

Chemistry Question Bank

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ANSWERS TO SHORT ANSWER TYPE QUESTIONS

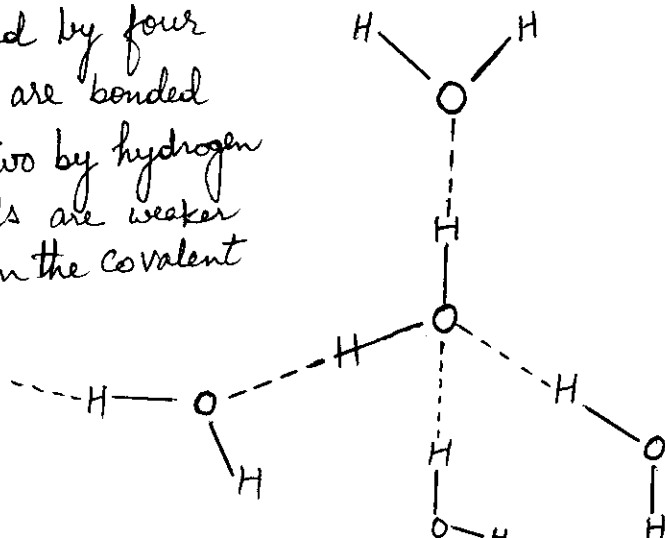
(Questions are to be seen in Question Bank given earlier)

Ans.1. This can be explained on the basis of hydrogen bonding. As the temperature is raised hydrogen bond in ice starts breaking, thereby bringing the water molecules closer and closer together. This leads to contraction. Above 4°C the normal expansion as in the case of other substances takes place.

Ans.2. Steam distillation depends upon a substance having an appreciable vapour pressure at the boiling point of water; by lowering the vapour pressure, intermolecular H-bonding inhibits steam distillation of m- and p-nitrophenol. Only o-nitrophenol is readily steam-distillable, because - NO_2 and -OH groups are located exactly right for the formation of a H -bond within a single molecule. Therefore o-isomer does not have the low volatility of an associated liquid.

Ans.3. In ice the hydrogen bonding between water molecule is more extensive than in liquid water. The molecules are tetrahedrally oriented with respect to one another.

Oxygen atom is surrounded by four hydrogen atoms, two of these are bonded covalently and the other two by hydrogen bonds. The hydrogen bonds are weaker and hence longer than the covalent bonds and thus an open cage like structure is formed. As ice melts



a large number of hydrogen bonds are broken and the molecules move into these open spaces and come closer thereby increasing the density of water.

Ans. 4

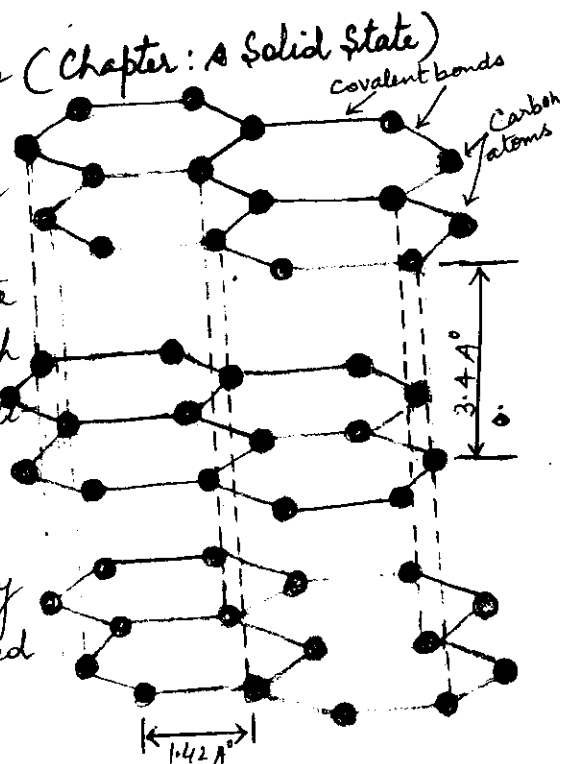
According to MOT, a molecule is considered to be quite different from the constituent atoms. All the electrons belonging to the atoms constituting a molecule are considered to be moving along the entire molecule under the influence of all the nuclei. Thus, a molecule is supposed to have orbitals of varying energy levels in the same way as an isolated atom has. These orbitals are called 'molecular orbitals'.

Ans. 5

B.O. in $H_2 = \frac{1}{2}(2-0) = 1$ The electronic configuration is $\sigma 1s^2$
 B.O. in $H_2^+ = \frac{1}{2}(1-0) = \frac{1}{2}$ The electronic configuration $\sigma 1s^1$
 B.O. in $H_2^- = \frac{1}{2}(2-1) = \frac{1}{2}$ The electronic configuration $\sigma 1s^2 \sigma^* 1s^1$
~~Hence paramagnetic~~ H_2^+ and H_2^- have unpaired electrons
 hence they are paramagnetic.

Ans. 6. Refer your Text Book for the answer (Chapter: A Solid State)

Ans. 7. Graphite is a good conductor of heat and electricity. This can be understood by looking at the loosely bound fourth electron of each carbon atom. Because of the delocalization of one of the outer electrons of each atom to form a π -cloud, graphite conducts electricity, but only in the plane of each covalently bonded sheet. The electron is relatively



Free to travel and move about in the crystal. The electrons are carriers of electricity (and heat) in a crystal. Hence it is clear why graphite is good conductor of electricity (and heat).

Ans 8. Refer your Text Book. (Chapter: Solid State)

Ans 9. Refer your Text Book. (Chapter: Chemical Kinetics)

Ans 10. Refer your Text Book. (Chapter: Phase Equilibria)

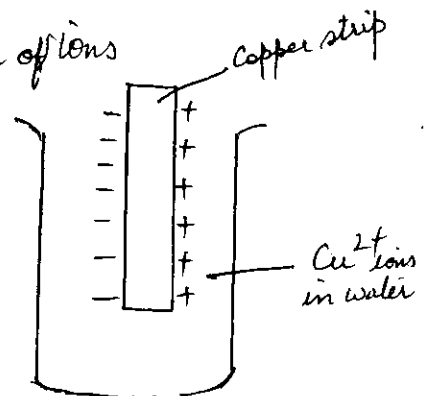
Ans 11. A salt bridge is a U-shaped tube containing concentrated solution of an inert electrolyte like KCl , KNO_3 , K_2SO_4 etc. The functions of salt bridge are to

- (i) prevent the intermixing of the solutions of half cells
- (ii) Complete the circuits
- (iii) maintain electrical neutrality of the two electrolyte solutions.

Ans 12.

A metal rod or plate in contact with its own ions is called electrode. When a metal is in contact with the solution of its own ions, it can undergo oxidation or reduction. The tendency of an electrode to lose or gain electrons is called electrode potential. Since each electrode represents a half cell, therefore, electrode potential is also called potential for half cell. The magnitude of electrode potential depends upon:

- (a) Nature of metal ions
- (b) Concentration of ions
- (c) Temperature



Ans 13.

The standard reduction potential for

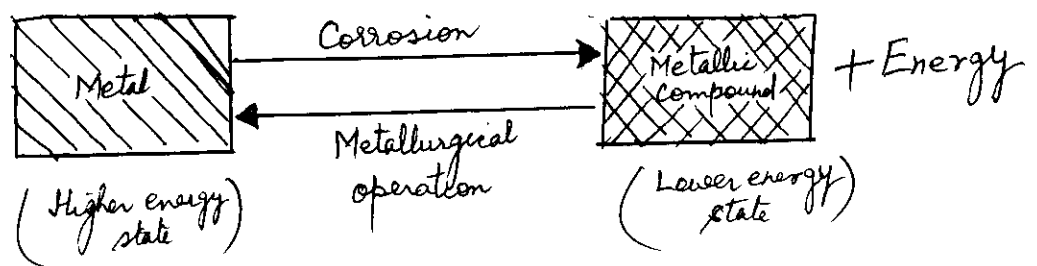
$$\text{Cu}^{2+} + 2\text{e}^{-} \longrightarrow \text{Cu}$$

is $+0.34$ as compared to standard hydrogen electrode for which it is 0.0V . Hence copper is a poorer reducing agent than hydrogen. The copper will only dissolve in acids which contain oxidising anions like NO_3^{-} , since $E^{\circ}_{\text{NO}_3^{-}/\text{NO}}$ is larger than $E^{\circ}_{\text{Cu}^{2+}/\text{Cu}}$, NO_3^{-} can be reduced by Cu.

Ans. 14. Refer your Text Book. (Chapter: Corrosion)

Ans 15.

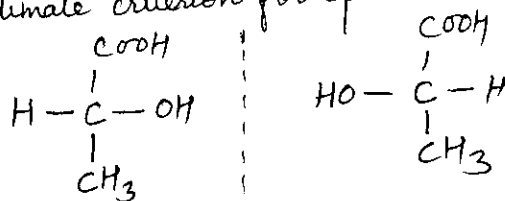
Metals are reduced to their metallic states from their ores, during their extraction processes. During extraction of metals, considerable amounts of energy is required. Consequently, isolated pure metals can be regarded in excited state (a higher energy state) than their corresponding ores, and they have a natural tendency to revert back to combined state (or lower energy state). Hence, when metals are put into use, in various forms, they are exposed to environment and their conversion into more stable metal compounds starts. In other words the corrosion starts.



Ans. 16. Refer your Text Book. (Topic: Fundamentals of Reaction Mechanism)

Ans. 17. Refer your Text Book (Topic: Same as for 16)

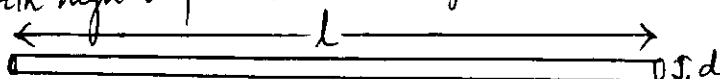
Ans. 18. The property of non superimposability of an object on its mirror image is called chirality. If a molecule is not superimposable on its mirror image, it is chiral. If it is superimposable on its mirror image, it is achiral. Chirality is ultimate criterion for optical activity of an organic compound. e.g.



Ans. 19. See your Text Book (Chapter: Polymers)

Ans. 20. Refer your Text Book (Chapter: Polymers)

Ans. 21. Fiber — "Fibers are polymers having thread-like structure with high aspect ratio (length to diameter ratio)"



$$\text{Aspect Ratio} = \frac{\text{Length}}{\text{Diameter}} = \frac{l}{d}$$

In case of fibers the minimum $l:d$ is 10:1

They have linear, unbranched symmetrical chains aligned in the direction of length giving rise to higher tensile strength and crystallinity.

Fibers can be classified as (a) Natural fibers (b) Artificial fibers

Fabrics are knitted or woven form of Yarns which in turn is formed by spinning of a number of fibers.

Ans. 22

These polymers have extensive conjugation in the backbone which is responsible for conductance. These are further of two types:

(a) Conducting Polymers having conjugated π -electrons in the backbone-

Such polymers contain conjugated π -electrons in the backbone which increases their conductivity to a large extent. This is because, overlapping of conjugated π -electrons over the entire backbone results in the formation of valence bands as well as conduction bands which extends over the entire polymer molecule. The valence band and the conduction bands are separated by a significant band gap. Thus, electrical conduction could occur only after thermal or photochemical activation of electrons to give them sufficient energy to jump the gap and reach into the lower levels of the conduction band.

(b) Doped Conducting Polymers — In comparison to conventional polymers, the conducting polymers of type (a) can be easily oxidized or reduced as they have low ionization potentials and high electron ~~densities~~ affinities. Their conductivities can be increased by creating positive or negative charge on polymer backbone by oxidation or reduction. By analogy with semiconductor technology, it is referred to as Doping and is of two types (i) p-doping (ii) n-doping.

Ans. 23

The problems with traditional, non biodegradable polymers are: (i) Solid waste problems, particularly with regard to decreasing availability of landfills
(ii) Litter problems
(iii) Entrapment or ingenious hazards to marine life

Biodegradable polymers are a particularly attractive ~~option~~ option for addressing the solid waste and marine pollution concerns.

Ans. 24.

An organometallic compound is generally a compound which possesses a metal-carbon bond.

For example: $\text{CH}_3\text{-Mg-I}$, $\text{Zn} \begin{cases} \text{C}_2\text{H}_5 \\ \text{C}_2\text{H}_5 \end{cases}$

Organometallic compounds are excellent catalysts which play a major role in the production pharmaceuticals, agrichemicals, polymers and semiconductors.

It may be noted that all the compounds containing carbon and a metal atom are not necessarily organometallic compounds. The term 'organo-metallic' is reserved to the compounds which contain at least one metal-carbon bond.

Ans. 25. Chemical analysis is carried out in two ways

- Qualitative analysis
- Quantitative analysis

Qualitative analysis is the detection of ions or radicals in an inorganic salt whereas, quantitative analysis involves the determination of quantity of a particular component present in a substance. In other words qualitative analysis involves a method to find out what the substance is made up of, whereas quantitative analysis involves a method to find out how much is present. Quantitative analysis can be carried out in two ways:

- (i) Gravimetric analysis
- (ii) Volumetric analysis

Ans 26.

ACIDIMETRY- To find the strength of an unknown acid with the help of a known base is known as acidimetry.

ALKALIMETRY- To find the strength of an unknown base with the help of known acid is known as alkalimetry.

Ans-27

Calorific value of a fuel is defined as the total quantity of heat liberated when a unit mass of a fuel is burnt completely.

It is one of the most important characteristics of a fuel. Calorific value judges the efficiency of fuel.

Ans. 28.

Actually, the region from $4000-1500\text{ cm}^{-1}$ in an infra-red spectrum, is useful for the identification of functional groups.

This region shows the absorption due to stretching mode, whereas, the region below 1500 cm^{-1} contains number of vibrations caused by bending and stretching vibrations. As there are many more bending vibrations in a molecule than stretching vibrations, this region shows a number of vibrations which makes it complex. However, each organic compound has its own unique absorption pattern in this region. This part of spectrum is therefore known as 'Finger Print Region'.