ARMY PUBLIC SCHOOL, DHAULA KUAN

Animesh

HALF YEARLY EXAMINATION (2015-16)
CLASS – XI
SUBJECT – CHEMISTRY

Max. Time: 3 Hrs.   M.M.: 70

GENERAL INSTRUCTIONS;
- All questions are compulsory.
- Question no.1 to 5 are very short answer questions and carry 1 mark each.
- Question no. 6 to 10 are short answer questions and carry 2 marks each.
- Question no. 11 to 22 are also short answer questions and carry 3 marks each.
- Question no. 23 is a value based question carrying 4 marks. Answer accordingly.
- Question no.24 to 26 are long answer questions and carry 5 marks each.
- Use log tables if necessary.

1. Write the empirical formula for the following: (1)
    a. $C_{12}H_{22}O_{11}$ b. $C_6H_{12}O_6$

2. Write the electronic configuration of Cr^{3+} ion.(Z = 24) (1)

3. Which one of the atomic orbitals has higher energy? (1)
    a. n=3, l= 2, m= +1
    b. n= 4, l = 0, m = 0

4. Why is dipole moment of BF_3 zero? (1)

5. Name a suitable adsorbent in column chromatography. (1)

6. What are the two developments which led to the discovery of Quantum mechanical model of an atom? (2)

7. What is the number of photons of light with a wavelength of 4000 pm that provide 1 J of energy? (2)

8. a. Arrange the following ions in the order of increasing size: (2)
    Be^{2+}, Cl^-, S^{2-}, Na^+, Mg^{2+}, Br^-.
    b. Arrange the following elements in increasing order of metallic character:
    B, Al, Mg, and K.

9. a. Draw the Lewis structure for CO (2)
    b. Calculate the formal charge on Carbon atom.
                        OR
    Draw the resonating structures for the following:
    a. SO_3 b. NO_2^-

10. Name the method of purification for the following pairs of compounds: (2)
    a. o-Nitrophenol and p-Nitrophenol   b. Camphor and Salt
    c. Ether(b.p. 353K) and Toluene(b.p. 384K)   d. components of Black ink.

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11. Electrons are emitted with zero velocity from a metal surface when it is exposed to a radiation of wavelength 6800 Å. Calculate the threshold frequency and work function of the metal. (3)

[Given h = 6.626×10^{-34} Js]

12. Account for the following: (3)
    a. Bond angle in NH_3 is more than in H_2O.
    b. Shape of NH_3 is molecule is pyramidal.
    c. Axial bonds are longer than the equatorial bonds in case of PCl_5 molecule.

13. An organic compound has the following percentage composition: Carbon: 57.8%, Hydrogen: 3.6% and oxygen: 39.6%. Vapour density of the compound was found to be 83. Find the molecular formula. [C=12 u, H=1u, O=16u] [Molar Mass = 2 X Vapour Density) (3)

OR

1 M solution of $NaNO_3$ has a density 1.25 g/cm^3. Calculate the molality of the solution. [Na =23u, N =14u, O= 16u]

14. a. Which hybrid orbitals are used by Carbon atoms in the following molecules: (2+1)
    i. C_2H_4 ii. CH_3COOH
    b. Use Lewis symbols to show electron transfer between K and S to form cation and anion.

15. Commercially available sulphuric acid contains 93% acid by mass and has a density of 1.84 g/cm^3
    a. Calculate the molarity of the solution. [At mass of S =32u]
    b. What volume of concentrated acid is required to prepare 2.5 L of 0.5 M sulphuric acid? (3)

16. An element with mass number 81 contains 31.7% more neutrons than protons. Assign the atomic symbol of that element. (3)

17. a. The first I.E., second I.E. (kJ/mol) and electron gain enthalpy (E.G. in kJ/mol) of a few elements are given below :- (2+1)

Elements	I.E. $_1$	I.E.$_2$	E.G.
I	520	7200	-60
II	2372	5251	+48
III	738	1450	-40
IV	1618	3374	-328

Identify the elements which is likely to be:-   a. The most reactive non-metal IV
                                                b. An alkali-metal I
                                                c. An alkaline-earth metal III
                                                d. Noble gas. II
    b. What is the difference between Electron gain enthalpy and Electronegativity?

18. Discuss the shape of the following molecules on the basis of VSEPR theory: (3)
    a. ClF_3 b. PCl_5 c. BCl_3

19. a. How much *MgS* can be obtained from 2 g of Magnesium and 2 g of sulphur by the reaction (3)

$$Mg + S \longrightarrow MgS$$

b. Which is the limiting reagent?

c. What is the amount of the unreacted reactant? [Atomic Mass Mg=24 u, S=32 u]

20. a. What is the lowest value of n that allows g-orbital to exist? (3)

b. An atom of an element contains 29 electrons and 35 neutrons. Deduce

   i. the number of protons and mass number of the element.

   ii. the electronic configuration of the element.

21. a. Describe the change in hybridization of the Al atom in the following reaction: (2+1)

$AlCl_3 + Cl^- \rightarrow AlCl_4^-$

b. Considering x-axis as internuclear axis which out of the following will not form a sigma bond

i. 1s and 1s, ii 1s and 2p$_x$, iii. 2p$_y$ and 2p$_y$, iv. 1s and 2s

22. Assign the position of the element in the periodic table having outer electronic configuration:- (3)

   a. ns^2np^4 for n=3, b. $(n-1)d\ ^2ns^2$ for n=4, c. $(n-2)f^7(n-1)\ d^1ns^2$ for n = 6.

23. Mr. Chawla has soap industry. He separates glycerol from spent lye in soap industry by using (4) distillation under reduced pressure. He uses glycerol in transparent soaps, cold creams and moisturizes. Glycerol can also be used to make dynamites.

   a. Why is glycerol obtained by distillation under reduced pressure?

   b. Distinguish between steam and vacuum distillation.

   c. What values are possessed by Mr. Chawla?

24. a. Point out two main postulates of the Bohr model of atom. (1+2+2)

   b. Using s, p, d, f notations designate the orbitals with the following quantum numbers:

   i. n=1, l=0 ii. n=3, l=1 iii. n=4, l=2 iv. n=4, l=3

   c. Table tennis ball has a mass 10 g and a speed of 90 m/s. If the speed can be measured within an accuracy of 4%, what will be the uncertainty in speed and position?

OR

a. State Pauli's exclusion principle.

b. Write the electronic configuration of Co^{+3} and find out the number of unpaired electrons present in it. [At. No. of Co =27]

c. What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition n=4 to n=2 of He^+ spectrum?

25. a. Account for the following:- (2+1+2)

The increasing order of reactivity among group 1 elements is Li< Na< K<Rb< Cs, whereas that among group 17 elements is F>Cl>Br>I.

b. Arrange the elements N, P, O and S in order of increasing non- metallic character.

c. Write the IUPAC name and symbol for the element 120. Predict its Group and period number.

OR

a. State modern periodic law. How do you justify the position of isotopes in modern periodic table?

b. Write the IUPAC name and symbol for the element 119.

c. Explain briefly how does electronegativity vary
   i. down the group
   ii. across the period from left to right.

26. a. How do you express bond strength in terms of bond order?   (1+2+2)
    b. Explain why BeH_2 molecule has a zero dipole moment, although the Be-H bonds are polar.
    c. Explain the structure of C_2H_2 with orbital diagram showing sigma and pi bond formation.

OR

a. Define hybridization.
b. Differentiate between σ and π bonds (two points).
c. Draw the diagram to show the formation of σ and π bonds in C_2H_4 molecule.

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