

JEE Main Online Exam 2019

Questions & Solutions

12th April 2019 | Shift - II

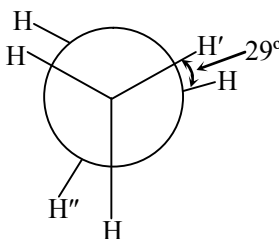
CHEMISTRY

- Q.1** Among the following, the INCORRECT statement about colloids is :
- (1) The range of diameters of colloidal particles is between 1 and to 1000 nm
 - (2) they are larger than small molecules and have high molar mass
 - (3) They can scatter light
 - (4) The osmotic pressure of a colloidal solution is of higher order than the true solution at the same concentration.

Ans. [4]

Sol. Osmotic pressure of colloidal solution is lower than true solution of same concentration.

- Q.2** In the following skew conformation of ethane, H'-C-C-H'' dihedral angle is :



- (1) 120° (2) 58° (3) 151° (4) 149°

Ans. [4]

Sol. H'-C-C-H'' = 120°

- Q.3** An 'Assertion' and a 'Reason' are given below. Choose the correct answer from the following options :

Assertion (A) : Vinyl halides do not undergo nucleophilic substitution easily.

Reason (R) : Even though the intermediate carbocation is stabilized by loosely held p-electrons, the cleavage is difficult because of strong bonding.

- (1) Both (A) and (R) are correct statements but (R) is not the correct explanation of (A)
- (2) Both (A) and (R) are correct statements and (R) is the correct explanation of (A)
- (3) (A) is correct statement but (R) is a wrong statement
- (4) Both (A) and (R) are wrong statements.

Ans. [3]

Sol. $\text{CH}_2=\text{CH}-\overset{\ominus}{\text{C}}\text{l} \leftrightarrow \overset{\ominus}{\text{C}}\text{H}_2-\text{CH}=\overset{\oplus}{\text{C}}\text{l}$

C-Cl bond is stronger due to resonance.

- Q.8** The C–C bond length is maximum in :
(1) C₆₀ (2) diamond (3) graphite (4) C₇₀

Ans. [2]

Sol. C–C in C₆₀ = 1.4 Å
C–C in C₇₀ = 1.37 to 1.46 Å
Diamond = $\ell > 1.54 \text{ Å}$
Graphite = 1.54 Å

- Q.9** 25 g of an unknown hydrocarbon upon burning produces 88 g of CO₂ and 9 g of H₂O. This unknown hydrocarbon contains :
(1) 18 g of carbon and 7 g of hydrogen (2) 20 g of carbon and 5 g of hydrogen
(3) 22 g of carbon and 3 g of hydrogen (4) 24 g of carbon and 1 g of hydrogen

Ans. [4]

Sol. Let hydrocarbon is C_xH_y
$$\text{C}_x\text{H}_y + \text{O}_2 \longrightarrow x\text{CO}_2 + \frac{y}{2}\text{H}_2\text{O}$$

wt of carbon = $\frac{88}{44} \times 12 = 24 \text{ g}$
wt of hydrogen = $\frac{9}{18} \times 1 \text{ g}$

- Q.10** The coordination numbers of Co and Al in [Co(Cl)(en)₂]Cl and K₃[Al(C₂O₄)₃], respectively, are :
(en = ethane-1, 2-diamine)
(1) 3 and 3 (2) 6 and 6 (3) 5 and 3 (4) 5 and 6

Ans. [4]

Sol. [CoCl(en)₂]Cl
en → bidentate
Cl – monodentate } So C.N. of Co is 5.
K₃[Al(C₂O₄)₃]
C₂O₄²⁻ → is bidentate so C–N of Al is 6

- Q.11** The primary pollutant that leads to photochemical smog is :
(1) acrolein (2) ozone (3) sulphur dioxide (4) nitrogen oxides

Ans. [4]

Sol. Photochemical smog contains oxides of nitrogen

- Q.12** Thermal decomposition of a Mn compound (X) at 513 K results in compound Y, MnO₂ and gaseous product. MnO₂ reacts with NaCl and concentrated H₂O₄ to give a pungent gas Z. X, Y and Z, respectively, are :
(1) KMnO₄, K₂MnO₄ and Cl₂ (2) K₂MnO₄, KMnO₄ and SO₂
(3) K₃MnO₄, K₂MnO₄ and Cl₂ (4) K₂MnO₄, KMnO₄ and Cl₂

Ans. [1]

Sol.
$$\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$$

(X) (Y)
$$\text{MnO}_2 + \text{NaCl} + \text{H}_2\text{SO}_4 \longrightarrow \text{MnSO}_4 + \text{Cl}_2 + \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$$

(Z)
X = KMnO₄, Y = K₂MnO₄, Z = Cl₂

Q.13 The INCORRECT match in the following is :

- (1) $\Delta G^0 = 0, K = 1$ (2) $\Delta G^0 < 0, K < 1$ (3) $\Delta G^0 > 0, K < 1$ (4) $\Delta G^0 < 0, K > 1$

Ans. [2]

Sol. $\Delta G = \Delta G^0 + RT \ln \theta_1$

at equil. $\Delta G = 0$

$\Delta G^0 = -2.303 RT \log K$

if $\Delta G^0 < 0$

$\Rightarrow -2.303RT \log K < 0$

$\Rightarrow \log K > 0$

$\Rightarrow K > 1$

Q.14 The INCORRECT statement is :

- (1) Lithium is least reactive with water among the alkali metals
(2) LiCl crystallises from aqueous solution as $\text{LiCl} \cdot 2\text{H}_2\text{O}$
(3) Lithium is the strongest reducing agent among the alkali metals
(4) LiNO_3 decomposes on heating to give LiNO_2 and O_2

Ans. [4]

Sol. $\text{Li}(\text{NO}_3)_2 \xrightarrow{\Delta} \text{Li}_2\text{O} + \text{NO}_2 + \text{O}_2$
(which is incorrect)

Q.15 The pair that has similar atomic radii is :

- (1) Mo and W (2) Mn and Re (3) Ti and Hf (4) Sc and Ni

Ans. [1]

Sol. Size of $3d < 4d = 5d$ (due to lanthanoid contraction)

So, size $\text{M}_0 \approx \text{W}$

Q.16 The correct statement is :

- (1) leaching of bauxite using concentrated NaOH solution gives sodium aluminate and sodium silicate
(2) the Hall-Heroult process is used for the production of aluminium and iron
(3) pig iron is obtained from cast iron
(4) the blistered appearance of copper during the metallurgical process is due to the evolution of CO_2

Ans. [1]

Sol. $\text{Al}_2\text{O}_3 + 2\text{NaOH} + 3\text{H}_2\text{O} \xrightarrow[35-36 \text{ bar}]{473-523 \text{ K}} \text{Na}[\text{Al}(\text{OH})_4]$

$\text{NaOH} + \text{SiO}_2 \longrightarrow \text{Na}_2\text{SiO}_3 + \text{H}_2\text{O}$

Q.17 Which of the given statements is INCORRECT about glycogen ?

- (1) It is a straight chain polymer similar to amylose (2) It is present in animal cells
(3) It is present in some yeast and fungi (4) Only α -linkages are present in the molecule

Ans. [1]

Sol. Amylose is a straight chain polymer of β -D-(+) glucose.

Q.18 NO_2 required for a reaction is produced by the decomposition of N_2O_5 in CCl_4 as per the equation,

$2\text{N}_2\text{O}_5(\text{g}) \rightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$.

The initial concentration of N_2O_5 is 3.00 mol L^{-1} and it is 2.75 mol L^{-1} after 30 minutes. The rate of formation of NO_2 is :

- (1) $2.083 \times 10^{-3} \text{ mol L}^{-1} \text{ min}^{-1}$ (2) $8.333 \times 10^{-3} \text{ mol L}^{-1} \text{ min}^{-1}$
(3) $4.167 \times 10^{-3} \text{ mol L}^{-1} \text{ min}^{-1}$ (4) $1.667 \times 10^{-2} \text{ mol L}^{-1} \text{ min}^{-1}$

Ans. [4]

Sol.

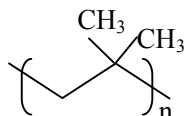
$$\frac{1}{2} \frac{d[\text{N}_2\text{O}_5]}{dt} = -\frac{1}{4} \frac{d[\text{NO}_2]}{dt}$$

$$\Rightarrow \frac{d[\text{NO}_2]}{dt} = -2 \frac{d[\text{N}_2\text{O}_5]}{dt}$$

$$\Rightarrow \frac{d[\text{NO}_2]}{dt} = -2 \frac{(3 - 2.75)}{30}$$

$$\frac{d[\text{NO}_2]}{dt} = \frac{2 \times 0.25}{30} = 1.667 \times 10^{-2} \text{ mol L}^{-1} \text{ min}^{-1}$$

Q.19 The correct name of the following polymer is :



- (1) Polytert-butylene (2) Polyisobutane (3) Polyisobutylene (4) Polyisoprene

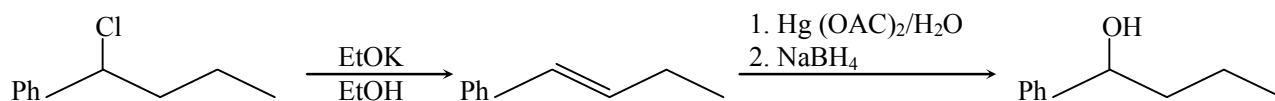
Ans. [3]

Q.20 Heating of 2-chloro-1-phenylbutane with EtOK/EtOH gives X as the major product. Reaction of X with $\text{Hg}(\text{OAc})_2/\text{H}_2\text{O}$ followed by NaBH_4 gives Y as the major product. Y is :



Ans. [1]

Sol.



Q.21 A solution is prepared by dissolving 0.6 g of urea (molar mass = 60 g mol^{-1}) and 1.8 g of glucose (molar mass = 180 g mol^{-1}) in 100 mL of water at 27°C . The osmotic pressure of the solution is :

$$(R = 0.08206 \text{ L atm K}^{-1} \text{ mol}^{-1})$$

- (1) 8.2 atm (2) 2.46 atm (3) 4.92 atm (4) 1.64 atm

Ans. [3]

Sol.

$$\begin{aligned} \Pi &= i_1 C_1 RT + i_2 C_2 RT \\ &= (i_1 C_1 + i_2 C_2) RT \\ &= \left[\left(\frac{0.6 \times 1000}{60 \times 1000} \right) + \left(\frac{1.8 \times 1000}{180 \times 1000} \right) \right] RT \\ &= (0.1 + 0.1) RT \\ &= 0.2 RT \\ &= 0.2 \times 0.082 \times 300 \end{aligned}$$

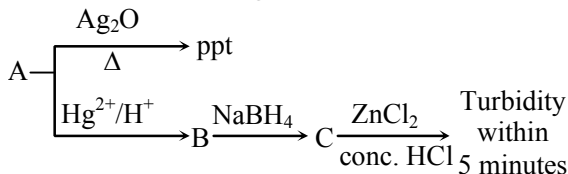
Q.22 The ratio of number of atoms present in a simple cubic, body centered cubic and face centered cubic structure are, respectively :

- (1) 8 : 1 : 6 (2) 4 : 2 : 1 (3) 1 : 2 : 4 (4) 4 : 2 : 3

Ans. [3]

Sol. $Z_{SC} : Z_{BCC} : Z_{FCC}$
1 : 2 : 4

Q.23 Consider the following reactions :

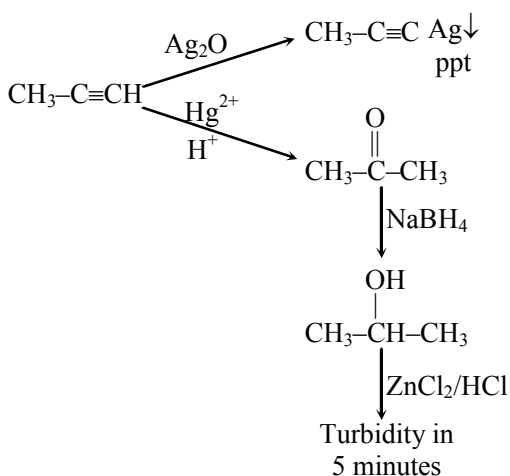


'A' is :

- (1) $CH_3-C\equiv CH$ (2) $CH_2=CH_2$ (3) $CH_3-C\equiv C-CH_3$ (4) $CH\equiv CH$

Ans. [1]

Sol.



Q.24 In comparison to boron, beryllium has :

- (1) lesser nuclear, charge and greater first ionisation enthalpy
(2) greater nuclear charge and greater first ionisation enthalpy
(3) greater nuclear charge and lesser first ionisation enthalpy
(4) lesser nuclear charge and lesser first ionisation enthalpy

Ans. [1]

Q.25 The compound used in the treatment of lead poisoning is :

- (1) desferrioxime B (2) Cis-platin (3) D-penicillamine (4) EDTA

Ans. [4]

Sol.

Q.26 The temporary hardness of a water sample is due to compound X. Boiling this sample converts X to compound Y. X and Y, respectively, are :

- (1) $Mg(HCO_3)_2$ and $MgCO_3$ (2) $Ca(HO_3)_2$ and CaO
(3) $Ca(HCO_3)_2$ and $Ca(OH)_2$ (4) $Mg(HCO_3)_2$ and $Mg(OH)_2$

Ans. [4]

Sol. $Mg(HCO_3)_2 \xrightarrow{\Delta} Mg(OH)_2 + CO_2 + H_2O$

Q.27 The molar solubility of $\text{Cd}(\text{OH})_2$ is 1.84×10^{-5} M in water. The expected solubility of $\text{Cd}(\text{OH})_2$ in a buffer solution of $\text{pH} = 12$ is :

- (1) 2.49×10^{-10} M (2) 1.84×10^{-9} M (3) 6.23×10^{-11} M (4) $\frac{2.49}{1.84} \times 10^{-9}$ M

Ans. [1]

Sol. $[\text{OH}^-] = 10^{-2}$ for Buffer solution

$$K_{\text{SP}} = [\text{Cd}^{+2}] [\text{OH}^-]^2$$

$$[\text{Cd}^{+2}] = \frac{K_{\text{SP}}}{[\text{OH}^-]^2} = \text{solubility in buffer solution} \quad \dots (1)$$

while

$$K_{\text{SP}} = 4S^3 \text{ for } \text{Cd}(\text{OH})_2$$

$$\Rightarrow K_{\text{SP}} = 4 \times (1.84 \times 10^{-5})^3 \quad \dots (2)$$

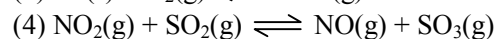
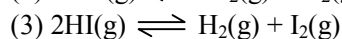
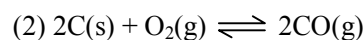
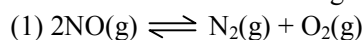
So solubility in Buffer solution is

$$[\text{Cd}^{+2}] = \frac{K_{\text{SP}}}{[\text{OH}^-]^2} = \frac{4 \times (1.84 \times 10^{-5})^3}{(10^{-2})^2} = 24.9 \times 10^{-11}$$

$$[\text{Cd}^{+2}] = 24.9 \times 10^{-11}$$

$$\text{Solubility} = 2.49 \times 10^{-10}$$

Q.28 In which one of the following equilibria, $K_p \neq K_C$?



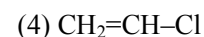
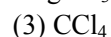
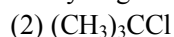
Ans. [2]

Sol. $K_p = K_C(\text{RT})^{\Delta n_g}$

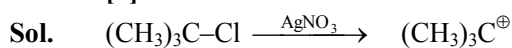
$$\Delta n_g = 0 \text{ so } K_p = K_C$$

$$\Delta n_g \neq 0 \quad K_p \neq K_C$$

Q.29 Which one of the following is likely to give a precipitate with AgNO_3 solution ?

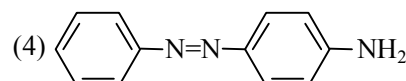
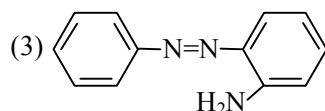
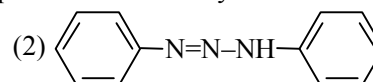
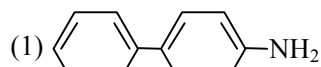


Ans. [2]



stabilises due to hyper conjugation

Q.30 Benzene diazonium chloride on reaction with aniline in the presence of dilute hydrochloric acid gives :



Ans. [4]

