SUCCESS KEY TEST SERIES

Annual Examination [MODEL ANSWER]

Std: 11th Science | **Subject: Chemistry** | **Time: 3 Hours**

Date : | **Sample Answer Key** | **Max Marks: 70**

Section A (MCQ & VSA 1 MARKS Questions)

Q.1 Select and write the correct answer: 10

(i) Ans. (b)
(ii) Ans. ©
(iii) Ans. (d)
(iv) Ans. (d)
(v) Ans. (a)
(vi) Ans. (b)
(vii) Ans. (b)
(viii) Ans. (d)
(ix) Ans. (b)
(x) Ans. (a)

Q.2 Answer the following: 8

(i) Ans. Paramagnetism is directly proportional to number of unpaired electrons. Hence, Fe^{3+} is more paramagnetic than Fe^{2+} because it contains 5 unpaired electrons while Fe^{2+} consists of only 4 unpaired electrons.

(ii) Ans. Covalent bond is formed by the overlap of two half-filled atomic orbitals. The atomic orbitals are oriented in specific directions in space (except s-orbital which is spherical). Hence, covalent bond is directional in nature.

(iii) Ans. Electron gain enthalpy in ev/atom= -3.611ev/atom
Electron gain enthalpy in J/atom= -348.4 KJ/mol

(iv) Ans. Carbon

(v) Ans. Brownian movement is caused by the striking of the colloidal particles with the molecules of dispersion medium due to their kinetic energy.

(vi) Ans. If a stress is applied to a reaction mixture at equilibrium, then the reaction takes place in the direction which relieves stress.

(vii) Ans. Electromeric effect is a temporary electronic effect exhibited by multiple-bonded groups in the excited state in the presence of a reagent.

(viii) Ans. Propyne>propene>propane

Section B (SA I - 2 MARKS EACH)

Attempt any Eight: **16**

Q.3 Ans. We know ,

Molecular formula of acetaldehyde is given by C_2H_4O

The Moles of acetaldehyde given = 2 mol

So,

- Number of moles of carbon atoms = Moles of acetaldehyde x Number of carbon atoms
  = 2 x 2
  = 4 moles of carbon atoms
- Number of moles of hydrogen atoms = Moles of x Number of hydrogen atoms
  = 2 x 4
  = 8 moles of hydrogen atoms
- . Number of moles of oxygen atoms = Moles of acetaldehyde x Number of hydrogen atoms
  = 2 x 1
  = 2 moles of oxygen atoms
- Number of molecules of acetaldehyde = Moles of acetaldehyde x Avogardo number
  = 2 mol x 6.022 x 10^{23} molecules of acetaldehyde

Q.4 Ans. The balance chemical equation for the combustion of propane is,

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

3x12+8x1 (44 g) 5 x 22.4 L (112 L)

(Where 1 mol off ideal gas occupies 22.4 L of volume)

Thus 44 g of propane requires 112 litres of oxygen for complete combustion

2.2 g of propane will require

$\frac{112}{44}$ x2.2= 5.6 litres of O_2 at STP for complete combustion.

Q.5 Ans. We should not heat organic solvents over a Bunsen burner flame because organic solvents are flammable; therefore they may catch fire if heated. Also, organic solvents have extremely low vaporization points. Thus, when heated over a Bunsen burner flame, it results into tremendous reaction due to their very low combustion temp.

Q.6 Ans.

	Column A		Column B
(a)	Neutrons	(i)	Chadwick
(b)	p-orbital	(ii)	Six electrons
©	Charge on electron	(iii)	-1.6×10^{19}C
(d)	Lyman series	(iv)	Ultraviolet region

Q.7 Ans. For ammonia (NH_3):

Types of hybridisation	Geometry	Bond angle
sp^3	pyramidal	107° 18′

Q.8 Ans.

Metal	**Non-Metal**
Metals form basic oxide	Non-metals form neutral or acidic oxide
Metals reacts with water to form metal hydroxide and hydrogen gas	Non-metals do not react with water
Metals react with dilute acid to form metal salt and hydrogen gas	Non-metals do not react with dilute acid
Metals react with chlorine to form ionic metal chlorides	Non-metals react with chlorine to form covalent non-metal chlorides
Few metals react with hydrogen to form metal hydrides	Non-metals react with hydrogen to form covalent hydrides

Q.9 Ans. An adult body contains about 25 g of Mg and 1200 g of Ca compared with only 5 g of iron and 0.06 g of copper. The daily requirement in the human body has been estimated to be 200 – 300 mg. All enzymes that utilise ATP in phosphate transfer require magnesium as a cofactor. The main pigment for the absorption of light in plants is chlorophyll which contains magnesium. About 99 % of body calcium is present in bones and teeth. It also plays an important role in neuromuscular function, interneuronal transmission, cell membrane integrity and blood coagulation. The calcium concentration in plasma is regulated at about 100 mgL–1. It is maintained by two hormones: calcitonin and parathyroid hormone. Do you know that bone is not an inert and unchanging substance but is continuously being solubilised and redeposited to the extent of 400 mg per day in man. All this calcium passes through the plasma.

Q.10 Ans. According to Boyle's law,

$P_1V_1 = P_2V_2$

Substituting the values of P_1V_1 and P_2 in the above expression we get

$V_2 = P_1V_1 / P_2 = 1 \times 25 / 1.25 = 20$ ml

Volume occupied by the gas is 20 ml.

Q.11 Ans. The equilibrium in a system having more than one phase is called heterogeneous equilibrium. If ethanolis placed in a conical flask, liquid vapour equilibrium is established.

$C_2H_5OH_{(l)} \rightleftharpoons C_2H_5OH_{(g)}$

For a given temperature:

$$Kc = \frac{[C2\ H\ 5\ OH_{(g)}]}{[C2\ H\ 5\ OH_{(g)}]}$$

But $[C2\ H\ 5\ OH_{(l)}]=1$

$\therefore Kc = [C2\ H\ 5\ OH(g)]$

Thus, at any given temperature density is constant irrespective of the amount of liquid, and the term denominator is also constant.

Q.12 Ans.

$$2NaHCO_3(s) \rightleftharpoons Na_2CO_3(s) + CO_2(g) + H_2O(g)$$

$$K_C = \frac{[Na_2CO_3(s)][CO_2(g)][H_2O(g)]}{[NaHCO_3(s)]^2}$$

$$\therefore K_C = [CO_2(g)][H_2O(g)]$$

$\therefore K_C$ has no unit.

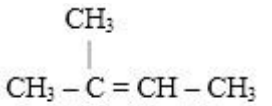
Q.13 Ans. A. The type of isomerism exhibited is metamerism.

B. The type of isomerism exhibited is functional group isomerism.

C. The type of isomerism exhibited is keto-enol tautomerism.

D. The type of isomerism exhibited is position isomerism and functional group isomerism.

Q.14 Ans. The structural formula of an alkene is



2 – Methyl but-2-ene

Section C (SA II - 3 MARKS EACH)

Attempt any Eight: **24**

Q.15 Ans. i. Formula mass of NaCl

= average atomic mass of Na

+ average atomic mass of Cl

= 23.0u +35.5u = 58.5u

ii. Formula mass of $Cu(NO_3)_2$

= average atomic mass of Cu + 2 x (average atomic mass of nitrogen + average atomic mass of three oxygen)

= (63.5) + 2(14 + 3 x 16) = 187.5 u

Q.16 Ans. $_{26}Fe$ [Ar] $3d^6$ $4s^2$
Fe^{2+} [Ar] $3d^6$
Fe^{3+} [Ar] $3d^5$

Q.17 Ans.

The oxidation number of O atom bonded to a more electropositive atom is -2 and that of H atom bonded to electronegative atom is +1. Using these values the oxidation numbers of atoms of the other elements in a given polyatomic species are calculated.

i. SO_3^{2e}

-2 = Oxidation number of S = - 2 - 3 (-2)

=-2+6=4

ii. BrO_3^{e}

- 1 = oxidation number of Br + 3 x (oxidation number of O)

∴ Oxidation number of Br = - 1 - 3 (-2)

=-1+6=5

similarly the oxidation number in the remaining species are found to be

iii. Cl in ClO_4^{e} :+7 iv. N in NH_4^{A}: -3

v. N in NO_3^{e}: +5 vi. N in NO_2^{e}: +3

vii. S in SO_3 :+6 viii. N in N_2O_5 : +5

Q.18 Ans. As we move across the period 3 from left to right the elements Si, P, S, C1 come in a sequence. Their outer electronic configurations are $3s^23p^2$, $3s^23p^3$, $3s^23p^4$ and $3s^23p^5$ respectively and 'P' loses an electron from a singly occupied 3p orbital whereas 'S' loses an electron from a doubly occupied 3p orbital. Therefore, the first ionization enthalpy of 'S'

would be less than 1060 kJ mol^{-1}, and therefore, should be close to 1000 kJ mol^{-1} and not 1200 kJ mol^{-1}.

Q.19 Ans. (i) Dihydrogen reacts with halogens (X_2) to give hydrogen halides,(HX).

H_2 (g) + X_2 (g) → 2HX (g)

(ii) Dihydrogen inflames with fluorine even at -250 °C in dark, whereas it requires catalyst to react with iodine. The reaction of dihydrogen with fluorine is very violent which decreases with increasing atomic number of halogen (down the group).

(iii) The reactions of dihydrogen with halogens are as follows:

$H_2 + F_2 \rightarrow 2HF$ (Hydrogen fluoride)

$H_2 + Cl_2 \rightarrow 2HCl$ (Hydrogen chloride)

$H_2 + Br_2 \rightarrow 2HBr$ (Hydrogen bromide)

$H_2 + I_2 \rightarrow 2HI$ (Hydrogen iodide)

Q.20 Ans. (i) The lighter elements in groups 13, 14 and 15 have small atomic radii and high ionization enthalpy values.

(ii) They form covalent bonds with other atoms by overlapping of valence shell orbitals.

(iii) As we move down the group, the ionization enthalpies are lowered.

(iv) The atomic radii increase since the valence shell orbitals are more diffused.

(v) The heavier elements in these groups tend to form ionic bonds. The first member of these groups belongs to second period and do not have d-orbitals.

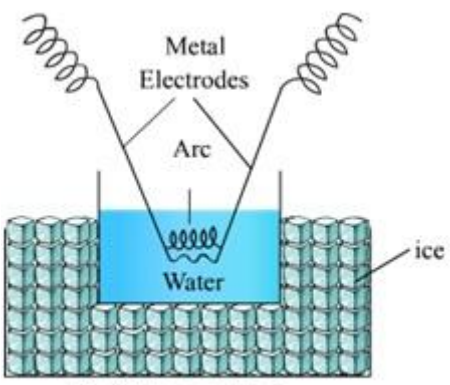
(vi) Boron, carbon and nitrogen cannot expand their octet. The subsequent elements in the group possess vacant d-orbital in their valence shell, which can expand their octet forming and form a variety of compounds.

Q.21 Ans. (a) $P \propto 1/V$

(b) Boyle's law

(c) For a fixed mass of a gas at constant temperature, the pressure (P) of a gas is inversely proportional to the volume (V) of gas.

Q.22 Ans.



Bredig's arc method

i. It is used in case of colloids to mix dispersed phase into dispersion medium in order to make them a stable colloid.

ii. This process involves vaporization as well as condensation.

iii. Colloidal sols of metals such as gold, silver, platinum can be prepared by this method.

iv. In this method, electric arc is struck between electrodes of metal immersed in the dispersion medium.

v. The intense heat produced vapourises the metal which then condenses to form particles of colloidal sol.

Q.23 Ans. Homogeneous Equilibrium:

(i) A homogeneous equilibrium is one in which all of the reactants and products are present in a single solution (by definition, a homogeneous mixture).

(ii) Reactions between solutes in liquid solutions belong to one type of homogeneous equilibrium.

(iii) The chemical species involved can be molecules, ions, or a mixture of both.

Heterogeneous Equilibrium

(i) A heterogeneous equilibrium is a system in which reactants and products are found in two or more phases.
(ii) The phases may be any combination of solid, liquid, or gas phases, and solutions.
(iii) When dealing with these equilibrium, remember that solids and pure liquids do not appear in equilibrium constant expressions.

Q.24 Ans. A=84, Z=36,

M= 83.913 u

m_n =1.0087u

m_H =1.0078 u

Binding energy per nucleon $\left(\bar{B}\right)$

i. $\Delta m = Zm_H + (A - Z)\ m_n - m$ ii. B.E= Δm x 931.4 MeV

iii. $\bar{B} = \frac{B.E}{A}$

i. $Zm_H + (A - Z)\ m_n - m$

$= (36 \times 1.0078) + (48 \times 1.0087) - 83.913$

$= 36.2808 + 48.4176 - 83.913$

$= 0.7854$ u

ii. B.E. = Δm x 931.4

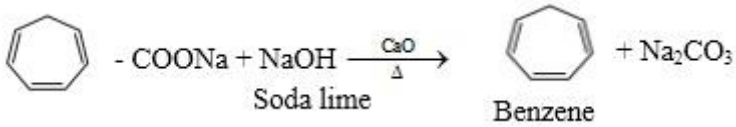
= 0.7854 x 931.4 = 731.522 MeV

iii. $\bar{B} = \frac{B.E}{A} = \frac{731.522}{84}$

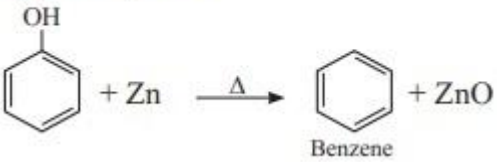
= 8.709 MeV

Binding energy per nucleon of $^{84}_{36}Kr$ = **8.709 MeV**

Q.25 Ans.



(ii) From phenol:



Q.26 Ans. Rancidity

It is defined as oxidation of food item that occurs when food is prolonged exposed to air due to which it becomes stale and taste bad with foul smell .

Causes of rancidity

1. Due to water present in food
2. presence of certain microorganisms
3. Due to an enzyme catalysed reaction.
4. Rancidity of milk and butter is due to the release of four, six and eight carbon fatty acids (butanoic, hexanoic and octanoic acids) on hydrolysis.
5. High temperature increases the rate of air oxidation of unsaturated fats.

Section D (SA II - 4 MARKS EACH)

Attempt any Three: **12**

Q.27 Ans. 1.

Sr. No	Accuracy	Precision
1	Accuracy is the ability of the instrument to measure the accurate value. Or we can say it is the closeness of the measured value to a standard or true value.	Precision means two or more values of the measurements are closed to each other.
2	It can be obtained by taking the small readings.	It is used for finding the consistency or reproducibility of the measurement.

2.

Since molarity

$$M = \frac{\text{Mass of NaOH/Molar mass of NaOH}}{0.250\,L}$$

$$M = \frac{4\,g/\,40\,g}{0.250\,L}$$

$$M = \frac{0.1\,mol}{0.250\,L}$$

$$M = 0.4\,mol\,L^{-1} = 0.4\,M$$

Note that molarity of a solution depends upon temperature because volume of a solution is temperature dependent.

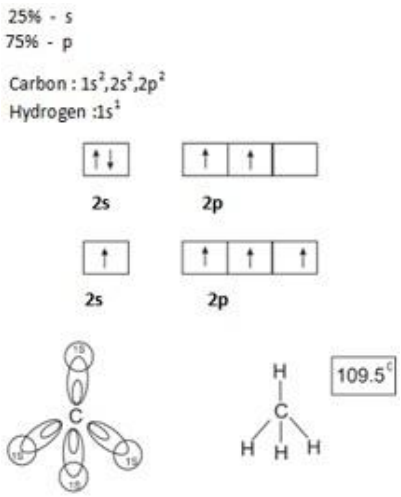
Q.28 Ans. 1. In this type one 's' and three 'p' orbitals having comparable energy mix and recast to form four sp^3 hybrid orbital's.

2. It should be remembered that 's' orbital is spherically symmetrical while the p_x , p_y , p_z , orbital's have two lobes and are directed along x, y and z axis, respectively.

3. The four sp^3 hybrid orbital's formed are equivalent in energy and shape.

4. They have one large lobe and one small lobe.

5. They are at an angle of 1090 28 with each other in space and point towards the corners of a tetrahedral as shown in figure :



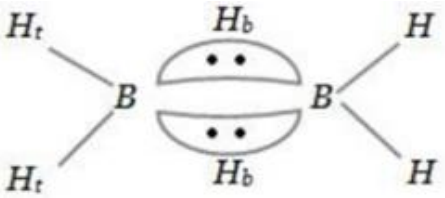
Q.29 Ans. Structure of Diborane: In formation of B_2H_6 only 12electrons (3 each from B and 6 from H-atom) are available for the formations of bonds. It needs to form 8 conventional bonds which need 16 electrons so it is electron deficient.

i. The four terminal B-H bonds are regular two centre-two electron bonds while the two bridge (B-H-B) bonds are different.

ii. Each B atom uses sp_3 hybrids.

iii. Out of 4 hybrids one is without electrons.

iv. The terminal B-H bonds are normal 2-centre-2-electron bonds but the two bridge bonds are 3-centre-2-electron bonds, also referred to as banana bonds.



Q.30 Ans. 1. The group exerting – I effect in $CH_3\ CH_2\ Cl$ is one – Cl while in CH_3 -$CHCl_2$ there are two – Cl atoms. Therefore CH_3 -$CHCl_2$ is expected to have strong – I effect.

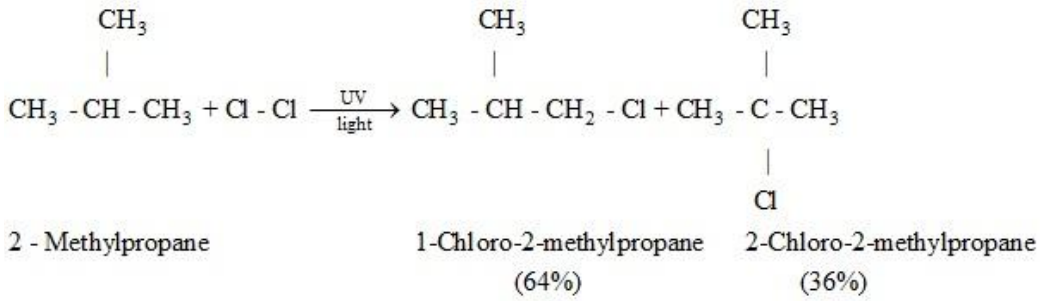
2. Stability order : I > II > III

I : Contains more number of covalent bonds, each carbon atom and oxygen atom has complete octet, and involves no separation of opposite charges. Therefore the most stable resonance structure.

II: Contains one covalent bond less than in I, one carbon (C) has only 6 valence electrons, involves separation of opposite charges; the resonance structure II has –ve charge on more electronegative 'O' and +ve charge on more electropositive 'C'. It has intermediate stability.

III: Contains one covalent bond less than in I , oxygen has only 6 valence electrons, involves separation of opposite charge, has –ve charge on the more electropositive 'C' and +ve charge on more electronegative 'O'. all these factors are unfavourable for stability. Therefore it is the least stable.

Q.31 Ans. (a) Two products are possible for chlorination of 2-methyl propane.



(b) Two products are possible for chlorination of 2-methyl butane.