Rathnavali Balika Vidyalaya - Gampaha.

| 02 | E | I |
|---|---|---|

# First Term Test - 2023 Grade 12

## Chemistry - I

**Time : 01 hour**

Rathnavali Balika Vidyalaya - Gampaha. Rathnavali Balika Vidyalaya - Gampaha. Rathnavali Balika Vidyalaya - Gampaha. Rathnavali Balika Vidyalaya - Gampaha.

- **Answer all questions.**

Avogadro constant $N_A = 6.022 \times 10^{23}\ mol^{-1}$

Planck constant $h = 6.626 \times 10^{34}\ Js^{-1}$

(1) The main objective of presenting an atomic model is,

1. Introduce the sub atomic particles
2. Denote the location of subatomic particles
3. Demostrate the magnitude of the atom
4. Discuss the properties/behaviors of the elements
5. Demostrate the neutral nature of atom.

(2) The true statement on cathode rays,

1. Always moves on linear path ways.
2. Colourled rays.
3. Always terminate from anode.
4. The deviation in magnetic field depends on stregth of field.
5. generate when all the gas molecules in the cathode ray tube are emited.

(3) Number of electrons in $^{56}_{26}Fe^{3+}$, shows $n + \ell = 4$ is,

1. 6 2. 3 3. 2 4. 8 5. none any of above

(4) $^{238}_{92}U + {}^{1}_{0}n \rightarrow {}^{235}_{90}Th + x$

A neutron attacks to a Urenium neucleous, as above equation. X particle is,

1. Electron
2. Proton
3. Neutron
4. $\propto$ particle
5. He atom

(5) A sample of H contains three different isotopes. The correct statement on the H sample is,

1. Six different molecules are there.
2. Masses are equal in all molecules
3. The number of neucleons are equal in every molecule.
4. Each molecule contains in equal presentages in the sampe.
5. The chemical properties are different in each molecule.

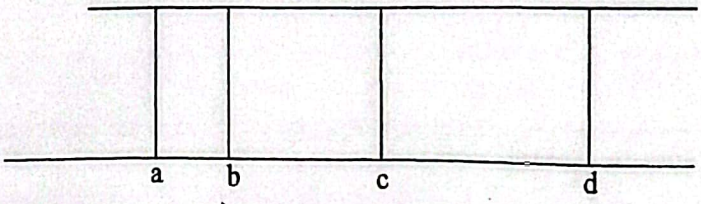
(6) Which out of the following is not a isoelectronic pair

1. $CO / CN^-$
2. $NO^+ / N_2$
3. $O_2 / CN^-$
4. $NO_3^- / BF_3$
5. $NO^+ / CN^-$

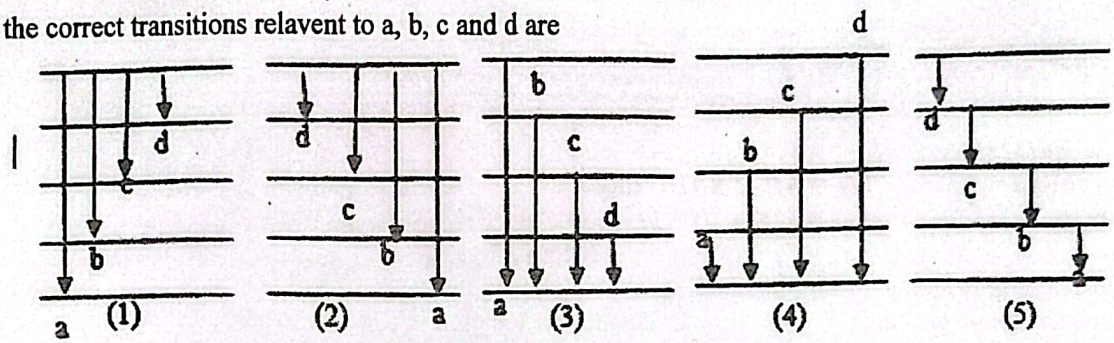
(7) Which out of the following is true regurding sub atomic particles,

1. Does not contribute to decide the chemical properties of an element.
2. Protons and neutrons are equal in mass.
3. The absolute charge of a proton is +1
4. The atoms with different number of neutrons are isotopes.
5. Dual Nature can not be seen in immobile electrons.

(8) A part of line series in emission spectrum is given below.




the correct transitions relavent to a, b, c and d are




(9) Electron confuguration is the arrangement of electrons in sub energy levels. The rule/ principle/ concept or postulate, used to determine the electronic configuration of an element is/are,

1. Aufbau principle
2. Aufbau principle + Hund's rule
3. Aufbau principle + Hunds rule + Pauli's exclusion principle
4. Hund's rule + Pauli Exclusion Principle
5. Hund's rule

(10) Which out of the following has highest electro negativity difference

1. HCl
2. NaH
3. C - H
4. HBr
5. HI

(11) The incorrect statement of orbital overlapping is,

1. Any two orbitals can be overlapped in the line which joins it's neuclei.
2. Empty orbital can be overlapped with orbital with an electron pair
3. Only attractive forces are among the two atoms in a bond.
4. Single atom can form more that one sigma ($\sigma$) bond
5. $\pi$ Bond easily participate in chemical reactions.

(12) The incorrect lewis structure is,

1. $:\dot{N}=\ddot{\underset{\cdot\cdot}{O}}$
2. $:\bar{C}\equiv\overset{+}{O}:$
3. $:\ddot{\underset{\cdot\cdot}{O}}-\dot{N}^{+}=\ddot{\underset{\cdot\cdot}{O}}$
4. $:N\equiv\overset{+}{O}:$
5. $:\ddot{\underset{\cdot\cdot}{O}}-\overset{\|}{N}=\ddot{\underset{\cdot\cdot}{O}}:$

(13) The pair without isoelectronic configuration in valance shell is,

1. $K^+$ & $Al^{3+}$
2. $Cu^+$ & $Ag^+$
3. $As^{3-}$ & $O^{2-}$
4. $Ti^{3+}$ & $Sc^{3+}$
5. $Br^-$ & $Se^{2-}$

(14) The element which emits largest total amount of energy relevant to first electron gain energy is,

1. Cl
2. Mg
3. F
4. N
5. O

(15) The set of quantum number of one electron in the bond electron pair in IF molecule is $\{2, 1, 0, -\frac{1}{2}\}$. The set of quantum number for the other electron in the bond is,

1. $\{2, 1, 0, +\frac{1}{2}\}$
2. $\{2, 1, 0, -\frac{1}{2}\}$
3. $\{5, 2, 0, +\frac{1}{2}\}$
4. $\{5, 0, 0, +\frac{1}{2}\}$
5. $\{5, 1, 0, +\frac{1}{2}\}$

- **For the questions 16 to 20, one or more responses out of the four responses (a), (b), (c) and (d) is/are correct. Select the correct responses. In accordance with the instruction give on your answer sheet, mark.**
  (1) If only (a) and (b) are correct
  (2) If only (b) and (c) are correct
  (3) If only (c) and (d) are correct
  (4) If only (a) and (d) are correct
  (5) If any other number or combination is correct

| (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|
| Only a and b correct | Only b and c correct | Only c and d correct | Only d and a correct | any other number or combination is correct |

(16) True statement / statements on sub atomic particles is/are.
(a) The mass of a neutron is larger than the mass of a proton.
(b) The charge of electron is considered relative to charge of proton.
(c) Any gas in cathode ray tube can produce protons.
(d) Every atom has proton, electrons & neutrons.

(17) True statement / statements on $P^{3-}$, $S^{2-}$, $Cl^-$, Ar is/are,
(a) Variation of radious is $P^{3-} > S^{2-} > Cl^- > Ar$
(b) Screening effect changes as $Ar < Cl^- < S^{2-} < P^{3-}$
(c) The effective neuclear charge is constant.
(d) The neuclear charge changes as $P^{3-} < S^{2-} < Cl^- < Ar$

(18) The true statement / statements on atomic spectrom of H is,
(a) All the lines in Balmer series can be seen with naked eye
(b) Only the lines in lymann series can be seen in uv region
(c) The series are getting apart to the direction of energy increment
(d) One spectral line is generated for the election transition between fifth and third energy levels.

(19) The true statement / statements on electromagnetic spectrum is/are,
(a) All electro magnetic radiations are included to this.
(b) The frequency of the radiation with 400nm wave length is higher than the frequency of the radiation with 700nm.
(c) The energy of a photon with $3.6 \times 10^{-14}$ Hz frequency radition is less than the energy of a photon with $1.8 \times 10^{-14}$ Hz frequency.
(d) The radiation with 820 $KJmol^{-1}$ energy has more velocity than the radiation with 482 $KJ\ mol^{-1}$ energy per one photon.

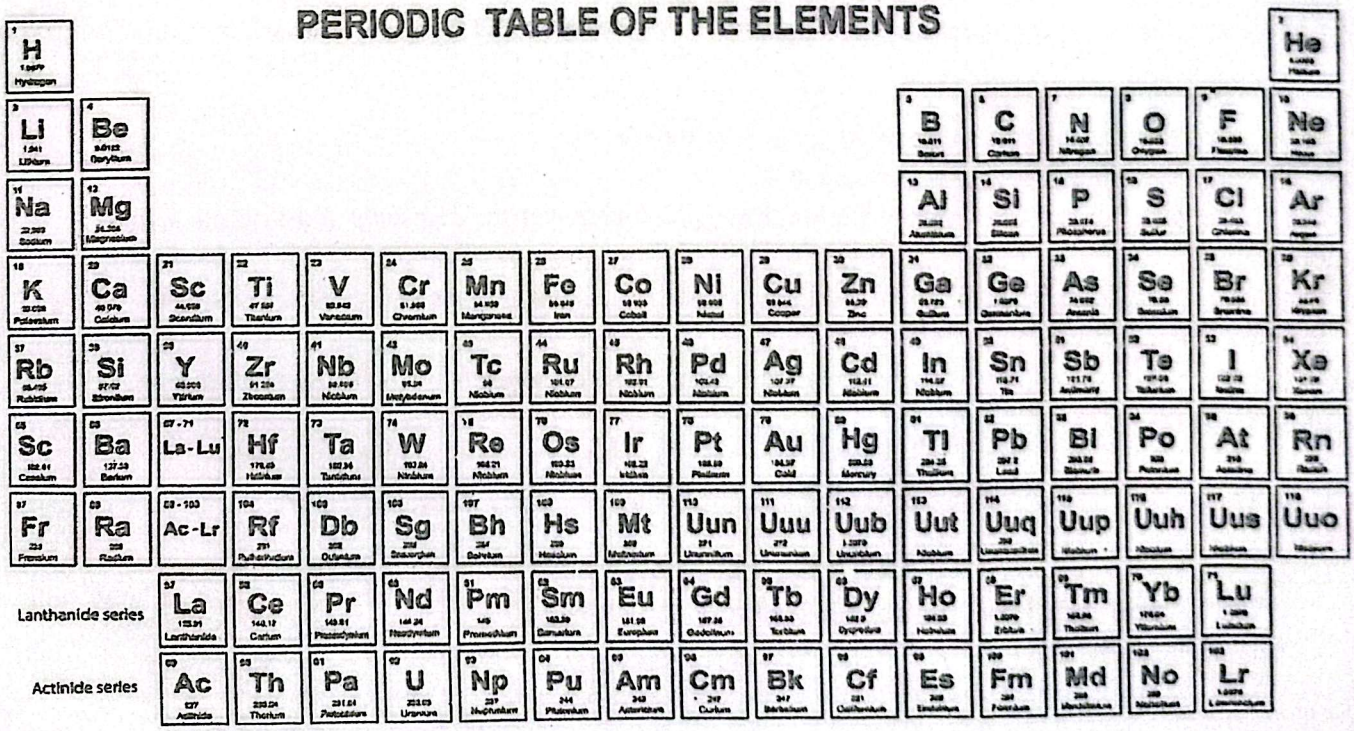
(20) The factor / factors effect to form a electron configuration with less energy is/are,
(a) Closing electrons to the neuclei
(b) Screening effect
(c) The elemination of electron which is loosely bonded to neucleous.
(d) Rotation of maximum unpaired electron in a sub energy level p to a same direction.

- **In question Nos. 21 to 25, two statement are given in respect of each question. From the table given below, select the responses out of the responses (1), (2), (3), (4) and (5), that best fits the two statements and mark appropriately on your answer sheet.**

| Response | First statement | Second statement |
|---|---|---|
| 1. | True | True , and well explain the first |
| 2. | True | True, but it does not explain the first one well. |
| 3. | True | False |
| 4. | False | True |
| 5. | False | False |

| | First Statement | Second Statement |
|---|---|---|
| (21) | Electro magnetic radiations are emitted from atoms of radio active elements | $\propto$ , $\beta$ and $\propto$ radiation are electromagnet radiations. |
| (22) | $I_3^-$ is angular | Lone pair - bond pair repulsion is more stronger than the repulsion of $\sigma$ bonds |
| (23) | The main energy levels are spherical in modern atom. | The energy of electrons in main energy level is equal in modern atomic model |
| (24) | Periodic table has built up based on electron configuration | Electron configuration is a periodic property. |
| (25) | Electrons fill into 4s sub energy level before 3d sub energy level in an atom. | The energy of 4s electron is higher than 3d electron. |

## PERIODIC TABLE OF THE ELEMENTS



| 02 | E | II |
|---|---|---|

# First Term Test - 2023 Grade 12

## Chemistry - II

Time : $01\frac{1}{2}$ hour

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**Important :**

- *This question paper consists of **07 pages***
- *This question paper comprises **Part A** and **Part B**. The time allotted for **both parts is 2 hours***

**Part A – Structured Essay:**

*Answer all the questions on this paper itself. Write your answers in the space provided for each question. Please note that the space **provided is sufficient for your answers** and that extensive answers are not expected*

**Part B – Essay:**

Answer all the questions.

**For Examiner's use only**

| | Q.No | Marks |
|---|---|---|
| A | 1 | |
| | 2 | |
| B | 1 | |
| | 2 | |

Final Marks

| | |
|---|---|
| In number | |
| In words | |

**Code Number**

| | | |
|---|---|---|
| Examiner | | |
| Checked BY | 1. | |
| | 2. | |
| Supervised By | | |

## Part A - Structured Essay

- **Answer all two questions on the paper.**

Avogadro constant $N_A = 6.022 \times 10^{23}\ mol^{-1}$

Planck constant $h = 6.626 \times 10^{34}\ Js^{-1}$

(1)a) The following questions are based on the element of the second period in the periodic table.

i. The element with the highest melting point

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ii. The element with highest valence.

.....

iii. The element with the electronegativity is 2.0 in Pauling's Scale

.....

iv. The element with minimum effective neaclear charge

.....

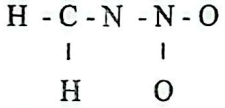
v. The element with metallic and non-metallic properties

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vi. The unstable element, although the electrons are half filled in a sub energy level.

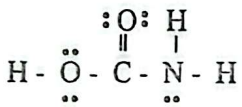
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b). The atomic skeleton of neutral $CH_2N_2O_2$ molecule is given below.



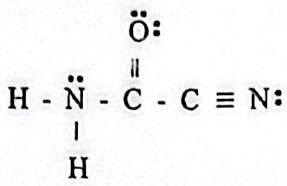
i Draw the most acceptable lewis structure for this molecule.

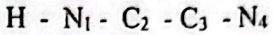
ii The lewis structure for $CO_2\ NH_3$ molecule is given below.



Draw other two acceptable lewis structures for the above molecule.

C). State the following, based on below lewis structure.





| | $N_1$ | $C_2$ | $C_3$ | H |
|---|---|---|---|---|
| Number of VSEPR Pairs | | | | |
| Electron pair geometry | | | | |
| Shape | | | | |
| Valence | | | | |

A plant leaf that absorbs only 662.6 nm radiations of sunlight has $0.01 m^2$ area.
The leaf absorbs energy with a rate of $3 \times 10^{-9} Js^{-1}$ as above.

i. Calculate the energy of a photon absorbed by the leaf.

.....

.....

ii Calculate the number of photons absorbed by leaf in 5 minutes.

.....

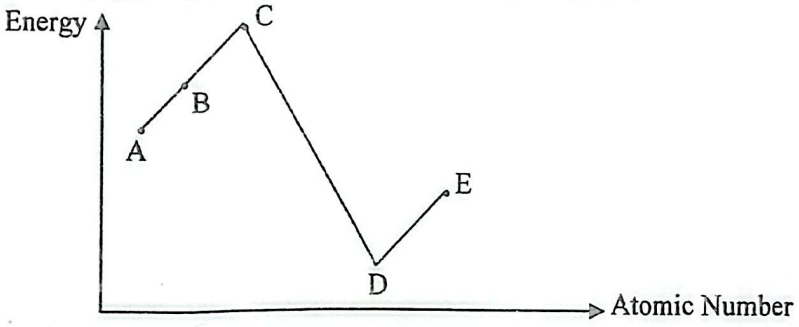
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iii Calculate the photon absorbing rate, through unit area of the above leaf in a second.

.....

.....

(2) A, B, C, D and E are 5 non transition consecutive elements.




a) The graph of first ionization energy deviation for A to E elements is given above.
A is in crystal form at room temperature.

i. Identify A - E elements and write with standard symbols.

A ..... D .....

B ..... E .....

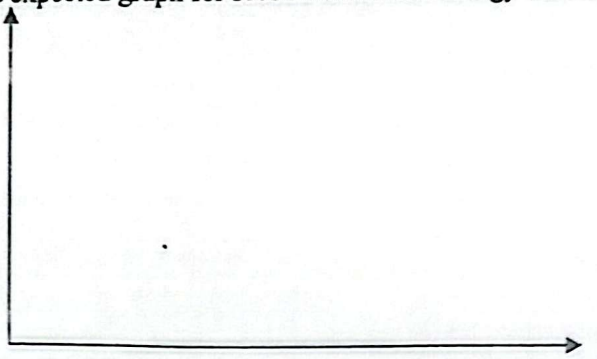
C .....

ii State two reasons for the difference of first ionization energy of C and D.

.....

.....

iii Draw the expected graph for second ionization energy variations for above elements.



b). i Discuss Pauli's exclusion Principle on the base the concept of quantum numbers.

.....

.....

ii Write the set of quantum numbers for the removed electrons to make $Al^{3+}$. Number them as A, B, C.

.....

.....

iii Arrange them in ascending order of the variation of energies at the ground state level reavent to A, B, C. (use A, B, C symbols)

.....

.....

.....

C). A, B, C, D are consequtive elements with an atomic number less than 20. The atomic radious changes as C < B < A < D.

i. Write two elements' sets for elements A - D.

Set 1 - .....

Set 2 - .....

ii. Identify A to D, elements, if D has completely filled its the valence shell with electrons.

A - .....

B - .....

C - .....

D - .....

iii Some elements of above form ions. Write them with charges and arrange them in ascending order of the ionic radius.

.....

.....

iv Compair radius of above ions with isoelectronic ions in adjacent period. State as "higher" , "lower" or equal. give reason to your answer

.....

.....

## Part B - Essay

- **Answer all questions.**

(1) a) The electron filling order of the element palladium (Pd) 46 is given below.

$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^2$ $3d^8$ $4p^6$ $5s^2$ $4d^8$

i Name the principle / law or rule which was used to gain the above order and write down them.

ii The above order is unstable, for electronic configuration. Re-arrange the order as a stable configuration is obtained. Give two reasons for your proposed configuration is more stable.

iii Illustrate the electron arrangement in the valance shell of the Pd atom above. State two principle/laws which was used to draw it.

iv Give the set of quantum numbers for the outermost electrone of the Cu atom.

b)

i. State two uses of emission spectrum of hydrogen?

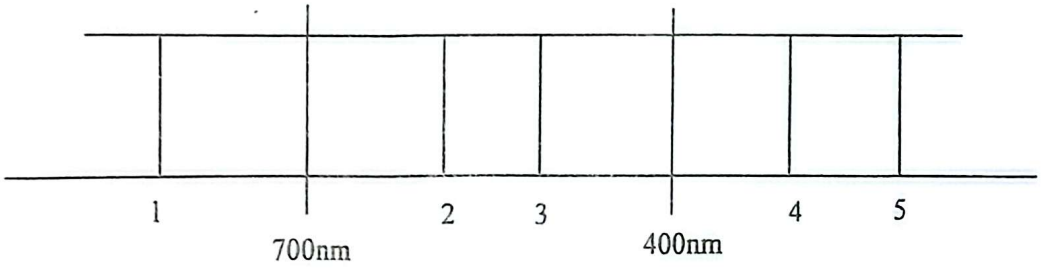
ii. X, Y and Z are three excited electrons in the fourth energy level of a sample of H atoms. The electron transitions to the ground state, are mentioned below.

X - Return to the first energy level, through the transition of successive energy levels.

Y - Return to second energy level first, and reach to ground state.

Z - Return to the first energy level in one transition.

The spectral lines spectrum relate to above electronic transitions are given below.



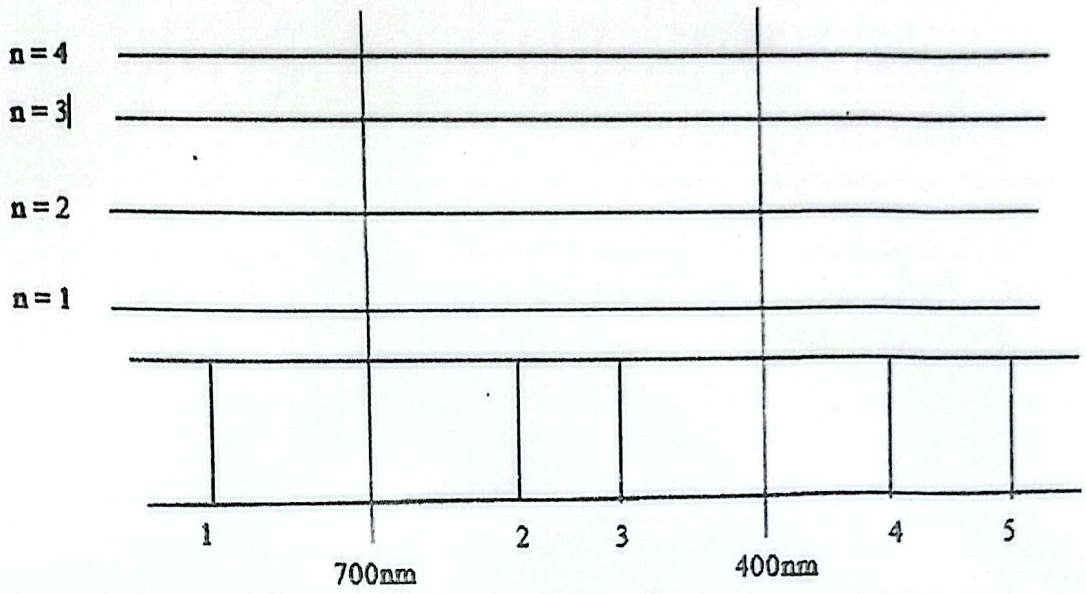

i. Write the number of electron transitions and the number of spectral lines that can be observed.

ii. State the relavent spectral lines for the electron transitions of X, Y, Z in the following table.

| Electron | Spectral line number |
|---|---|
| X | |
| Y | |
| Z | |

(copy the table to your answer script)

iii. Draw electron transitions related to each spectral line in energy levels given below. Name them as X, Y and Z.




iv. The minimum wave length of above line spectrum is 102.5 nm. Calculate the energy of 1 mol of photon.

v. Calculate the energy of fourth energy level, if the energy of the first energy level is -1312 KJ $mol^{-1}$.

(2) a) Draw the lewis structures, shapes and approximate bond angles for the following molecules/ions.

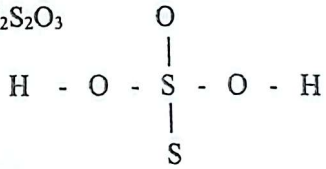
1. $NO_4^-$ 2. $N_2O$ 3. $S_2O_3^{2-}$

b) Draw the lewis structures for the given molecules, using the given skeleton.

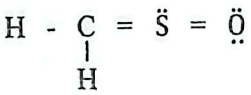
1. $N_2O_3$



2. $H_2S_2O_3$



c) Consider the following lewis structures given for an organic molecule.



1. Derive the electron pair geometry around C atom.
2. Derive the molecular shape around S atom.

d) Draw the molecular orbital diagram for $O_2$ molecule. Lable each orbital.