CBSE Board
Class XI Chemistry
Sample Paper – 6

Time: 3 Hours **Total Marks: 70**

General Instructions

1. All questions are compulsory.
2. Question nos. 1 to 8 are very short answer type questions and carry 1 mark each.
3. Question nos. 9 to 18 are short answer type questions and carry 2 marks each.
4. Question nos. 19 to 27 are also short answer type questions and carry 3 marks each.
5. Question nos. 28 to 30 are long answer type questions and carry 5 marks each.
6. Use log tables if necessary, use of calculators is not allowed.

Q1: How many significant figures are there in 0.0052?

Q2: Calculate the wave number of yellow radiation having wavelength 5800Å.

Q3: Why is σ bond stronger than π bond?

Q4: State the relation between K_a, K_b and K_w

Q5: Represent MnO_2 using Stock notation.

Q6: Ammonia (NH_3) is a covalent hydride. How will your further categorize it as –electron deficient, electron precise or electron rich hydride?

Q7: State "Avogadro's law"

Q8: Which of the following is an electrophile: $HS^-, C_2H_5O^-, H_2N:^-, BF_3$?

Q9: Complete the following equations:

a) $Al + NaOH + H_2O \rightarrow$

b) $CaCO_3 + HCl \rightarrow$

Q10: The work function for cesium atom is 1.9 eV. Calculate

i. Threshold frequency of radiation
ii. Threshold wavelength of radiation

$(h = 6.63 \times 10^{-34}\ Js)$

OR

Q10: Calculate de- Broglie wavelength of an electron having $\text{mass} = 9.1 \text{ x } 10^{-31}$ kg and moving at 1% speed of light. $(h = 6.63 \text{ x } 10^{-34} \text{ kg m}^2 \text{ s}^{-1}, \text{Speed of light} = 3 \text{ x } 10^8 \text{ m s}^{-1})$

Q11: In terms of period and group where would you locate the element with Z= 114.

Q12: State the number of valence electrons & valence for elements belonging to group 14 & 17 respectively.

Q13: Although both CO_2 and H_2O are triatomic molecules, the shape of H_2O molecule is bent while that of CO_2 is linear. Explain this on the basis of dipole moment.

Q14: Explain why N_2 has greater bond dissociation enthalpy than N_2^+.

Q15: At 273 K, the density of a gaseous oxide at 2 bar is same as that of nitrogen at 5 bar. Calculate the molecular mass of oxide.

Q16: Mention differences between ideal gas and real gas in terms of

a) Temperature and pressure conditions under which gas laws are obeyed
b) Equation obeyed by ideal and real gas

Q17: Balance reaction of potassium dichromate (VI), $K_2Cr_2O_7$ with sodium sulphite, Na_2SO_3, in an acid solution to give chromium (III) ion and the sulphate ion using oxidation number method.

Q18:

a) Why is dihydrogen gas not preferred in balloons?
b) Name the radioactive isotope of hydrogen along with its notation.

Q19: What is the energy in joules, required to shift the electron of hydrogen atom from first Bohr orbit to fifth Bohr orbit and what is the wavelength of light emitted when the electron returns the ground state. The ground state electron energy is -2.18×10^{-11} ergs and $h = 6.63 \text{ x } 10^{-34}$ Js

Or

a) What do you infer about the structure of CO_2 if its dipole moment is zero?
b) Write the molecular orbital configuration of N_2^- and calculate its bond order.
c) Draw the resonating structures of NO_3^- ion.

Q20:

a) Out of the following reaction, in which case heat evolved will be more?

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g)$$

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$$

b) In a process, 701 J of heat is absorbed by a system and 394 J of work is done by the system. What is the change in internal energy for the process?

Q21:

a) Calculate the enthalpy change for the process:

$CCl_4(g) \rightarrow C(g) + 4Cl(g)$ and calculate the bond enthalpy of C-Cl bond in CCl_4.

$$\Delta_{vap}H^o(CCl_4) = 30.5\ kJ/mol$$

$$\Delta_f H^o(CCl_4) = -135.5\ kJ/mol$$

$$\Delta_a H^o(C) = 715\ kJ/mol$$

$$\Delta_a H^o(Cl_2) = 242\ kJ/mol$$

b) When is bond dissociation energy equal to bond energy?

Q 22:

a) Though both B & Al are electron deficient compounds $AlCl_3$ exists as dimer Al_2Cl_6 while BCl_3 exist as monomer.

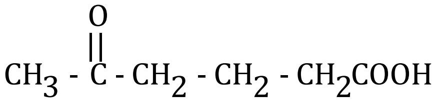
b) Suggest a reason as to why CO is poisonous.

c) What happens when borax solution is acidified?

Q23: A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molecular mass is 98.96. What is molecular formula of compound? (Atomic mass of C=12 u, H=1 u and Cl=35.5. u)

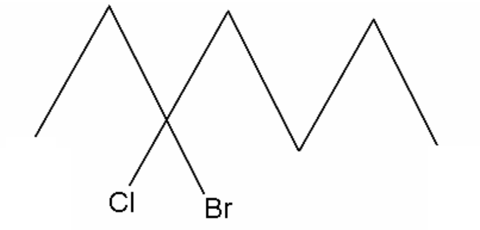
Q24: Give IUPAC name of the following

a)

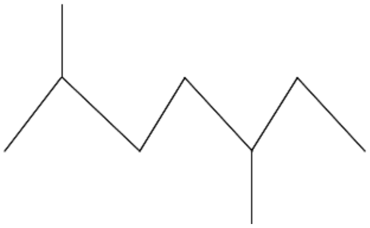


$$CH_3-\overset{\overset{\displaystyle O}{||}}{C}-CH_2-CH_2-CH_2COOH$$

b)



c)



Q25: An organic compound contains 69% carbon and 4.8% hydrogen, the remainder is oxygen. Calculate the masses of carbon dioxide and water produced when 0.20 g of this substance is subjected to complete combustion.

Q26:

a) Draw cis-trans isomer of $CHCl=CHCl$ and write their IUPAC names

i. Draw structure of anthracene.

ii. Mention the number of π-electrons in anthracene?

Q27: Water is a universal solvent. But alcohol also dissolves most of the substances soluble in water and also many more. Boiling point of water is 100°C and that of alcohol is 80°C. The specific heat of water is much higher than the specific heat of alcohol. List out three possible differences, if instead of water as the liquid, we had alcohol in our body.

Q28:

a) Two moles of PCl_5 were introduced in a 2L flask and heated at 600 K to attain the equilibrium. PCl_5 was found to be 40% dissociated into PCl_3 and Cl_2 Calculate the value of K_C

b) The solubility of $Sr(OH)_2$ at 298 K is 19.23 g L^{-1} of solution. Calculate the concentration of strontium and hydroxyl ions and also the pH of the solution. Molar mass of $Sr(OH)_2$=121.6 g/mol

OR

Q28:

a) An equilibrium system for the reaction between hydrogen and iodine to give hydrogen iodide at 670 K in a 5 litre flask contains 0.4 mole of hydrogen, 0.4 mole of iodine and 2.4 moles of hydrogen iodide. Calculate equilibrium constant.

b) Write expressions for K_p and K_c the decomposition reaction of calcium carbonate.

c) A system is in equilibrium as: $SO_2Cl_2 + \text{Heat} \rightleftharpoons SO_2 + Cl_2$

Why does the temperature of the system increase when Cl_2 is added to the equilibrium mixture at constant volume?

Q29: Discuss the various reactions that occur in the Solvay process

OR

Q29:

a) Alkali metals are soft and have low boiling and melting points. Explain.

b) What happens when:

   i. Quicklime is heated with silica

   ii. Calcium nitrate is heated

   iii. Chlorine reacts with slaked lime

c) When is a cation highly polarising? Which alkali metal ion has the highest polarizing power?

Q30:

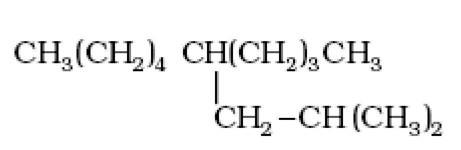
a) Why does benzene undergo electrophilic substitution reactions easily and nucleophilic substitutions with difficulty.

b) Write IUPAC names of the following compounds:

i.

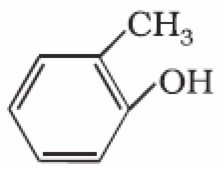
$CH_2{=}CH{-}C{\equiv}C{-}CH_3$

ii.



$$\begin{array}{l} CH_3(CH_2)_4\ CH(CH_2)_3CH_3 \\ \qquad\qquad\quad\ | \\ \qquad\qquad\quad CH_2-CH(CH_3)_2 \end{array}$$

iii.



c) Which of the two: trans-but-2-ene or trans-pent-2-ene is non polar?

OR

Q30:

a) Why is Wurtz reaction not preferred for the preparations of alkanes containing odd number of carbon atoms. Illustrate your answer by taking one example.

b) Write IUPAC names of the products obtained by the ozonolysis of the following compounds:

i. Pent-2-ene
ii. 3,4-Dimethylhept-3-ene
iii. 2-Ethylbut-1-ene