

GYAN BHARATI SCHOOL
Half yearly Examination (2015-16)
Class SS1
Subject – Chemistry

TIME ALLOWED: 3HRS

MM-70

GENERAL INSTRUCTIONS:

- All the questions are compulsory.
- Q. Nos.1-5 are very short questions, carrying one mark each.
- Q. Nos. 6 - 10 are short answer questions, carrying two marks each.
- Q. Nos. 11 - 22 are also short answer questions carrying 3 marks each.
- Q. No. 23 is value based question, carrying four marks.
- Q. No. 24-26 are long answer questions, carrying 5 marks each.
- Use log tables, if needed.

$h = 6.62 \times 10^{-34} \text{ Kg m}^2 \text{ s}^{-1}$, $R = 0.0821 \text{ Latm K}^{-1} \text{ mol}^{-1}$, $0.0831 \text{ Lbar K}^{-1} \text{ mol}^{-1}$,
 mass of electron = $9.1 \times 10^{-31} \text{ kg}$.

1. An element has atomic number 23. What is its group number and period in periodic table?
2. What is the oxidation number of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$?
3. If the enthalpy of the reaction is 43 kJ, $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g})$, what is the enthalpy of formation of NO?
4. The bond angle in ammonia is less than the normal tetrahedral angle. Why?
5. Which is more ΔH or ΔU for combustion of one mole of benzene?
6. a. Write the quantum numbers of 19th electron in Cr (atomic no. = 24)
 b. How many subshells and orbitals are present in fourth shell?
7. Arrange the following as indicated:
 - a. BaSO_4 , CaSO_4 and BeSO_4 --- increasing thermal stability.
 - b. $\text{Be}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, $\text{Sr}(\text{OH})_2$ and BaSO_4 ----increasing solubility in water. (1x2)

OR

7. Given below are the ionization potentials of three elements X, Y and Z

	X	Y	Z
IE1	403	549	1142
IE2	2640	1060	2080

Identify the element which is likely to be: a. Non-metal, b: alkaline earth metal?

Justify your answer

(1x2)

8. What types of interactions are present between following pairs of compounds:

- CCl_4 and I_2 .
- NaCl and H_2O .
- HCl and H_2O .
- He and Ne.

(1/2 x 4)

9. a. Fish don't grow in well in warm water and cold water. Why?
b. What are the diseases caused by the excess of nitrate ions in water?

(1x2)

10. Arrange the electrons represented by the following set of quantum numbers in decreasing order of energies:

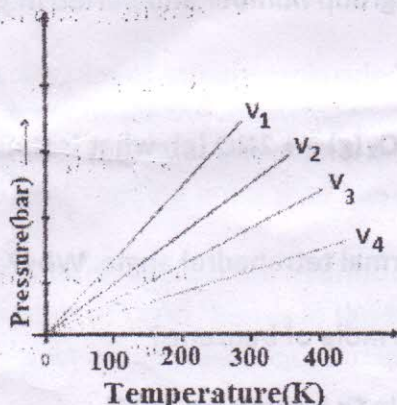
- $n = 4, l = 0, m = 0, s = +1/2$.
- $n = 3, l = 1, m = 1, s = -1/2$.
- $n = 3, l = 2, m = 0, s = -1/2$.
- $n = 3, l = 0, m = 0, s = -1/2$.

(1/2 x 4)

11. a. How will the hybridization and the shape change for the following reaction: $\text{AlCl}_3 + \text{Cl}^- \rightarrow \text{AlCl}_4^-$?
b. Using MO theory explain that He_2 molecule does not exist.

(1.5 x 2)

12. Consider the graph given below and answer the questions:



- Identify the law depicted in the diagram and state the law.
- Arrange V_1, V_2, V_3 and V_4 in increasing order and justify your answer.
- Give an application / example of the law.

(1x3)

13. a. Arrange A, B and C in order of decreasing oxidizing power, if their reduction potentials respectively are 0.79 V, 1.09 V and -0.31 V.

b. Out of Al and Silver vessel which would be more suitable for storing 1M HCl solution?

The reduction potentials are: $E^\circ \text{Al}^{3+} | \text{Al} = -1.66 \text{ V}$ and $E^\circ \text{Ag}^+ | \text{Ag} = 0.80 \text{ V}$. (1+2)

14. Give reasons for the following:

- F has lesser negative electron gain enthalpy than Cl although F is more electronegative.
- The first ionization enthalpy of oxygen is less than that of nitrogen.
- Size of Ga (31) is slightly less than that of Al(13).

(1x 3)

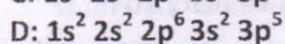
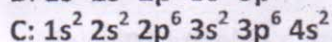
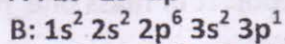
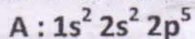
15. How do you differentiate between the following? (Write two differences each)

- σ and π bond.
- Atomic orbitals and hybrid orbitals.
- 2p and 3p orbitals.

(1x3)

16. A mixture is made by mixing 100 mL of 0.4 N H_2SO_4 , 50 mL of 0.5 N H_2SO_4 , 400 mL of 0.2N H_2SO_4 and enough water to make total volume upto One L. Calculate the molarity of the resulting solution.

17. Consider the configuration of four elements A, B, C and D and answer the questions given below:



- Which elements belong to same group?
- Which belong to same period?
- Which is smallest in size?
- Which has highest IE_1 ?
- Which has highest IE_2 ?
- What is the group number of element D?

(1/2 x 6)

18. 2.0 L flask at $25^\circ C$ contains 1.25 moles of Oxygen and 1.0 moles of carbon.

- What is the initial pressure of the gas?
- What will be the pressure when the reaction is complete?

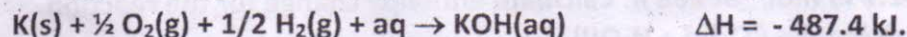
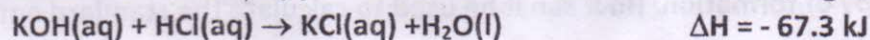
(3)

19. a. Sodium chloride solution gives a precipitate with silver nitrate, whereas CCl_4 does not. Why?

b. Al^{3+} is smaller in size than Na^+ , although both are isoelectronic. Why?

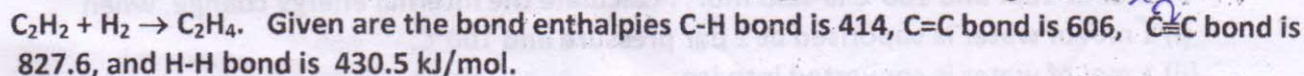
c. Which of the following is most basic among the following: LiOH, KOH and NaOH .Why? (1 x3)

20. Calculate the enthalpy of formation of KCl from the following data:



OR

20. Calculate the enthalpy of hydrogenation of C_2H_2 to C_2H_4 (g) in the following reaction



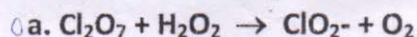
Handwritten calculations for question 20:

$$\begin{array}{r} 651.8 \\ 67.3 \\ \hline 719.1 \\ 18.4 \\ \hline 737.5 \end{array}$$

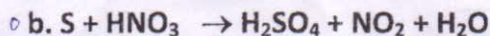
$$\begin{array}{r} 719.1 \\ 286.2 \\ \hline 432.9 \end{array}$$

$$\begin{array}{r} 432.9 \\ 430.5 \\ \hline 451.3 \end{array}$$

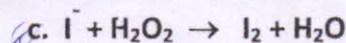
21. Balance the following reactions:



basic medium



acidic medium.



acidic medium

(1x3)

22. The density of 3M $\text{Al}(\text{OH})_3$ solution is 1.110 g/mL. Calculate the molarity and normality of this solution. (Atomic masses: H=1, Al=27, O=16 u)

$$27 + 3 + 48 \\ = 78$$

23. Scientists have claimed that chlorofluorocarbons and other gases emitted from the exhaust system of supersonic aero planes (CFCs) might be depleting the concentration of the ozone layer in the upper atmosphere.

- Name the gas emitted by the exhaust of the supersonic jet planes causing ozone depletion.
- What are the harmful effects of ozone depletion?
- Write a reaction to show how depletion of ozone layer takes place.
- Mention the values to be learnt from the above facts. (1x4)

24. a. Show that Heisenberg uncertainty principle is not significant for an object of mass one mg.

b. How many electrons in an atom can have $n = 4$, $s = +\frac{1}{2}$?

c. What will be the wavelength of a ball of mass 0.1 Kg moving with a velocity 10 m/s? (2+1+2)

OR

24. a. Using uncertainty principle, prove that an electron cannot exist in the nucleus. Assume radius of the nucleus = 10^{-15} m.

b. The ionization energy of H atom in ground state is $-x$ kJ/mol. Find the energy to excite this electron to third energy level.

c. Which of the atomic orbitals are non-directional? (2+2+1)

25. a. Draw orbital diagram of ethene molecule, explain the hybridization and the shape also.

b. How do you account for the following?

1. NF_3 is less polar than NH_3 although F is more electronegative than H.

2. MgO has higher melting point than Na_2O . (3+2)

OR

25. a. Using VSEPR theory, explain the hybridization and draw the structure of BrF_3 . (At no. Br = 35)

b. Calculate number of π and σ bonds in the following: $\text{CH}_3\text{-CH}(\text{CH}_3)\text{-CH}=\text{CH}-\text{C}\equiv\text{N}$

c. What is the effect of the following reaction on the bond enthalpy: $\text{C}_2 + e^- \rightarrow \text{C}_2^-$? (2+1+2)

26. a. Define standard enthalpy of formation. How can it be used to calculate the standard enthalpy of reaction?

b. The reaction of cyanamide, NH_2CN (s), with dioxygen was carried out in a bomb calorimeter, and ΔU was found to be -742.7 kJ mol^{-1} at 298 K. Calculate enthalpy change for the reaction.



OR

26. a. If water vapour is assumed to be a perfect gas, molar enthalpy change for vaporization of 1 mol of water at 1 bar and 100°C is 41 kJ mol^{-1} . Calculate the internal energy change, when

(i) 1 mol of water is vaporised at 1 bar pressure and 100°C .

(ii) 1 mol of water is converted into ice.

b. State a condition when $\Delta H = \Delta U$. Give an example.

c. Define standard enthalpy of combustion? (3+1+1)