Shri Shantadurga Higher Secondary School, Bicholim-Goa.
First Terminal Examination October/November-2018

Std: XI Science **Answer Key** **Max Marks: 55**

Date: 26/10/2018 **Chemistry** **Duration: 150 Minutes**

Instructions:-

*1. All questions are compulsory; however question **8, 24,** and **25** has internal choice.*
2. Use of calculator is not permitted, however logarithmic table will be provided on request.
3. Every Question should be attempted only once.

Section-A consists of 7 questions of 1 mark each.
Section-B consists of 8 questions of 2 marks each.
Section-C consists of 8 questions of 3 marks each.
Section-D consists of 2 questions of 4 marks each.

N_A= 6.022×10 ^{23}; c=3 ×10 ^{8}m/s
At mass (u): H=1, C=12, O=16, S=32; K=39

Section-A

Q.1. Shortest bond length is observed in----------$C \equiv C$---------- (1)

C-C # C=C # $C \equiv C$ # all of these

Q.2 A mixture of two gases, having partial pressure p_1 and p_2, has total pressure p, then: (1)

$p = p_1 + p_2$

$p = p_1 + p_2$ # $p = \sqrt{p_1 + p_2}$ # $p = p_1 \times p_2$ # $p = \frac{p_1 + p_2}{2}$

Q.3. Synthesis gas is a mixture of ------ **$CO + H_2$**----- (1)

$CO+CH_3$ #$CO+ H_2$ # C+CO # $C+H_2O_2$

Q.4. Increased concentration of CO_2 in atmosphere is responsible for **greenhouse effect** (1)

greenhouse effect # acid rain # lack of photosynthesis # death of aquatic life

Q.5. Name the experiment that formed the basis of **Rutherford's model** of atom. (1)

Ans:Rutherford gold foil experiment /Rutherford's **α–particle** scattering experiment

Q.6. Write the general electronic configuration for **f-block** elements. (1)

Ans:$(n-2)f^{1-14}(n-1)d^{0-10}ns^2$, where n = 6 – 7

Q.7. Suggest any two methods to avoid/reduce **Sound** pollution. (1)

Ans:

Control	Reduce
• Noise-free electronic appliances • Use of headphone for TV and Music: • No honking in front of home: when • Noiseless office appliances: • Keep your fingers touched on the keyboard: • Intercom the best way of internal communication: • No honking in a residential area: • Open air dance parties must be avoided: • The silencer of your vehicle in good condition: • No music while driving, just important news in low tones:	Declaring a "no horn zone" in hospital, school and residential areas. Creating awareness and education on the consequences of noise pollution Turn off the electronic or reduce the volume. Invest in noise-canceling headphones. Put on earplugs. Use of modern acoustic wall panels.

Section-B

Q.8 Calculate the **molarity** of a solution containing 20.7g of potassium carbonate (K_2CO_3) dissolved in 500ml of solution. (2)

M=No of moles of Solute/Volume of Solvent in L

No of moles of Solute=20.7/138 = 0.15

M=.015/500 X100 = **0.3M** **Molarity** of a solution= **0.3M**

OR

Q.8 The composition of an organic compound is 92.4% **Carbon** and 7.6% **Hydrogen**. Determine the **empirical formula** of the compound. (2)

Element	**At Mass**	**% Composition**	**Relative no of moles**	**Simple ratio**	**Simplest ratio**
Carbon	12	92.4	92.4/12=7.7	7.7/7.6=1.01	1
Hydrogen	1	7.6	7.6/1=7.6	7.6/7.6=1	1

Therefore **empirical formula of the compound= C_1H_1 = CH**

Q.9 Give reason for the following. (2)

a) Boron has less **ionization enthalpy** than Beryllium.

Ans: The penetration of a 2*s*-electron to the nucleus is more than that of a 2*p*-electron; hence the 2*p* electron of boron is more shielded from the nucleus by the inner core of electrons than the 2*s* electrons of beryllium. Therefore, it is easier to remove the 2*p*-electron from boron compared to the removal of a 2*s*- electron from beryllium. Thus, boron has a smaller first ionization enthalpy than beryllium **OR**
The **ionisation energy** of **Boron** is less **than** that of **Beryllium** because in **Boron** there is a complete 2s orbital. The increased shielding of the 2s orbital reduces the **ionisation energy**.

b) Oxygen has lower **ionization enthalpy** than Nitrogen and Flourine

Ans: Oxygen **has** low **ionisation energy** (**than** that of nitrogen). It is due to an electron being added to an already half full orbital in oxygen, which results in electron electron repulsion, which will **lower** the **ionisation energy**. ... Nitrogen also **has** the added stability of a half filled shell of electrons in the 2p shell.

Q.10 Arrange the following as stated. (2)

a) in increasing order of Ionic sizes

Na^+ , F^- , O^{2-} **Ans: O^{2-}, F^- ,Na^+**

b) in increasing order of electronegativity

H , F , Cl **Ans: H, Cl , F**

Q.11 Write **any four** postulates of **kinetic molecular theory of Gases**. (2)

1. All gases are made up of large number of minute particles called molecules.
2. Large distances separate the molecules so that the actual volume of the molecules is negligible as compared to the total volume of the gas.
3. The molecules are in a state of constant rapid motion in all directions, colliding with one another and also with the walls of the container.
4. The molecular collisions are perfectly elastic with no loss of energy and only redistribution of energy during collision.
5. There are no attractive or repulsive forces between the molecules.
6. The pressure exerted by the gas is due to the bombardment of its molecules on the walls of the container per unit area.
7. The average kinetic energy of the gas molecules is directly proportional to the

absolute temperature.

Q.12 Write a point of **similarity** and a point of **difference** between **hydrogen** and **halogen**. (2)

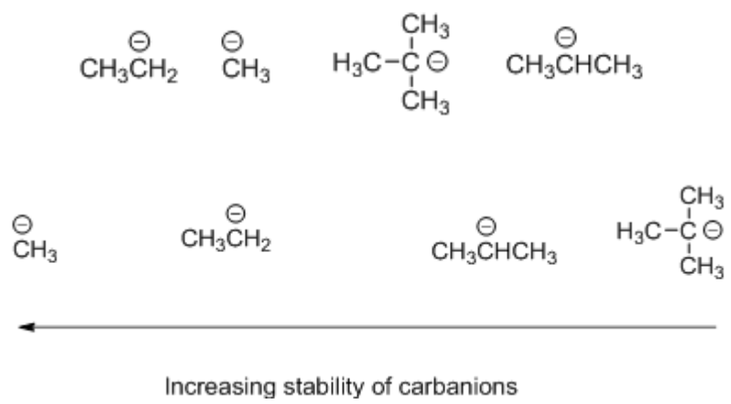
Halogens, column 17 elements, need 1 electron to make 8 in the outermost energy level. Hydrogen can act like a halogen and become a hydride by taking 1 electron and filling it's outer energy level. That makes a H- ion.
Hydrogen can also give away its 1 electron , as the alkali metals do, and become a H+ ion, easily combining with a halogen

Q.13 a) Classify the following species as **nucleophile** and **electrophile**. (2)

NH_3 , H^+ , $AlCl_3$, Cl^-

Nucleophile	Electrophile
Cl^- NH_3	**H^+ , $AlCl_3$**

b) Arrange and write the following **carbanions** in increasing order of their stabilities.



Increasing stability of carbanions

Q.14 Answer the following with respect to the reaction given below. (2)

$CH_3\text{-}CH_2\text{-}CH{=}CH_2 + HBr \rightarrow CH_3\text{-}CH_2\text{-}\underset{\displaystyle Br}{\underset{|}{CH}}\text{-}CH_3$

Compound **A**

a) Write the **type** of the above organic reaction.

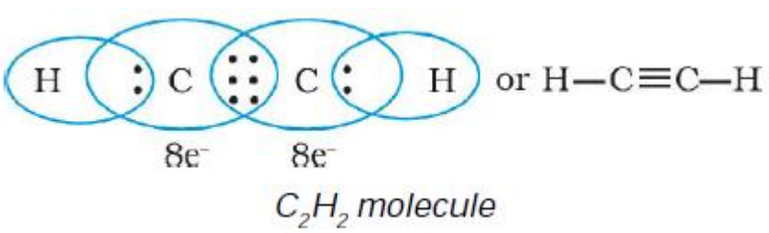
Addition reaction

b) Write the **structure** of the **position isomer** of compound **A** and name the same.

CH_3 -CH_2-CH_2-CH_2- Br (1-bromobutane)

Q.15 Draw the following. (2)

a) Lewis dot structure for **C_2H_2** Molecule



C_2H_2 molecule

b) Orbital picture of **Ethane** Molecule.

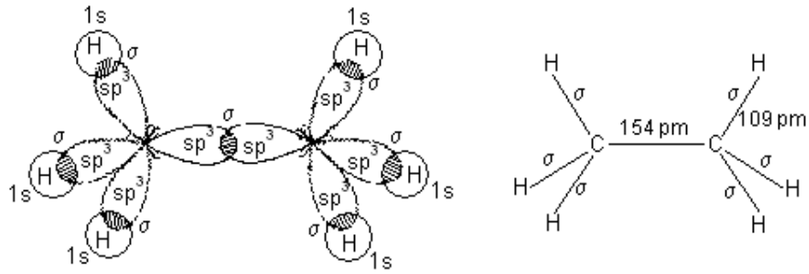


Figure. Orbital picture of ethane.

Section-C

Q.16. Dihydrogen and Iodine react with each other to produce hydrogen iodide according to the following chemical equation: (3)

$$\mathbf{H_{2\,(g)} + I_{2(g)} \rightarrow 2HI_{(g)}}$$

Write the information available from the above balanced chemical equation.

Calculate the mass of **One atom of Iodine** *(Given atomic mass of Iodine=129 u)*

Ans: According to the above chemical reaction,

- Hydrogen and iodine are reactants and Hydrogen iodide is a product.
- One **mole** of H_2(g) reacts with One **mole** of I_2(g) to give Two **moles** of HI(g)
- One **molecule** of H_2(g) reacts with One **molecule** of I_2(g) to give Two **molecules** of HI(g)
- 22.4 L of H_2(g) reacts with 22.4 L of O_2 (g) to give 44.8 L of HI(g)
- 2g of H_2 (g) reacts with 254g of I_2 (g) to give216g of HI(g)
- It also tells us that all the reactants and products are in gaseous state.

6.023×10^{23} atoms of Iodine will weigh=129 grams

..One atom of Iodine will weigh=x gram

$X=1 \times 129/6.023 \times 10^{-23}$

$=21.42 \times 10^{23}$ gram i.e $=2.142 \times 10^{24}$ gram

Mass one atom of **Iodine** $=2.142 \times 10^{24}$ gram

Q.17. Answer the following. (3)

a) What is **photoelectric** effect?

Photoelectric effect is the phenomenon of ejection of electrons from the surface of metal when the light of suitable frequency strikes on it.

b) Light emitted from a source has a wavelength of 490nm. Calculate **frequency** and **wave number** of the light.

Q.18 Answer the following. (3)

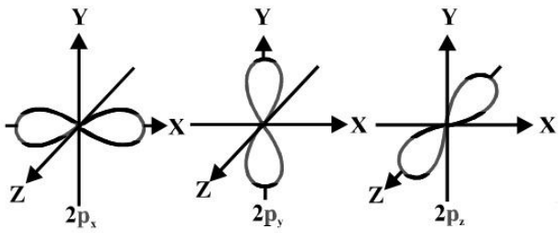
a) Define **Heisenberg's uncertainty** principle.

Heisenberg's uncertainty principle states that both the position and momentum of an electron cannot be known precisely at the same time.

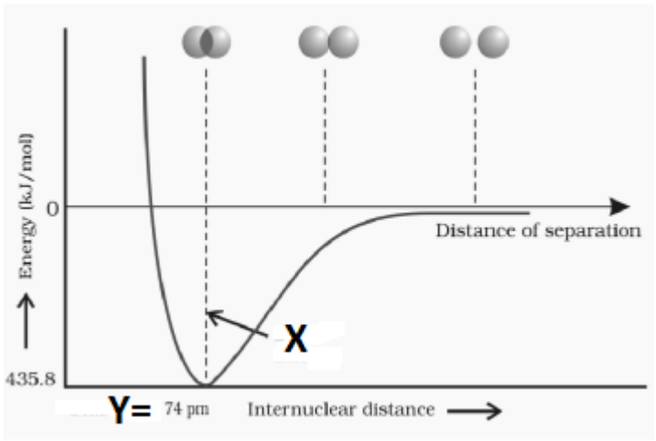
b) Write electronic configuration for **Mn** (Z=25)

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

c) Draw a neat labelled diagram for $2p_x$ orbital.



Q.19 Answer the following questions with respect to graph which shows The potential energy curve for the formation of H_2 molecule as a function of internuclear distance of the H atoms. (3)



i. Name the theory that graph tries to explain.
VBT-Valence bond theory

ii. Why the curve initially decreases when internuclear distance decreases?
When two atoms approach each other, the attractive forces predominent over the repulsive forces hence the reason.

(potential energy decreases due to attractive forces. Ultimately a stage is reached where the net force of attraction between the atoms balances the force of repulsion and system acquires minimum energy At this stage two hydrogen atoms are said to be bonded together to form a stable molecule having the bond length of 74 pm.)

iii. Why the curve shows high value of Potential energy below internuclear distance of 74 pm.
below internuclear distance of 74 pm, the repulsive forces predominent over the attractive forces hence the reason.

iv. Label the "**X**" and "**Y**".
X= **Bond enthalpy** and Y= **Bond length**

Q.20 State the **Charles** law. (3)

It states that pressure remaining constant, the volume of a fixed mass of a gas is directly proportional to its absolute temperature

On hot days, you may have noticed that potato chip bags seem to "inflate", even though they have not been opened. If you have a 250 mL bag at a temperature of 19 ^{0}C, and you leave it in your car which has a temperature of 60^0 C, Calculate what will the new volume of the bag.

Solution:

Ans: Formula $V_1/T1=V_2/T2$

Given V_1= 250 ml ,V_2= ? T_1 = 19+273=292K & T_2 = 60+273=333K

$V_2 = \frac{V_1 \times T_2}{T_2}$

$V_{2=}$ 285ml The new volume of the bag = **285ml**

Q.21 Define **Surface tension** and give reason for the following. (3)

a) **Viscosity** of liquids **decreases** as the temperature rises.

Ans: Viscosity of liquids decreases as the temperature rises because at high temperature molecules have high kinetic energy and can overcome the intermolecular forces to slip past one another between the layers.

b) Liquids at high altitudes boil at **lower temperatures** in comparison to that at sea level.

Ans: At high altitudes atmospheric pressure is low. Therefore liquids at high altitudes boil at lower temperatures in comparison to that at sea level.

Q.22 Answer the following. (3)

a) Write a complete chemical reaction of hydrogen with halogen.

$$H_{2\,(g)} + X_{2(g)} \rightarrow 2HX_{(g)} \quad (X=Cl/Br/I)$$

b) Write one example each of ionic and covalent hydride.

Ionic-→LiH, BeH_2, MgH_2

Covalent-→CH_4, NH_3, H_2O, HF

c) Write a method used to remove temporary hardness of water.

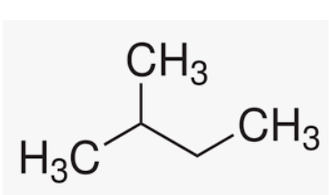
Boiling

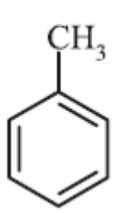
Q.23 Answer the following. (3)

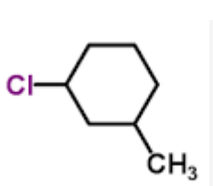
a) Write the structural formula for **carboxylic** acid and **amine**.

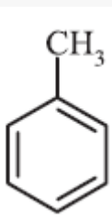
ANS: --COOH --------NH_2

b) Amongst the following organic compounds, select and name the aromatic **benzenoid compound.**









Ans: **Methyl benzene (Toluene)**

Section-D

Q.24 With respect to **Dipole moment**, answer the following questions. (4)

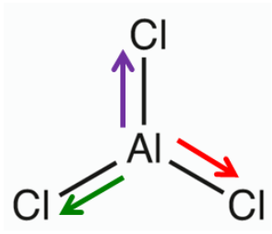
a) Define Dipole moment.

Ans:|Dipole moment is defined *as the product of the magnitude of the charge and the distance between the centres of positive and negative charge.*

b) Write how it is designated (Symbol) and what is its unit.

Its unit is Debye unit denoted by symbol **D or Cm**

c) Draw the structure of $AlCl_3$ molecule and show the bond dipoles in it.



(⟷ + + ⟶) = 0

d) Comment on net dipole moment in $AlCl_3$ with reason.

In $AlCl_3$, the dipole moment is zero although the Al – Cl bonds are oriented at an angle of 120° to one another, the three bond moments give a net sum of zero as the resultant of any two is equal and opposite to the third.

OR

Q.24 With respect to **NH_3 (Ammonia**) molecule answer the following. (4)

a) Define Hybridization.

Hybridisation *may be defined as the process of intermixing of the orbitals of slightly different energies so as to redistribute their energies, resulting in the formation of new set of orbitals of equivalent energies and shape*

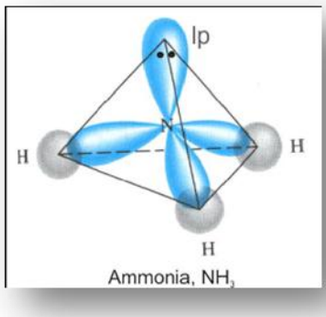
b) Name the type of Hybridization that Nitrogen atom has undergone.

sp^3

c) Write the number of lone pairs and bond pairs on Nitrogen atom.

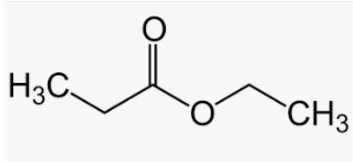
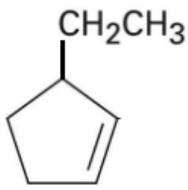
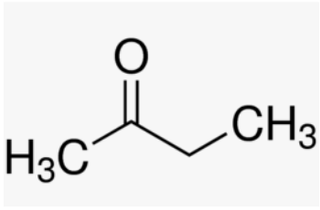
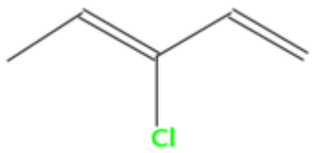
One lone pair and **Three** bond pairs

d) Draw the orbital picture and comment on its geometry.



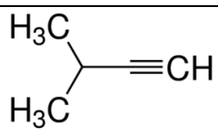
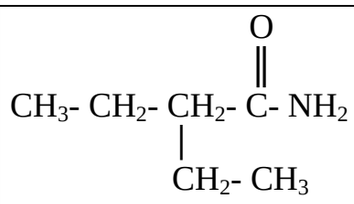
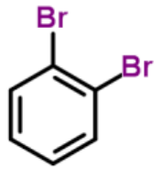
Trigonal pyramidal

Q.25 Write the IUPAC name of the following. (4)

a)  Ethoxy propane	b)  3-ethyl-1-cyclopentene
c)  2-butanone	d)  3-chloro-1,3-pentadiene 3-chloropenta-1,3-diene

OR

Q.25 Write the structure for the following compounds. (4)

a) 3-methylbutyne	
b) Pentanenitrile	CH_3- CH_2- CH_2- CH_2-C≡N
c) 2-ethylbutanamide	
d) o-dibromobenz ne	

*----------**THE END**----------*