# Kendriya Vidyalaya Sangathan
## Regional Office Varanasi
### Class- XI Term-2 Exam (2021-22)
### Subject- Chemistry Theory (043)
### (Sample Paper)

**Time: 2Hrs**                                                                                                    **MM: 35**
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**General Instructions:**
**Read the following instructions carefully**
1.  There are 12 questions in this question paper with internal choice.
2.  Sec-A, Q No-1 to 3 are very short answer questions carrying two marks each.
3.  Sec-B, Q No- 4 to 11 are short answer questions carrying 3 marks each.
4.  Sec-C, Q No- 12 is case based question carrying 5marks.
5.  All questions are compulsory.
6.  Use of log tables and calculators is of allowed.

## SECTION-A

Q-1. Answer any two of the following.
   a)  Write the Van der Waal equation n mole of a real gas.
   b)  Mention the conditions of temperature and pressure at which real gases behave ideally.
   c)  State the Dalton's Law of Partial Pressure.

Q-2. At $0^o$C the density of a certain oxide of a gas at 2 bar is same as that of nitrogen at 5 bar. What is the molecular mass of its oxide?

Q-3. a) What do you understand by the terms- system and surrounding?
   b) In a process 701 Joule of heat is absorbed by a system and 394 joule of work is done by the system. Calculate the change in internal energy of the process.

## SECTION-B

Q-4. a) Define Hess's Law of Constant Heat Summation.

   b) Enthalpy of Combustion of carbon to $CO_2$ is -393.5kJ/mol. Calculate the heat released upon formation of 35.2g of $CO_2$ from Carbon and Di-oxygen gas. (Molecular Mass of $CO_2$ = 44 )

                                                              OR

   a)  What do you mean by Gibb's Free Energy?
   b)  For a reaction 2A (g)  + B (g) $\longrightarrow$ 2D (g) , $\Delta U^0$ = -10.5 kJ and $\Delta S^0$ = -44.1 J/K
       Calculate $\Delta G^0$ for the reaction and predict whether the reaction may be spontaneous or not.

Q-5. a) Write the statement of Le-Chateliers Principle.

b) At 450 K Kp= 2.0 x 10$^{10}$/ bar for the given reaction at equilibrium.

$2SO_2 (g) + O_2 (g) \longrightarrow 2 SO_3 (g)$

What is Kc at this temperature? (R= 0.0831 L bar K$^{-1}$ mol$^{-1}$)

OR

Derive a relation between Kc and Kp for the following reversible reaction

$aA + bB \longleftrightarrow cC + dD$

Q-6. Assuming Complete dissociation, calculate the pH of following solutions.

a)  0.003M HCl
b)  0.005M NaOH
c)  0.002M HBr

(Given log3= 0.4771, log5= 0.699, log2= 0.3010)

Q-7.  Rationalise the give statements ad give chemical reactions.

a)  Lead (II) Chloride reacts withCl$_2$ to give PbCl$_4$
b)  Lead (IV) Chloride is highly unstable towards heat.
c)  Lead is known not to form an iodide, PbI$_4$.

Q-8. a) State the trends observed in oxidation states of the elements of group-13.

b)  Why does +3 Oxidation state becomes less stable down the group 14.
c)  Explain why maximum covalency of Boron is 4 while that of Aluminium is 6.

Q-9. a) Write the IUPAC name of CH2=CH-C≡C-CH3 and  —— CH3.

b)  Write the structural formula of 2,3 Dimethylhexane and 1,3-Butadiene.
c)  How many sigma and pi bonds are present in benzene molecule.

OR

a)  Write the IUPAC name of CH2=CH-CH(CH$_3$)-CH$_3$ and CH$_3$-CH$_2$-C≡CH.
b)  Write the structural formula of 2-Methylbut-2-ene.
c)  How many Sigma and pi bonds are present in toluene.

Q-10. a) Define the term Conformation.

b)  How many conformations of ethane are possible?
c)  Draw the Staggered and eclipsed conformation of ethane.

OR

a) What is aromaticity? State Huckel's Rule.
b) What are the necessary conditions for any system to be aromatic?

Q-11. Write the chemical reactions involved in the following.

a) Halogenation of benzene.
b) Nitration of Benzene.
c) Friedal Craft's Alkylation.

OR

Suggest a scheme to bring about following conversions.

a) Methane to ethane
b) Ethane to methane.
c) Ethene to ethyne.

## SECTION-C

Q-12. **Read the passage given below and answer the questions that follow.**

A diagonal relationship is said to exist between certain pairs of diagonally adjacent elements in second and third periods of periodic table. These pairs exhibit similar properties e.g. Boron and Silicon, both are semiconductors forming halides that are hydrolysed in water and form acidic oxides. Such a relationship occurs because crossing and descending the periodic table having opposite effects. On crossing a period of the periodic table the size of atoms decreases and on descending a group size of atoms increases.

**Based on the above information, answer the following questions.**

a) Why does Lithium resemble magnesium?
b) What are the factors responsible for diagonal relationship?
c) Which properties are similar in diagonal relationship?
d) Which element shows diagonal relationship with Beryllium?
e) Do Boron and Silicon show diagonal relationship?