, 3655, 25028 & 32854 KG moil respectively. B element creates as a stable cation.

(1) Write down the chemical symbols for elements A, B, C & D?

_____

_____

(2) Write down the ascending order of first, second and third, ionization energies for A, B, C 9& D?

a. First ionization energy _____

b. Second ionization energy _____

c. Third ionization energy _____

(3) Give the answer for the followings based on the elements A, B, C & D

a. Elements which has highest melting point

_____

b. Element found in metallic lattice

_____

c. Element which has highest electro negative

_____

d. Element which has highest 3rd ionization energy

_____

A.Aravinthan Bsc (Hons)Spl.Chem,PGDE 0771275275

www.lkedu.lk

(4) Give the factors depending on the ionization.

(b)

(1) Beryllium form stable BeF_3^-, BeF_4^{2-} ions write the geometrical shape and state the hybridization of the central atom with the aid of the shape of the molecule



BeF_3^-



BeF_4^{2-}

a. Geometrical shape _____

b. Hybridization of the central atom _____

(2)

1. What are the shapes of S, P and D orbitals respectively?

   S_____ P_____ D_____

2. How many orbitals are these in on atom is orbitals 4p orbitals? 4d orbitals?

   Is_____ 4p_____4d_____

(3) Which is the maximum number of orbitals with

a) n=4 l=1 _____

b) n=2 l=2 _____

c) n=3 l=2 _____

d) n=5 l=1 _____

(4) Write a set of quantum numbers for a 4d orbital

_____

_____

A.Aravinthan Bsc (Hons)Spl.Chemistry DE 0771275275

www.lkedu.lk

Part II B Essay

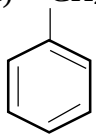
5. 1) Draw the Lewis structures of the following molecules/ions given below?

a) N_2 b) N_2O_4 c) NH_4^+ d) $S_2O_3^{2-}$

e) HN_3 f) H_3PO_2 g) NO_2 h) I_3^-

2) Draw the resonance structures and the resonance hybrids of the molecules/ions?

a) O_3 b) HSO_4^- c) $^+CH_2$



3) Give the molecular shapes & VSEPR theory notation of the following molecule?

a) NO_2^+ b) XeF_4 c) H_3PO_3 d) C_2H_2

6. 1) Give two evidences for existence of hydrogen bonds in water?

2) Give four importance of hydrogen bonds for existence of living organisms?

3) Draw the orbital overlapping diagram of C_2H_4 show the bond formation of δ and π, And mention how these bonds are formulated.

4) Which has the higher boiling point in water (H_2O) and hydrogen peroxide (H_2O_2) give one reasons for your answer?

5) Explain why the second ionization energy of group IA is greater than the second Ionization energy of the successive element of group IIA.

A.Aravinthan Bsc (Hons)Spl.Chem,PGDE 0771275275

www.lkedu.lk