AIEEE Model Test Paper (SOLVED)

1) Which of the following compounds containing chiral carbons is optically inactive?

a) (R)-Lactic acid

b) (R,R)-Tartaric acid

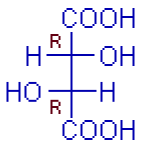
c) (R,S)-Tartaric acid

d) Glycine

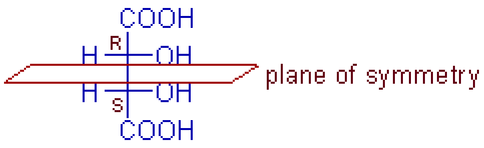
Solution:

The (R,R)-Tartaric acid is optically active as it has no plane of symmetry.

But the (R,S)-Tartaric acid, which is also known as meso-Tartaric acid is optically **inactive** even as there are chiral centres. It is because, the molecule possesses plane of symmetry. Hence its mirror image is superimposable on it.

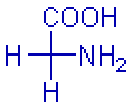


(2R,3R)-Tartaric acid



(2R,3S)-Tartaric acid

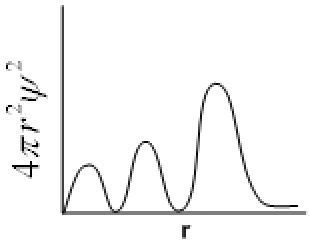
Glycine is also optically inactive but it has no chiral carbon.



Glycine

2) Which of the following radial distribution graphs corresponds to orbital with n = 3, *l* = 2 ?

a)



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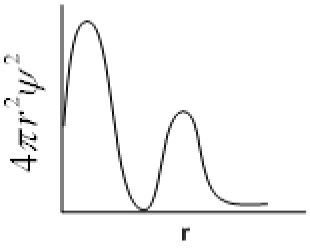
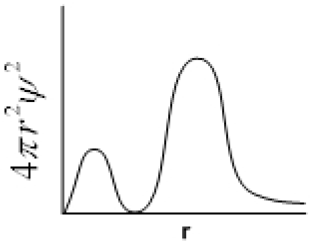
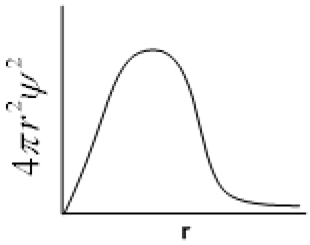


c)



d)



Solution:

The troughs in the above graphs represent the radial nodes. For a given orbital, the number of radial nodes = n - *l* - 1

For the orbital n = 3 and *l* = 2, the number of radial nodes = 3 - 2 - 1 = 0

The radial probability distribution curve which represents correctly this orbital is **d)**.

3) Complete coagulation of one litre of an aquasol requires 0.001 equivalents of Na_3PO_4. Whereas the coagulation of the same requires 0.1 equivalents of $AlCl_3$. During electrophoresis of this colloidal solution, the sol particles will migrate towards:

a) anode

b) cathode

c) both anode and cathode

d) do not migrate

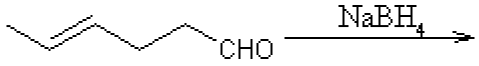
Solution:

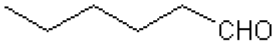
When electrolytes are added to the colloids (especially the lyophobic sols), the ions in them neutralize the charge on the sol particles and thus by bringing the coagulation of that colloid. The ions with opposite charge as that on the sol particles are required for the coagulation.

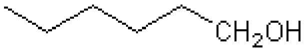
According to Hardy-Schutlz rule, the ability to coagulate a colloid by an electrolyte increases with increase in the charge on the ions supplied by the electrolyte. Hence greater the ability of an electrolyte to coagulate, lesser is the amount of it required for coagulation.

The data given in the question suggests that Na_3PO_4 is more efficient in bringing coagulation of the given aquasol. The phosphate ion (PO_4^{3-}) has greater charge than the chloride ions in $AlCl_3$. Hence the sol particles must be positively charged. Hence they will migrate towards cathode.

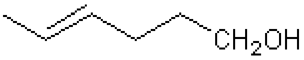
4) The major product formed in the following reaction is:



a) 

b) 

c) 

d) 

Solution:

$NaBH_4$ can only reduce the polar double bonds (like C=O). It cannot reduce non polar double bonds (C=C). Hence the correct option is d).

The reaction is initiated by the attack of hydride ion (H^-) on the carbonyl carbon. $LiAlH_4$ also behaves in the same way.

5) Dioxygen is paramagnetic because:

a) there are two unpaired electrons in doubly degenerate -LUMO’s.

b) there are two unpaired electrons in doubly degenerate -HOMO’s.

c) there are two unpaired electron in a ! -LUMO.

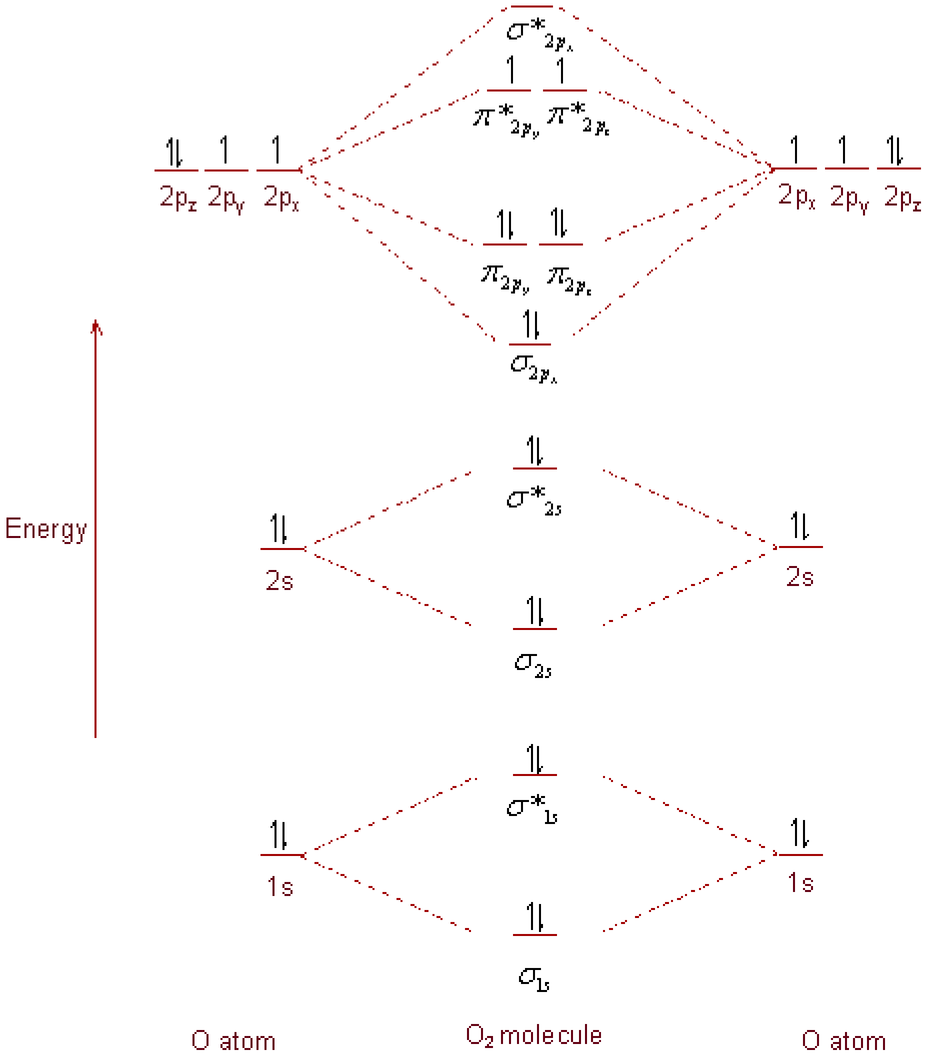
d) Dioxygen is not paramagnetic and hence there are no unpaired electrons.

Solution:

Following Molecular Orbital Energy Diagram for dioxygen molecule clearly shows there are unpaired electrons in the -HOMO's.

HOMO = Highest Occupied Molecular Orbital

LUMO = Lowest Unoccupied Molecular Orbital



6) Austenite form of iron has FCC crystal lattice structure, whereas its alpha form has BCC crystal lattice structure. Assuming closest packed arrangement of iron atoms, what will be the ratio of density of Austenite to that of alpha iron?

a) 1 : 1.088
b) 1 : 1.837
c) 3.674 : 1
d) 1.088 : 1

Solution:

density (") = $\frac{Zm}{a^3}$

Where
Z = number of atoms in a unit cell
m = mass of one atom
a = edge length of unitcell

The relations between radius, r of the atom and the edge length of the unitcell are given below:
For FCC: a = 4r/1.414
For BCC: a = 4r/1.732

The number of atoms in different types of unitcells is given below:
For FCC: Z = 4
For BCC: Z = 2

Therefore the ratio of density of Austenite to that of alpha iron can be caluculated as:

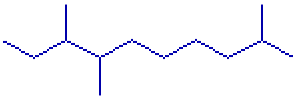
$$\frac{\text{"}_{FCC}}{\text{"}_{BCC}} = \frac{[Z/a^3]_{FCC}}{[Z/a^3]_{BCC}} = \frac{4 \text{ x } 1.414^3}{2 \text{ x } 1.732^3} = \frac{2 \text{ x } 2.827}{5.1956} = \frac{1.088}{1}$$

7) The anti-histamine which reduces the secretion of pepsin and hydrochloric acid in stomach is

a) Pencillin
b) Terfenadine (Seldane)
c) Brompheneramine
d) Cimetidine

Solution:

a) Pencillin - An antibiotic.
b) Terfenadine (Seldane) - Antihistamine used to treat allergy. It is a non sedating H_1 receptor antagonist.
c) Brompheneramine - Antihistamine used to treat cold and allergic rhinitis. It is also H_1 receptor antagonist.
d) Cimetidine - Antihistamine used treat acidity and ulcers in stomach. It is a H_2 receptor antagonist. It reduces the secretion of pepsin and HCl in stomach. Femotidine, Ranitidine etc., are the other examples.

8) The correct IUPAC name of  **is:**

a) 3,4,9-Trimethyldecane
b) 2-Ethyl-3,7-dimethylnonane
c) 2,7,8-Trimethyldecane
d) 3,4,9-Trimethylnonane

Solution:

According to the **Rule of First Point of Difference**, when series of locants containing the same number of terms are compared term by term, that series is "lowest" which contains the lowest number on the occasion of the first difference.
Hence 2,7,8-Trimethyldecane is the correct option.

9) A diamagnetic compound of a metal ‘M’, which belongs to Nickel group,with the formula - $M(NO_2)(CN)(NH_3)(CO)$ does not show electrical conductivity in aqueous solution. Which of the following is the incorrect statement about this compound?

a) The metal contains $(n-1)d^8$ configuration.
b) The metal undergoes dsp^2 hybridisation.
c) In this complex, pairing energy(P) is less than crystal field splitting energy(#).
d) The complex exhibits optical activity.

Solution:

As this complex is diamagnetic and the ligands are of strong field type, the hybridization must be dsp^2.
Hence the geometry is square planar and optical activity is not possible for this geometry.
But geometrical isomers are possible.
Optical activity is only possible with tetrahedral geometry when there are four different ligands attached to the central metal atom.

10) The percent ionization of a 0.20 M acetylsalicylic acid solution in the stomach where the pH is 1.00 is (K_a of acetylsalicylic acid = 3.0×10^{-4})

a) 3.8%
b) 0.30%
c) 0.03%
d) 0.0003%

Solution:

Let AcOH = acetylsalicylic acid

$= degree of dissciation
c = initial concentration of AcOH = 0.2 M
K_a = Acid dissiciation constant of AcOH = 3 x 10^{-4}
p^H = 1; Therefore H^+ = 0.1 M (due to acid in stomach)
The initial and equilibrium concentrations (in mol L^{-1}) due to following equilibrium:

$$AcOH \longrightarrow AcO^- + H^+$$

init conc	c	0	0
equil. conc	c-cα	cα	cα+ 0.1

Since total con. of H^+ at equilibrium = $[H^+]_{tot}$ = c + 0.1
From the law of mass action

$$K_a = \frac{c\alpha \times (c\alpha+0.1)}{c-c\alpha} = c\alpha^2 + 0.1\alpha \quad (\because c-c\alpha \approx c \text{ as } \alpha \text{ is negligible for weak acids})$$

$$c\alpha^2 + 0.1\alpha - K_a = 0$$

by substituting the values

$$0.2\alpha^2 + 0.1\alpha - (3 \times 10^{-4}) = 0$$

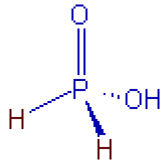
By solving above quadratic equation, $= 0.003018
% ionization = 0.003018 x 100 = 0.3018%

11) Phosphorus reacts with caustic soda by giving a salt ‘X’ and a poisonous gas ‘Y’. The number of P-H bonds respectively present in ‘X’ and ‘Y’ are,

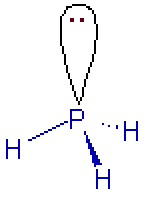
a) 1 & 3
b) 2 & 2
c) 2 & 1
d) 2 & 3

Solution:

The equation for the reaction is : $P_4 + 3NaOH + 3H_2O$ -----------> $3NaH_2PO_2 + PH_3$
Hence X = NaH_2PO_2 and Y = PH_3
NaH_2PO_2 is the salt of hypophosphorous acid.

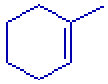
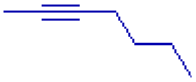


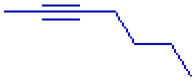
Hypophosphorus acid

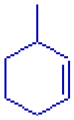
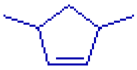


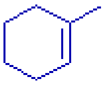
Phosphine

12) Two hydrocarbons ‘X’ and ‘Y’, of same molecular formula C_7H_{12}, gave 6-Oxoheptanal and Heptane-2,3-dione respectively upon ozonolysis. The ‘X’ and ‘Y’ are respectively,

a)  and 

b)  and 

c)  and 

d)  and 

Solution:

* The unsaturation index for C_7H_{12} is 2. Hence X and Y may be acyclic compounds with a triple bond or

alicyclic compounds with a double bond.

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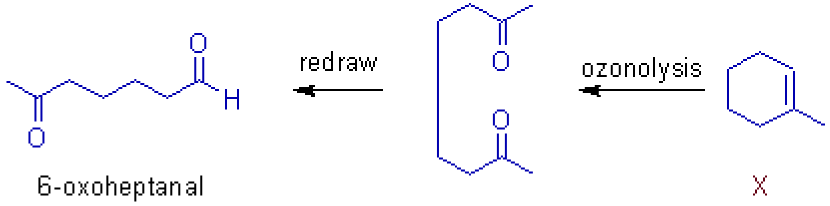
* X -------> 6-Oxoheptanal
Hence 'X' must be a cyclic compound with a double bond as illustrated below.



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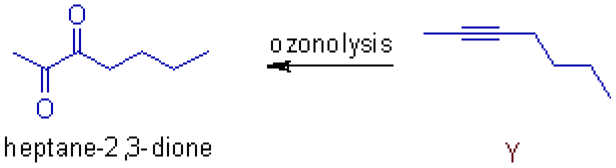
* Y -------> Heptane-2,3-dione
This suggests, 'Y' must contain a triple bond.



13) For HI the molar entropy of vaporization is 89.0 J/K/mol and the molar enthalpy of vaporization is 21.16 kJ/mol. The temperature at which the value of ! G becomes equal to zero for the vaporisation process will be:

a) -273^{o}C

b) -35.2^{o}C

c) 23.8 K

d) 42^{o}C

Solution:
#G = #H + T#S
When #G = 0

#H 21.16 kJ/mol
T = ---- = -------------------------- = 237.8 K = 237.8 - 273 ^{o}C = -35.2^{o}C
#S 89 x 10^{-3} kJ/K/mol

14) In 1895, Lord Rayleigh discovered that samples of nitrogen from the air were of a different density than nitrogen resulting from chemical reactions. The correct explanation for this observation is:
a) Nitrogen samples obtained from air has heavier isotopes.
b) Nitrogen samples obtained from air contain argon.
c) Nitrogen samples obtained from chemical reactions also contain helium.
d) All of the above.
Explanation: Air also contains noble gases. Among the noble gases, argon is the most abundant. The nitrogen gas that was separated from air by Lord Rayleigh has different density because it contains argon gas. It is chemically inert and hence cannot be separated easily.

15) The rate of a reaction is increased by four times when the concentration of reactants is doubled. The true statement about this reaction is;
a) The units of the specific rate of reaction is L^{2}.mol^{-2}s^{-1}.
b) Half life of the reaction is proportional to the initial concentration of reactants.
c) Half life of the reaction is inversely proportional to the initial concentration of reactants.
d) It is a first order reaction.
Solution:
* The rate law for a reaction can be written as: Rate (r) = kc^{n}

Where n = order of the reaction.

Let $r_1 = kc_1^n$ & $r_2 = kc_2^n$

Then $r_2/r_1 = kc_2^n/kc_1^n$

But $r_2 = 4r_1$ & $c_2 = 2c_1$

Therefore $r_2/r_1 = 4 = 2^n$

Or n = 2

* Hence it is a second order reaction. And for second order reaction, the half life is inversely proportional to the initial concentration of the reactants. The units of specific rate for a second order reaction is $L.mol^{-1}s^{-1}$.

16)

Assertion(A): LiCl is an ionic compound but dissolves in non polar solvents.

Reason(R): Li^+ ion undergoes polarization due to strong polarizing power of Cl^- ion and hence the compound shows some covalent nature.

a) Both ‘A’ & ‘R’ are correct ; and ‘R’ is the correct explanation of ‘A’

b) Both ‘A’ & ‘R’ are correct ; but ‘R’ is not the correct explanation of ‘A’.

c) ‘A’ is correct but ‘R’ is incorrect.

d) ‘A’ is incorrect but ‘R’ is correct.

Explanation:

* According to Fajan's rule, greater the polarizing power of the cation greater is the covalent nature. As the Li^+ ion is smaller in size it has greater charge density and has greater polarizing power. Hence its compounds show some covalent nature. Therefore the assertion is correct.

* But the reason is not a correct statement. It is the Cl^- ion which is polarized and not the Li^+ ion.

17) A diamagnetic colorless salt liberated a paramagnetic reddish brown gas upon heating and leaves behind an orange yellow solid residue. Upon addition of dil.HCl, its solution gave a white precipitate, which is soluble in hot water. Its solution also gave a yellow precipitate with Potassium chromate solution. The salt is most likely to be,

a) $Zn(NO_3)_2$

b) $Pb(NO_3)_2$

c) $Ba(NO_3)_2$

d) NH_4NO_3

Explanation:

* All the salts are diamagnetic.

* Nitrate salts usually give paramagnetic reddish brown gas, NO_2 upon heating.

* But an orange yellow solid residue is obtained upon heating only in the case of $Pb(NO_3)_2$.

* Pb^{2+} salts give white precipitate with dil.HCl and also give yellow precipitate with potassium chromate.

$Pb(NO_3)_2$ ---------> PbO + NO_2 + O_2
Litharge paramagnetic
orange yellow solid reddish brown gas

Pb^{2+} + 2HCl --------> $PbCl_2$ + $2H^+$
white ppt.

Pb^{2+} + K_2CrO_4 --------> $PbCrO_4$ + $2K^+$
yellow ppt.

18) The depression in freezing point of a dilute aqueous solution of a non electrolytic solute is 0.67°C. What is its relative lowering of vapour pressure? (K_f= 1.8 $K.Kg.mole^{-1}$)

a) 0.0067

b) 0.042
c) 0.21
d) 0.42

Solution:

* $dT_f = K_f.m$ ===> $m = dT_f/K_f = 0.67 / 1.8\ Kg.mol^{-1}$
* Relative lowering of vapor pressure (RLVP) = Molefraction of solute (X_{solute})

$$\text{Molality (m)} = \frac{w_{solute} \times 1000}{MW_{solute} \times w_{solvent}}$$

$$\text{or} \quad \frac{m}{1000} = \frac{w_{solute}}{MW_{solute} \times w_{solvent}}$$

$$\text{Therefore} \quad RLVP = X_{solute} = \frac{w_{solute} \times MW_{solvent}}{MW_{solvent} \times w_{solvent}} = \frac{m \times MW_{solvent}}{1000}$$

$$\text{And} \quad RLVP = \frac{m \times MW_{solvent}}{1000} = \frac{0.67 \times 18}{1.8 \times 1000} = 0.0067$$

19) Given the following standard potentials:

$Mn^{2+}(aq) + 2e^{-}$ ------------> $Mn(s)$; $E^{o} = -1.18$ V

$2H_2O(l) + 2e^{-}$ ------------> $H_2(g) + 2OH^{-}(aq)$; $E^{o} = -0.83$ V

$Br_2(l) + 2e^{-}$ ------------> $2Br^{-}(aq)$; $E^{o} = +1.08$ V

$O_2(g) + 4H^{+}(aq) + 4e^{-}$ ------------> $H_2O(l)$; $E^{o} = +1.23$ V

In the electrolysis of an aqueous solution of $MnBr_2$, the products formed at cathode and anode respectively are:

a) H_2 & Br_2
b) Mn & O_2
c) Mn & Br_2
d) H_2 & O_2

Explanation:

* Higher the reduction potential, greater is its ability to undergo reduction. Water undergoes reduction at cathode because it has higher reduction potential than that of Mn^{2+} ion.
* Bromine is liberated at anode as its reduction potential is less than that of oxygen. i.e., It is more easier to oxidize Br^{-} ions than O^{2-} ions.

20) The element with atomic number 58 belongs to :

a) Halogens
b) Lanthanoids
c) Actinoids
d) Chalcogens

Hints:

* Atomic number = 58 = 54 + 4
* 54 is the atomic number of Xenon. As Xenon belongs to 5th period, the element with atomic number 58 belongs to 6th period.
* The electronic configuration for this element can be written as $[Xe]\ 4f^{1}5d^{1}6s^{2}$

* The differentiating electron is entering into 4f orbital.

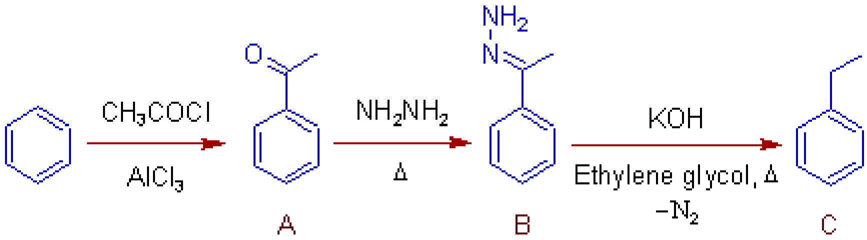
21) In the following sequence of reactions the compound ‘C’ is:

CH_3COCl NH_2NH_2 KOH
C_6H_6 --------------> A -------------> B ------------------------> C
$AlCl_3$! Ethylene glycol, !

a) Acetophenone
b) Toluene
c) Ethylbenzene
d) Styrene

Solution:

* The last reaction is Wolff-Kishner reduction.



22) Which of the following group on benzene deactivates the ring towards electrophilic substitution but activation energy for meta substitution is greater than that of ortho substitution?

a) $-NO_2$
b) $-OCH_3$
c) $-NH_2$
d) -Cl

Explanation:

* Both $-NO_2$ and -Cl groups deactivate the ring towards electrophilic substitution.

* -Cl group not only deactivates the ring due to -I effect but also activates it through +M effect. It activates the ring more at ortho and para positions. Hence the activation energy for meta substitution is greater than that of ortho or para substitution.

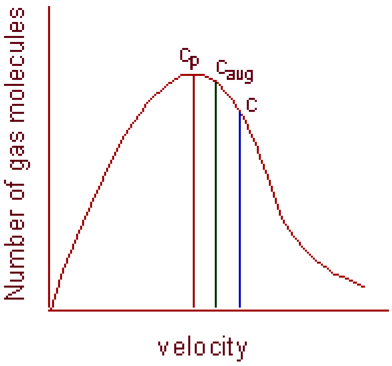
23) The correct order of distribution of molecular velocities of gases at a given temperature is: (where c = Root mean square velocity; c_p = most probable velocity and c_{avg}= average velocity)

a) $c_{avg} > c_p > c$
b) $c > c_{avg} > c_p$
c) $c_p > c > c_{avg}$
d) $c_p > c_{avg} > c$

Explanation:

* Most probable velocity, c_p is defined as the velocity possessed by more number of gas molecules at particular temperature.

* The number of gas molecules possessing root mean square velocities is less than the number of molecules with average speeds as shown below.



* Above graph represents the distribution of different types of molecular velocities of gas molecules at a given temperature.

24) The carbide which gives propyne upon hydrolysis is:

a) Be_2C
b) CaC_2
c) SiC
d) Mg_2C_3

Explanation:

* Be_2C is a methanide. It gives methane gas upon hydrolysis with water. Another example is Al_4C_3.
* CaC_2 gives acetylene (ethyne) gas upon hydrolysis.
* Mg_2C_3 gives propyne upon hydrolysis.

25) Which of the following compounds gives positive test for both nitrogen and halogen with its Lassaignne's extract?

a) NH_4Cl
b) $C_2H_5NH_2.HCl$
c) NCl_3
d) $N_2H_4.HCl$

Explanation:

* Carbon must be present along with nitrogen to give positive test for nitrogen in Lassaigne's test. Because the nitrogen in the compound forms CN^- ion when fused with sodium metal. Hence carbon must be present. Otherwise CN^- ion is not formed.

26) For a particular process at 450 K, ! G = -5.2 kJ and ! H = -43.7 kJ. If the process is carried out reversibly, the amount of maximum useful work that can be performed is:

a) -48.9 kJ
b) -5.2 kJ
c) -43.7 kJ
d) -38.5 kJ

Explanation:

* # G = maximum useful work under reversible conditions.

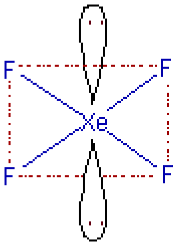
27) The fluoride for which the dipole moment is not equal to zero, is:

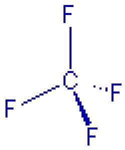
a) XeF_4
b) CF_4
c) SF_4
d) PF_5

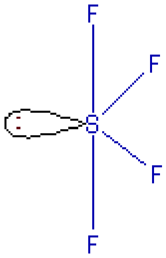
Explanation:

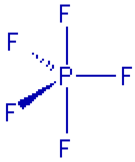
* If the bond moments are exactly cancelled by each other, then that molecule do not have net dipole moment. Usually symmetrical molecules have no dipole moment.
* XeF_4 is square planar, CF_4 is tetrahedral and PF_5 is trigonal bipyramidal. Hence they have zero dipole moment.

* But SF_4 has see-saw shape or distorted tetrahedral structure. Hence it has net dipole moment.

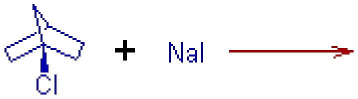








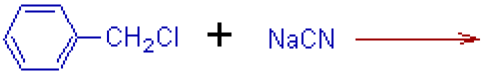
28) In which of the following reactions, the product is formed very fast mostly through SN_1 mechanism in ethanol, without formation of elimination side product?

a) 

b) $H_3C-Cl + NaCN \longrightarrow$

c) 

$H_3C-C(CH_3)_2-I + NaCN \longrightarrow$

d) 

Explanation:

* CH_3^+ ion is not stable and hence is not formed easily. Hence CH_3Cl undergoes mostly SN_2 reaction. It has to wait until the nucleophile attacks the carbon from other side of halogen.

* Incase of tert-butyl iodide (b), the tert-carbocation, $(CH_3)_3C^+$ is formed easily as it is stable due to +I effect of methyl groups. Hence it shows SN_1 reaction. But it undergoes mostly elimination due to presence of %hydrogen.

* $C_6H_5-CH_2^+$ cation (benzyl cation) is very stable and is formed more easily. Hence benzyl chloride mostly undergoes SN_1 reaction. It cannot undergo elimination because there is no %hydrogen.

29) The solubility products (K_{sp}) for three salts MX, MY_2 and MZ_3 are $2x10^{-8}$, $8x10^{-9}$, and $54x10^{-8}$, respectively. The solubility of these salts follow the order :

a) $MX > MY_2 > MZ_3$

b) $MY_2 > MX > MZ_3$

c) $MZ_3 > MY_2 > MX$

d) $MX > MZ_3 > MY_2$

Explanation:

* For a salt of type A_xB_y which undergoes ionization as follows:

A_xB_y <====> $xA^{y+} + yB^{x-}$

The $K_{sp} = [A^{y+}]^x\ [B^{x-}]^y$

If the solubility of the salt is 'S' $mol.L^{-1}$. i.e., 'S' moles of A_xB_y will give xS moles of A^{y+} and yS moles of B^{x-}

$K_{sp} = [xS]^x\ [yS]^y$

or $K_{sp} = x^x.y^y.S^{x+y}$

* The relationship between solubility and the K_{sp} value for above salts can be written as follows:

for MX : $K_{sp} = 1^1.1^1.S^2$

=====> $S = K_{sp}^{1/2} = (2 \text{ x } 10^{-8})^{1/2} = 1.414 \text{ x } 10^{-4}\ mol.L^{-1}$.

for MY_2 : $K_{sp} = 1^1.2^2.S^3$

$$\Longrightarrow S = \frac{K_{sp}^{1/3}}{4^{1/3}} = \frac{(8 \times 10^{-9})^{1/3}}{4^{1/3}} = 2^{1/3} \times 10^{-3}\ \text{mol.L}^{-1}$$

for MZ_3 : $K_{sp} = 1^1.3^3.S^4$

$$\Longrightarrow S = \frac{K_{sp}^{1/4}}{9^{1/4}} = \frac{(54 \times 10^{-8})^{1/4}}{9^{1/4}} = 6^{1/4} \times 10^{-2}\ \text{mol.L}^{-1}$$

* Hence the correct order of solubility if **c) $MZ_3 > MY_2 > MX$** .

30) The complementary strand of m-RNA formed over the single stranded DNA of sequence 5’-A-T-C-A-G-T-3’ is

a) 5’-T-G-A-C-T-A-3’
b) 5’-A-C-T-G-A-T-3’
c) 5’-A-C-U-G-A-U-3’
d) 5’-U-A-G-U-C-A-3’

Explanation:

* DNA contains following bases associated with the nucleotides:
A = Adenine
T = Thymine
G = Guanine
C = Cytosine

* In RNA, Thymine is absent. Instead of it Uracil is present.
* Always 'A' pairs up with 'T' and 'G' pairs up with 'C'.
* During the synthesis of DNA strand,
'T' is introduced on the newly formed strand for every 'A' on the parent strand and vice versa.
'G' is introduced for every 'C' on the parent strand and vice versa.
* But during the synthesis of RNA (over DNA strand), uracil, U is introduced instead of 'T' for every 'A' on the DNA strand.

base on parent DNA	base on child DNA strand	base on child RNA strand
A	-->T	**U**
T	-->A	A
G	-->C	C
C	-->G	G

* The complementary strand is always antiparallel to the first strand. i.e., if one is in 5' to 3' direction, the other one is in 3' to 5' direction.
* Hence the answer is **c)**.

parent DNA strand	5’-A-T-C-A-G-T-3’
complementary m-RNA strand	3'-U-A-G-U-C-A-5'

31) The radioactive isotope used to locate brain tumors is

a) ${}_{1}D^{2}$
b) ${}_{16}S^{31}$
c) ${}_{53}I^{131}$
d) ${}_{92}U^{232}$

More information:

* $_{53}I^{131}$ is used to locate brain tumors, in the treatment of thyroid problems.

* $_{1}D^{2}$ is used as a tracer in chemical reactions. It is also used in nuclear fission in hydrogen bomb. But it is not radioactive.

* $_{16}S^{35}$ (not $_{16}S^{31}$) is used to identify the problems in blood circulation and in diagnosis of heart problems.

32) The black precipitate formed when hypo is added with silver nitrate solution is:

a) Ag_2S
b) $Na_3[Ag(S_2O_3)_2]$
c) S
d) Na_2S

Explanation:

* When hypo is added in small amounts to silver nitrate, initially a white precipitate of silver thiosulfate is formed. It is converted immediately to black silver sulfide.

$Na_2S_2O_3$ + $2AgNO_3$ ----------> $Ag_2S_2O_3$ + $2NaNO_3$
$Ag_2S_2O_3$ + H_2O ----------> Ag_2S + H_2SO_4

33) If the following reaction were at equilibrium in a closed vessel at a controlled temperature, what would be the effect of adding more CO_2 to the reaction vessel and permitting the reaction to approach equilibrium again?

$CO + H_2O$ <===> $CO_2 + H_2$

a) The concentrations of CO, H_2O, and H_2 would all increase.
b) The concentrations of CO, H_2O, and H_2 would all decrease.
c) The concentrations of CO and H_2O would decrease and the concentration of H_2 would increase.
d) The concentrations of CO and H_2O would increase and the concentration of H_2 would decrease.

Explanation:

* According to Le Chatelier's principle, when the concentration of any one of the product increases, the equilibrium position is shifted so as to increase the concentrations of reactants.

34) The strongest base among the following is:

a) Methanamine
b) N-Methylmethanamine
c) N,N-Dimethylmethanamine
d) Aniline

Explanation:

* The electron density on nitrogen of amine group increases with increase in the number of methyl groups which release electrons by inductive effect (+I effect). Hence **N,N-Dimethylmethanamine** is more basic among the given options.
* Aniline is least basic due to electron withdrawing phenyl ring.

35) The wavelength of electron wave in the first orbit of hydrogen atom is:

a) 3.33 A^o
b) 0.529 A^o
c) 2.21 A^o
d) 1.06 A^o

Solution:

According to de Broglie's concept:

n&= 2 r = 2   x 0.529 x n^2 A^o

&= 2   x 0.529 x n A^o = 2 x 3.14 x 0.529 x1 = 3.33 A^o

Here

n = quantum number of the orbit

r = radius of the orbit