CHEMISTRY (043)

CLASS: 11   MARKS: 70

GENERAL INSTR UCTIONS:

Read the following instructions carefully.

éa) There are 33 questions in this question paper with internal choice.

(b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.

(c) SECTION B consists of5 short answer questions carrying 2

marks each. Id) SECTION C consists of 7 short answer

questions carrying 3 marks each.

(e) SECTION D consists of2 case - based questions carrying 4 marks each.

(f) SECTION E consists of3 long answer questions carrying 5

marks each.i'g) All questions are compulsory.

SECTION A

1.   The spectral line in the hydrogen spectrum obtained when the electron jumps from n = 7 to   1

        n = 2 energy level belongs to

             (a) Lyman series   (b) Balmer series   (c) Paschen series (d) Pfund series

2.   An element with atomic number 27 belongs to which block?   1

             (a) s block   (b) p block   (c) d block   (d) f block

3.   The number of radial nodes possible for 3d orbital is   1

             (a) 3   (b) 2   (c) 1   (d) 0

4.   Two electrons occupying in the same orbital can be distinguished with the help of
        l

             (a) Azimuthal quantum numbers   (b) Spin quantum numbers

             (c) Principal quantum numbers   (d) Magnetic quantum numbers

        5.Which of the following oxides are amphoteric in nature?

                       A) NO_2 (b) Al_2O (c)SO_2 d) CO_2 1

(b) 6.T he unpaired electrons are there in Ni^{2+}? (Atomic number   of Ni = 28)

(a) 0   (b) 2   (c) 4   (d) 6

7.Identify the smallest ion among the following:

A)Mg 2+ b)Al3+ c)Na+   d)K+

8.Consider the following statementsts:

(i) NF3 molecule has a trigonal planar structure.

(ii) The hybridized orbitals are always equivalent in energy and shape.

(iii) Cl*, Ar, Ca^{2+} are isoelectronic species.

(iv) Dipole moment of H2S is higher than that of water

molecule. Choose the correct answer from the

options given below:

(a) (iii) and (iv) are correct

(b) (i) and (ii) are correct

(c) (ii) and (iii) are correct

(d) (i) and (iv) are correct

9..The radius of which of the following orbit is same as that of the first obit

of Bohr's of hydrogen   ?

(a) He+ (n = 2)   (b) $Li+^2$ (n 2)

(c) Li^2+ (n=3)   (d) $Be^{3"}$ (n   2)

11.The compound with no lone pair of electrons on the central atom is   1

(c) NF3   (b) HzO   (c) PF5   (d) SF4

12.   What will be the geometry of the compound having three bond pairs and
one lone pair of electrons?

A)Trigona1 planar   (b) Pyramidal

(c) Tetrahedral   (d) Trigonal bipyramidal

In the following questions (Q.No 13 to 16) consist of two statements

─ Assertion (A) and Reason (R) .Choose the correct answer out of

the following choices.

(a) Assertion and reason both are correct and reason is the correct explanation for
assertion.

(b) Assertion and reason both are correct but reason is not the correct

explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(e) Both assertion and reason are wrong statement.

13. **Assertion:** P < S < F < Cl is increasing order of electron gain enthalpy   1

   Reason: Gaining of second electron is endothermic process.

14. **Assertion: 'F** represent orbital wave function.   1

   Reason: $'F^2$ is probability density of finding an electron at a particular point.

15. **Assertion:** Ionic compound have high melting and boiling point.   1

   Reason: A large amount of energy is needed to overcome the strong

   interionic electrostatic attractive forces.

   Assertion: Atomic radius decreases along the period.   1

   Reason: In a period, effective nuclear charge decreases as we move from

   left to right in a periodic table.

SECTION B

16. Calculate the formal charge on the atoms in nitrite ion (NO_2).   2

   17. The first (fi;H i) and second (A;H2) ionization enthalpies (KJ/mol) and electron gain enthalpies   2

   (egH) Of a few elements are shown below:

Elements	A Hi	fi iH2	AegH
A	620	7400	-70
B	519	3152	-58
c	1781	3475	-338
D	1108	1956	-299
E	2472	5345	+58
F	838	1541	-50

Which of these elements is likely to be

(i) the least reactive element

(ii) the most reactive non-metal

(iii) the most reactive metal

(iv) the metal that forms a stable binary halide of the formula MX2 (X- halogen)

18. Explain any two limitations of octet rule with an example each.   2

19 The reactivity of halogen decreases down the group but of alkali metals increases down the group. Why?

19.   Calculate the de Broglie wavelength associated with an electron, whose velocity in Bohrs first   2

orbit is 2.19×10^6 mls.

(h — $6.626 \times 10^{'4}$J s, mass of electron = 9.1×10^{31}kg)

OR

Which of the following sets of quantum numbers represent an impossible

arrangement. Justify your answer.

(a) n 1, 1 = 0, mi 0, mv = -'•

(b) n 1, 1 = 1, mi= 0, mv= '' 2

(c) n 2, 1 1, ml = 0, ms = +/2

(d) n 0, 1 1, mi = 0, mv = + 2

SECTION C

20. (a) Write the electronic configuration of $Cr^{3}+$. (Atomic number of Cr = 24)   3

(b) The orbital electronic configuration of an element X is given below.

Identify the rule violated in the below case? State the rule.

1s2 2s1 2p3
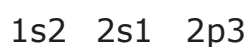
21. Compare the satbility of O2,O2+ usng MO theory.

22. (a) Out of 6s and 4f orbitals, which has lower energy and why?   3

(b) What is the oxidation state and covalency of Al in [AlCl(H2)5]^2+ 2

OR

(i) Be in the second period of the periodic table has slightly higher first

ionization enthalpy than B. Justify the statement

(ii) Define electronegativity.

23.(a) Explain why BeH2 molecule has a zero-dipole moment although, the Be-H bonds are polar?

(b) All carbon to oxygen bonds in CO_3^{2} are equivalent. Explain.

24. Calculate the wave number and wavelength of the radiation emitted when an electron in ahydrogen atom undergoes a transition from 4'h energy level to 2nd energy level.

25.On the basis of hybridization discuss the structure in case of the following species: 3

(d) PCls   (b) SF6

26. Give reason: 3

(i) Electron gain enthalpy of fluorine is less negative than that of chlorine.

(ii) Oxygen has lower ionization enthalpy than Nitrogen.

(iii) Na and Mg+ have same number of electrons but removal of electron

from Mg" requiremore energy.

27. If an electron is moving with a velocity 600m/s which is accurate up to 0.005%, calculate the uncertainty in its position.

(h = 6.626 x 10*34J s, mass of electron = 9.1 x 10 3' kg)

28. Explain the following.

A)Electron gain enthalpy of noble gas is positive.

B)The radius of 0 '2 is greater than that of O atom.

C)Na and Mg+ have same number of electrons but removal of electron

from Mg+ requiremore energy.

SECTION D

29.When Schrodinger wave equation was solved for hydrogen atom, the solution gives the possible energy states that an electron can occupy. These values of energy are called eigen values. The wave functions and the corresponding energy states are characterized by set of numbers called quantum numbers. Quantum numbers are obtained from the solution of Schrodinger wave equation. These four sets of quantum numbers give us complete information, ie location, energy, the type of orbital occupied and orientation of orbital etc. about all the electrons present in an atom.

(e) What would be the colour of light emitted from an excited hydrogen atom, when an electron jumps from n = 3 to n = 2?

(f) Draw the shape of 2p and $3d_{x^2-y^2}$ Orbital.

(g) Calculate the energy of photons of radiation whose frequency is 5×10^{14} Hz.

OR

What is the difference in the angular momentum of an electron in 3p and 4p orbitals?

30..The chemical force which keeps the atoms in any molecules together is commonly described 4as a chemical bond. There are different types of chemical bonds- Ionic bond, covalent bond and coordinate bond. The octet rule is very useful for describing bonding in a large number of compounds. Depending upon the chemical nature of the combining element, there is polar covalent bond and non-polar covalent bond. In 1940, Sidgwick and Powell proposed a simple theory based on repulsive interaction of the electron pairs in the valence shell of the atoms, which help to predict the shape of the molecule.

(h) Write the electron dot structure of HNO3.

(i) What is the hybridization of each carbon atom in $CHP= CH — CH \quad CH2$

(j) Define lattice enthalpy. How is it related to stability of an ionic compound?

OR

Out of sigma bond and pi bond, which one is stronger and why?

SECTION E

31..Attempt any five of the following: 5

(i) Which element shows diagonal relationship with Magnesium and why?

(ii) Write the general electronic configuration of d block elements.

(iii) Arrange in Increasing order of ionic radii: N^o ,0^{2} , F , Na+ , Mg^{2+} , Al +

(iv) Predict the period and group of the element in the periodic table satisfying the electronic configuration $(n-1) d^l ns^2$ for n=4.

(v) Which group of elements in the periodic table are known as Chalcogens?

(vi) Arrange the elements F, Cl, O, N in the correct order of their reactivity in terms of oxidising property.

(vii) What would be the IUPAC name and symbol for the element with atomic number 119?

32..(a) Why is dipole moment of HF (1.98D) higher than that of HCl (1.03D)?   5

(b) Out of N_2 and O_2, which has greater bond dissociation enthalpy and why?

(c) Discuss the bonding in ethene (C_2H_4) molecule on the basis of hybridization.

OR

(i) Explain the formation of hydrogen molecule on the basis of valence bond theory.

(ii) Give the hybridization and shape of Bris?

(iii) Although geometries of NH_3 and H_2O molecules are distorted tetrahedral, bond angle in water is less than that of NH_3. Discuss.

33..(a) Two particles A and B are in motion. If the momentum of B is half of that of A and if the wavelength of A is $5 \times 10^{o'}$ nm, what is the wavelength of B?

b)Write any two differences between orbit and orbital.

C)Define frequency.

OR

(i) The energy associated with Bohr's first orbital of hydrogen atom is $2.18 \times 10^{o1'}$J /atom. What is the energy associated with fourth orbital of He+ ion?

(ii) Which principle goes against the concepts of Bohrs fixed orbits? State the principle.

(iii) Define degenerate orbitals.

****END **OF THE QUESTION** PAPER****

why?