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JEE (Main)

PAPER-1 (B.E./B. TECH.)

2023

COMPUTER BASED TEST (CBT)

Memory Based Questions & Solutions

Date: 30 January, 2023 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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PART : CHEMISTRY

1. The maximum no. of e^- in n = 4 shell.

(1) 72 (2) 50 (3) 16 (4) 32

Ans. (4)

Sol. Maximum no. of election in given shell is given as

$2n^2$, n = principal quantum no. or shell no.

Here, n = 4, then maximum no. of electron will be = $2 \times (4)^2 = 32\ e^-$

2. Which of the following metal chloride is more soluble in organic solvent –
(1) Be (2) K (3) Ca (4) Mg

Ans. (1)

Sol. Due to smaller size, Be^{2+} will show more polarising power. Hence $BeCl_2$ will have maximum covalent character & most soluble in organic solvents

3. The correct order of bond strength for the following compounds is :
H_2O, H_2S, H_2Se, H_2Te
(1) H–Te < H–Se < H–S < H–O (2) H–S < H–O < H–Te < H–Se
(3) H–Te < H–O < H–S <H–Se (4) H–Se < H–O < H–S <H–Te

Ans. (1)

Sol. In the given compound the order of bond length
H–Te < H–Se < H–S < H–O
So the bond strength for H–O is maximum

4. The volume strength of a sample of H_2O_2 is 50 The molarity of the sample is :

Ans. (4.46)

Sol. Volume strength = 11.2 × molarity
Molarity of H_2O_2 = 50/11.2 = 4.46M

5. $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $\Delta H = -190$ kJ/Mol
(a) increasing SO_2 (b) increasing pressure
(c) increasing temperature (d) Adding catalyst
(e) increasing O_2
How many factors are responsible for getting more product ?
(1) a, c, d & e (2) b, c, d & e (3) a, b & e (D) a, b, c

Ans. (3)

6. For given cell
$x / x^{+2}(0.00/M) \| y^{+2}(0.0/M) / y$ at 298k
$E^o(X^{+2}/x) = -0.76V$
$E^o(y^{+2}/y) = +0.34V$
$\frac{2.303RT}{F} = 0.06$
If E_{cell} = t, find 5t (closest integer).

Ans. (6)

Sol. Anode Cathode
$x \rightarrow x^{+2} + 2e$ $y^{+2} + 2e \rightarrow y$
overall cell reaction
$x_s + y^{+2} \rightleftharpoons x^{+2}_{(aq)} + y(s)$
$E^0_{cell} = (S.R.P)_{cathode} - (S.R.P)_{anode}$
$= 0.34 - (-0.76) = 1.1V$
$E_{cell} = 1.1 - \frac{0.06}{2} \log \frac{0.001}{0.01}$
= 1013 volt then 5 $E_{cell} = 5.65 \approx 6.0$

7. Which of the following equation is correct ?
(a) $LiNO_3 \rightarrow Li + NO_2 + O_2$ (b) $LiNO_3 \rightarrow LiNO_2 + O_2$
(c) $Li\ NO_3 \rightarrow Li_2O + N_2O_4 + O_2$ (d) $LiNO_3 \rightarrow Li_2O + N_2O_4 + O_2$
(1) a (2) b (3) c (4) d

Ans. (3)

Sol. On heating $LiNO_3$ we get Li_2O, NO_2 and O_2
$4LiNO_3 \rightarrow 2Li_2O + 4NO_2 + O_2$

8. In freundlich isotherm slope is 45°, intercept = 0.6020, pressure = 0.4 atm find extent of adsorption per gram of adsorbent.

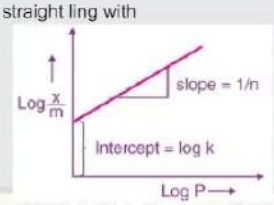
Ans. (1.6)

Sol. $\frac{x}{m} = kP^{\frac{1}{n}}$

Sol. $\frac{x}{m} = kP^{\frac{1}{n}}$

$\log(x/m) = \log k + \frac{1}{n}\log P$

log (x/m) vs logP graph will be straight ling with



slope = $\frac{1}{n} = \tan 45^0 = 1$

y = intercept = log k_1 = 0.6020 = log 4 $\Rightarrow$ k = 4

$\log \frac{x}{m} = \log 4 + \log 0.4$

$\log \frac{x}{m} = \log 1.6$

$\frac{x}{m} = 1.6$

9. Time taken for 60% decomposition is 540 Sec, then time taken for 90% completion of first order reaction is (in sec)

(1) 1250 (2) 1350 (3) 1150 (4) 1550

Ans. (2)

Sol. First order reaction

$t = \frac{1}{k} \ln \frac{C_0}{C_t}$

$540 = \frac{1}{k} \ln \frac{100}{40}$ ....(1)

$t = \frac{1}{k} \ln \frac{100}{40}$ ....(2)

from (1) and (2)

$\frac{540}{t} = \frac{\ln\frac{100}{40}}{\ln\frac{100}{10}} = \frac{\log 100 - \log 40}{\log 100 - \log 10}$

$\frac{540}{t} = \frac{2-1.6}{2-1} = 0.4$

$t = \frac{540}{0.4} = 1350$

10. Lead storage battery have 38% (w/w) H_2SO_4. Find the temp at which the liquid of battery will freeze.

(i = 2.67) ; Kg of water = 1.86 k. $\frac{K}{Mol}$)

(1) –3.1°C (2) –31°C (3) –0.31°C (4) –0.031°C

Ans. **(2)**

Sol. $\Delta T_f = i_{max} \times K_f \times$ molality

Consider 100 g solution

W(H_2SO_4) = 38gm

W (Water) = 62 g

Molality = $\frac{38 \times 1000}{98 \times 62} = 6.254$

$\Delta T_f = I \times K_f \times$ molality

$= 2.67 \times 1.86 \times 6.254 = 31$

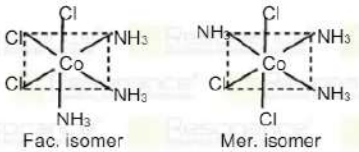
Freezing point of liquid in battery is –31°C

11. The is Cl–Co–Cl bond angle in the complex $[CoCl_3(NH_3)_3]$ is :

(1) 90° (2) 180° (3) 120° & 90° (4) 180° & 90°

Ans. (4)

Sol.



Fac. isomer ∠ClCoCl = 90°

Mer. isomer ∠ClCoCl = 180°

12. The option containing the correct match is given as :

List – I	List – II
(A) $Ni(Co)_4$	(i) sp^3
(B) $[Ni(CN)_4]^{2-}$	(ii) sp^3d^2
(C) $[Cu(H_2O)_6]^{2+}$	(iii) d^2sp^3
(D) $[Fe(CN)_6]^{4-}$	(iv) dsp^2

(1) (A) – (i), (B) –(iv), (C) – (ii), (D) – (iii) (2) (A) – (iii), (B) –(ii), (C) – (iv), (D) – (i)
(3) (A) – (ii), (B) –(iii), (C) – (iv), (D) – (i) (4) (A) – (iv), (B) –(ii), (C) – (i), (D) – (iii)

Ans. (1)

Sol.

Complex	Hybridisation
(A) $Ni(Co)_4$	(i) sp^3
(B) $[Ni(CN)_4]^{2-}$	(ii) dsp^2
(C) $[Cu(H_2O)_6]^{2+}$	(iii) sp^3d^2
(D) $[Fe(CN)_6]^{4-}$	(iv) d^2sp^3

13. Nessler's reagent is :

(1) $NaHCl_4$ (2) K_2HgI_4 (3) $Hg(NH_3)_2Cl$ (4) K_2HgI_4 + KOH

Ans. (4)

Sol. Nessler's reagent is a mercury (ii) iodide (HgI_2) solution in potassium iodide (KI) and potassium hydroxide (KOH).
Nessler's reagent: K_2HgI_4 + KOH
It is used for confirmation test of NH_4^+ ion.

14. $KMnO_4$ oxidized I^- in acidic and neutral medium to which forms respectively.

(1) IO_3^- and IO^- (2) I_2 and IO_3^- (3) IO_3^- and IO_3^- (4) IO_3^- and I_3^-

Ans. (2)

Sol. In acidic medium

$2MnO_4^- + 10\,I^- + 16H^+ \longrightarrow 2Mn^{2+} + 8H_2O + 5I_2$

In neutral or faintly alkaline medium

$2MnO_4^- + I^- + H_2O \longrightarrow 2MnO_2 + 2OH^- + IO_3^-$

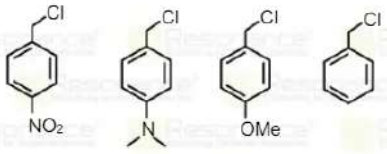
15. Boric acid is present in solid state while BF_3 is a gas at room temperature. Then which of the following statements are correct

(A) Hydrogen bonding is present in Boric acid
(B) Boric acid has more molecular mass as compared to BF_3
(C) BF_3 is polymeric in nature
(D) BF_3 easily reacts with NH_3

(1) A, B and C only (2) A, B and D only (3) B & C only (4) A & C only

Ans. (2)

16.



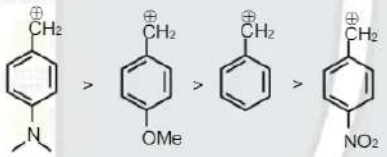
(i) (ii) (iii) (iv)

The order of S_N1 reaction for above reactants is

(1) ii > iii > i > iv (2) ii > iii > iv > i (3) ii > iv > iii > i (4) iii > ii > iv > i

Ans. (2)

Sol. Rate of S_N1 reaction $\propto$ stability of carbocation:



17. **Assertion**: Antihistamines does not affect secretion of acid in stomach

Reason: Antiallergic and antacids attack on different receptors.

(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(3) Assertion is true but Reason is false.

(4) Assertion is false but Reason is true.

Ans. (1)

Sol. Both, Assertion and Reason, are true and Reason is the correct explanation of Assertion.

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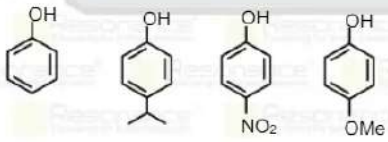
18. The correct order of the acidic strength of the following compounds is given as



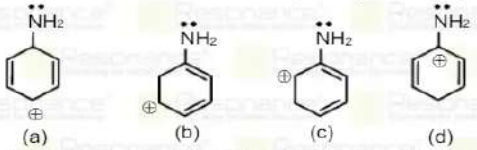
(1) a > b > c > d (2) c > a > b > d (3) b > c > d > a (4) d > a > c > b

Ans. (2)

Sol. Acidity of any compound is directly proportional to the stability of conjugate base.

Conjugate base is stabilized by –M, –I and resonance.

19. Find the correct order of decreasing stability of following compounds :

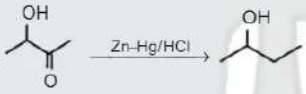


(a) (b) (c) (d)

(1) a > b > c > d (2) b > d > a > c (3) d > b > c > a (4) b > a > d > c

Ans. (3)

Sol. +M group stabilize the carbocation followed by resonating structures.

20. **Statement-1** : 

Statement-2 : Zn-Hg/HCl will convert C=O into CH_2.

(1) Both statement are correct

(2) Both statement are incorrect

(3) Statement-1 is correct but Statement-2 is incorrect

(4) Statement-1 is incorrect but Statement-2 is correct

Ans. (4)

Sol. Zn-Hg/HCl (Clemmensen reduction reduces the carbonyl group to $-CH_2$ but also affect acid sensitive functional groups as alkene, alcohol, ether and ester.)

21. B.O.D value of a water sample is 3 ppm. Select the correct option from given:

(1) It is highly polluted water.

(2) It is clean water.

(3) Concentration of oxygen in the given sample is very less.

(4) None of these

Ans. (2)

Sol. Clean water have B.O.D value less than 5 ppm while highly polluted water have B.O.D value of 17 ppm or more.

22. **Statement-1** : A mixture of chloroform and aniline can be separated by distillation.

Statement-2 : When separating aniline from a mixture of aniline and water by steam distillation aniline boils below its boiling point.

(1) Both statement are correct

(2) Both statement are incorrect

(3) Statement-1 is correct but Statement-2 is incorrect

(4) Statement-1 is incorrect but Statement-2 is correct

Ans. (1)

Sol. Both statement 1 and 2 are correct.

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