

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

QUESTIONS & SOLUTIONS

Reproduced from Memory Retention

18 March, 2021

SHIFT-1

09:00 am to 12 Noon

Duration : 3 Hours

Max. Marks : 300

SUBJECT - CHEMISTRY

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CHEMISTRY

1. Non reducing sugar which gives two reducing sugar is

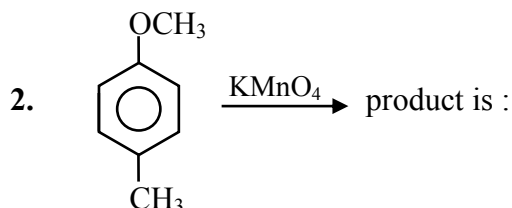
- (1) Glucose (2) Fructose (3) Galactose (4) Sucrose

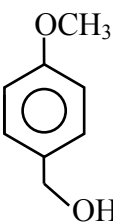
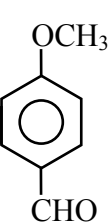
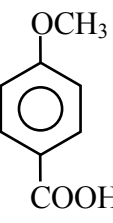
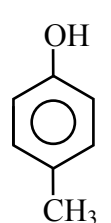
Ans. (4)

Sol. Sucrose $\xrightarrow{\text{Hydrolysis}}$ Glucose + Fructose

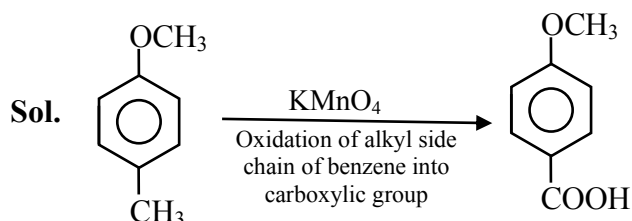
Sucrose is disaccharide and it gives two monosaccharides on hydrolysis.

Sucrose is non-reducing sugar but sugars obtained by hydrolysis are reducing sugars.



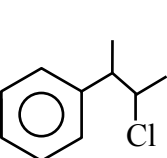
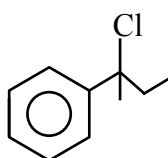
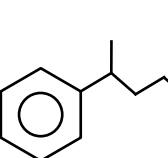
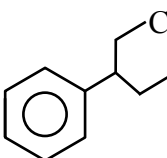
- (1)  (2)  (3)  (4) 

Ans. (3)

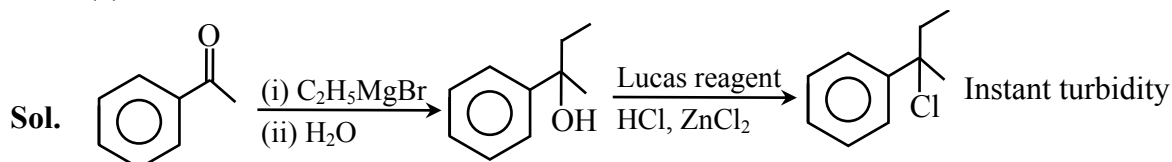


3. $\text{C}_8\text{H}_8\text{O} + \text{CH}_3\text{CH}_2\text{MgBr} \longrightarrow (\text{A}) \xrightarrow[\text{Reagent}]{\text{Lucas}} (\text{B})$ Instant turbidity

Identify product (B).

- (1)  (2)  (3)  (4) 

Ans. (2)



4. Match the following :

Column-I

- (A) Anti fertility
(B) Antacid
(C) Tranquilizer
(D) Artificial sweetener

Column-II

- (i) Alitame
(ii) Valium
(iii) Cimetidine
(iv) Novestrol

(1) (A) → (iv) ; (B) → (iii) ; (C) → (ii) ; (D) → (i)

(2) (A) → (i) ; (B) → (ii) ; (C) → (iii) ; (D) → (iv)

(3) (A) → (ii) ; (B) → (iv) ; (C) → (i) ; (D) → (iii)

(4) (A) → (iv) ; (B) → (iii) ; (C) → (i) ; (D) → (ii)

Ans. (1)

5. Which of the following statements is/are true for methane?

Statement-1 : Methane causes both, photochemical smog and global warming.

Statement-2 : Methane is found in paddy fields.

Statement-3 : It is a stronger global warming gas than CO₂.

Statement-4 : Methane is a part of reducing smog.

(1) S1, S2, S3

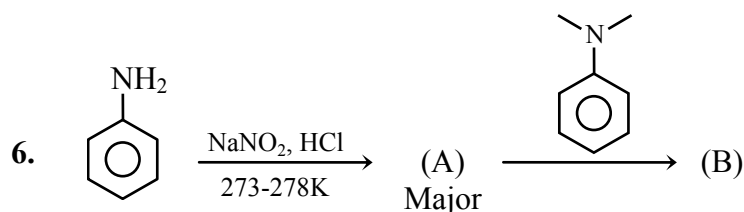
(2) S2, S3

(3) S1, S2, S4

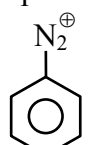
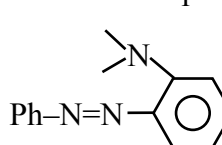
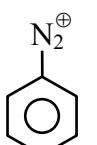
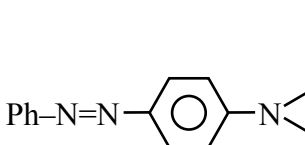
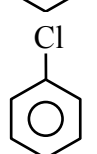
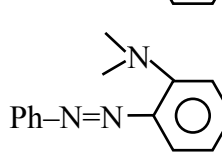
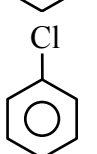
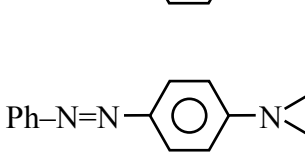
(4) S1, S2

Ans. (1)

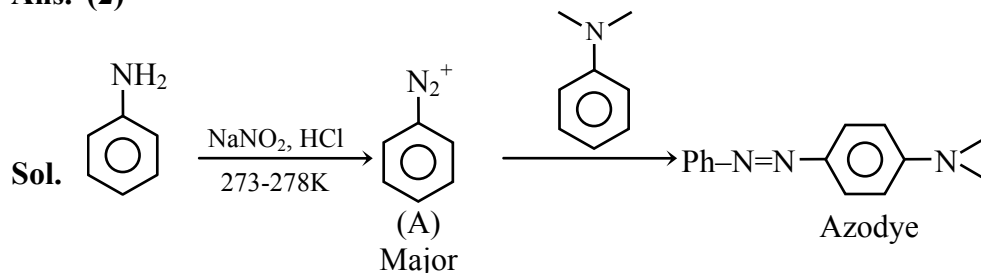
Sol. Methane is a part of oxidising smog not reducing smog.

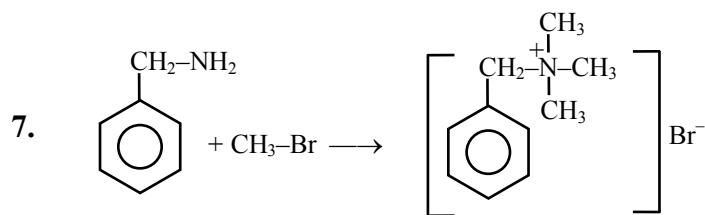


Find product A and B are respectively?

- (1)  ,  (2)  , 
- (3)  ,  (4)  , 

Ans. (2)



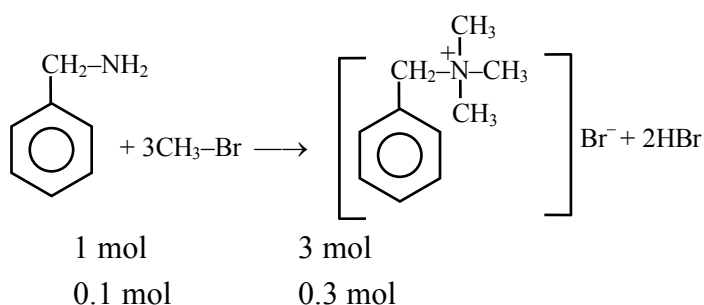


Moles of Methylbromide required to form 23 gm Trimethylbenzyl ammonium bromide is $n \times 10^{-1}$. Calculate "n"

Ans. (3)

Sol. Mole of trimethylbenzyl ammonium bromide = $\frac{23}{230}$
= 0.1

Mole of CH_3Br required = $3 \times 0.1 = 0.3 \text{ mol}$



8. $\text{C}_3\text{H}_6\text{O}$ can shows

- | | |
|------------------------|-------------------------------------|
| (1) Chain isomers | (2) Position isomers |
| (3) Functional isomers | (4) Metamers and positional isomers |

Ans. (3)

Sol. Acetone and propanal are functional isomers having same molecular formula $\text{C}_3\text{H}_6\text{O}$.

9. Match the following

Column (I)

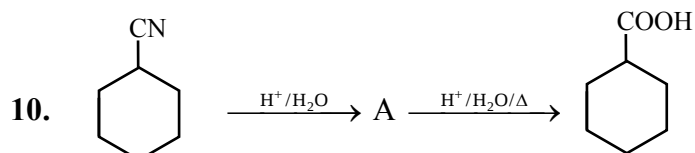
- (A) Alc. KOH
(B) Pd/BaSO_4
(C) BHC
(D) Polyacetylene

Column (II)

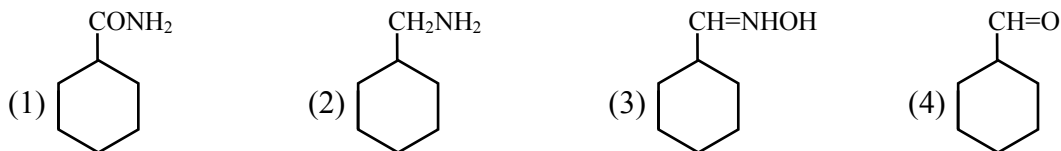
- (I) Electrode formation
(II) Lindlar
(III) β -Elimination
(IV) Addition

- (1) $\text{A} \rightarrow \text{II}$; $\text{B} \rightarrow \text{III}$; $\text{C} \rightarrow \text{IV}$; $\text{D} \rightarrow \text{I}$
(2) $\text{A} \rightarrow \text{III}$; $\text{B} \rightarrow \text{II}$; $\text{C} \rightarrow \text{I}$; $\text{D} \rightarrow \text{IV}$
(3) $\text{A} \rightarrow \text{III}$; $\text{B} \rightarrow \text{II}$; $\text{C} \rightarrow \text{IV}$; $\text{D} \rightarrow \text{I}$
(4) $\text{A} \rightarrow \text{I}$; $\text{B} \rightarrow \text{III}$; $\text{C} \rightarrow \text{II}$; $\text{D} \rightarrow \text{IV}$

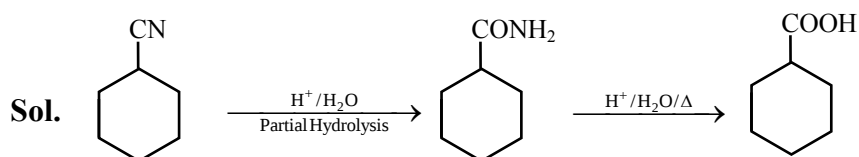
Ans. (3)



Compound A is :



Ans. (1)



11. Chemical used to decrease melting point of Alumina is :

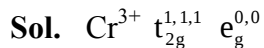
- (1) Bauxite (2) Cryolite (3) Calamine (4) Kaolinite

Ans. (2)

Sol. Fact

12. Number of unpaired electrons in $K_3[Cr(ox)_3]$ is :

Ans. (3)



So number of unpaired electron = 3

13. A diatomic compound AX has bond order 2.5 Both A and X are elements of 2nd period of periodic table. Total number of electrons in 1 molecule of AX is-

Ans. (15)

Sol. Species is NO

Total number of electron = 7 + 8 = 15

14. If Na^+ has ionic radii 1.02 Å, ionic radii of Mg^{2+} & Al^{3+} are respectively :

- (1) 0.72 Å, 0.66 Å (2) 1.05 Å, 0.99 Å
(3) (4)

Ans. (1)

15. pH of buffer solution of CH_3COOH and CH_3COONa is 5.74. Concentration of $\text{CH}_3\text{COOH} = 1\text{M}$. Find concentration of CH_3COONa in solution.

Given pK_a of $\text{CH}_3\text{COOH} = 4.74$.

Ans. (10)

Sol. $\text{pH} = \text{pK}_a + \log_{10} \frac{[\text{CH}_3\text{COONa}]}{[\text{CH}_3\text{COOH}]}$

$$5.74 = 4.74 + \log_{10} \frac{[\text{CH}_3\text{COONa}]}{1}$$

$$\therefore [\text{CH}_3\text{COONa}] = 10\text{M}$$

16. Match the column

Column – I

Column–II

(A) $\text{Ca}(\text{OCl})_2$

(P) Bleach

(B) CaO

(Q) Antacid

(C) CaCO_3

(R) Plaster of paris

(D) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$

(S) Cement

(1) $\text{A} \rightarrow \text{P}$, $\text{B} \rightarrow \text{S}$, $\text{C} \rightarrow \text{Q}$, $\text{D} \rightarrow \text{R}$

(2) $\text{A} \rightarrow \text{P}$, $\text{B} \rightarrow \text{Q}$, $\text{C} \rightarrow \text{S}$, $\text{D} \rightarrow \text{R}$

(3) $\text{A} \rightarrow \text{P}$, $\text{B} \rightarrow \text{S}$, $\text{C} \rightarrow \text{R}$, $\text{D} \rightarrow \text{Q}$

(4) $\text{A} \rightarrow \text{S}$, $\text{B} \rightarrow \text{Q}$, $\text{C} \rightarrow \text{R}$, $\text{D} \rightarrow \text{P}$

Ans. (1)

17. Which subshell has 2 radial nodes & no angular node-

(1) 3s

(2) 2s

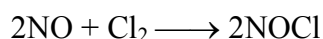
(3) 2p

(4) 3p

Ans. (1)

Sol. Subshell	Radial node	Angular node
3s	2	0
2s	1	0
2p	0	1
3p	1	1

18. Find overall order of given reaction using following experimental data



Exp.	[NO]	[Cl ₂]	Initial rate
1.	0.1	0.1	0.18
2.	0.1	0.2	0.35
3.	0.2	0.2	1.4

Ans. (3)

Sol. $\frac{0.18}{0.35} = \frac{K[\text{NO}]^\alpha[\text{Cl}_2]^\beta}{K[\text{NO}]^\alpha[\text{Cl}_2]^\beta}$

$$\frac{0.18}{0.35} = \frac{[0.1]^\alpha[0.1]^\beta}{[0.1]^\alpha[0.2]^\beta}$$

$$\beta = 1$$

$$\frac{0.35}{1.4} = \frac{K[0.1]^\alpha[0.2]^\beta}{K[0.1]^\alpha[0.2]^\beta}$$

$$\alpha = 2$$

$$\text{Rate} = K[\text{NO}]^1[\text{Cl}_2]^2$$

$$\text{Overall order} = 3$$

19. 2 Molal aqueous solution of weak acid freezes at -3.885°C . K_f of water = 1.85 K m^{-1} . If degree of dissociation of acid is $x \times 10^{-2}$. Determine x.

Ans. (5)

Sol. $\Delta T_f = 3.885$, $K_f = 1.85 \text{ K m}^{-1}$

$$i = 1 + \alpha, m = 2$$

Now,

$$\Delta T_f = i \cdot K_f \cdot m$$

$$3.885 = (1 + \alpha) \times 1.85 \times 2$$

$$\alpha = 0.05 = 5 \times 10^{-2}$$

$$\Rightarrow x = 5$$

20. Match the following

Column - I

- (A) Anticancer Drug
- (B) Chlorophyll
- (C) Vitamin B₁₂
- (D) Grubbs reagent

Column - II

- (I) Ru
- (II) Co
- (III) Mg
- (IV) Pt

$$(1) A \rightarrow \text{IV}; B \rightarrow \text{III}; C \rightarrow \text{II}; D \rightarrow \text{I}$$

$$(2) A \rightarrow \text{I}; B \rightarrow \text{II}; C \rightarrow \text{III}; D \rightarrow \text{IV}$$

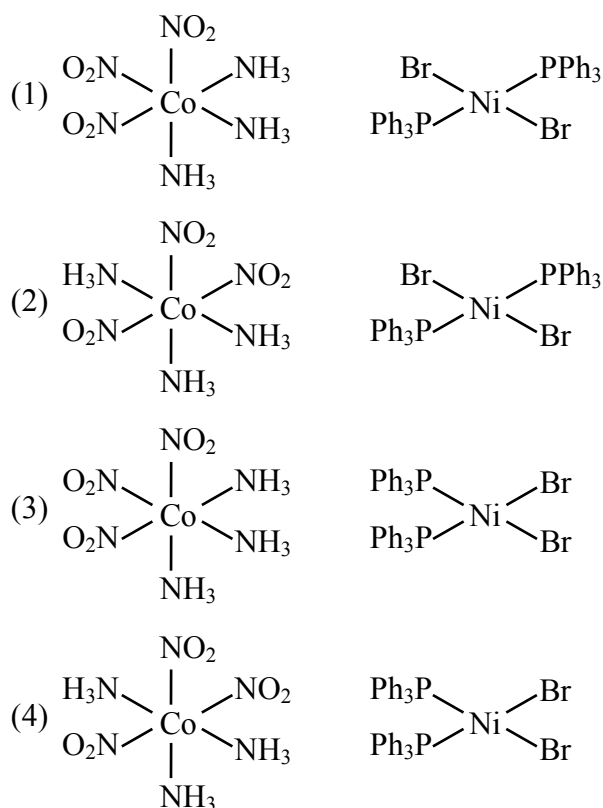
$$(3) A \rightarrow \text{III}; B \rightarrow \text{IV}; C \rightarrow \text{II}; D \rightarrow \text{I}$$

$$(4) A \rightarrow \text{I}; B \rightarrow \text{III}; C \rightarrow \text{II}; D \rightarrow \text{IV}$$

Ans. (1)

- Sol.** $\Rightarrow$ Cis-platin $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ used in treatment of cancer
 $\Rightarrow$ Chlorophyll is complex of Mg
 $\Rightarrow$ Vitamin B₁₂ is a complex of Co
 $\Rightarrow$ Grubb's catalyst are a series of catalysts containing Ruthenium

21. What is the structure of trans isomer of $[\text{NiBr}_2(\text{PPh}_3)_2]$ & meridional isomer of $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$?



Ans. (2)

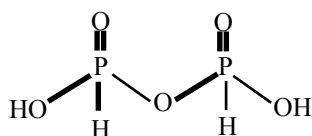
22. Phosphoric acid react with PCl_3 to give A. How many ionisable hydrogen are there in A?

- (1) 2 (2) 0 (3) 1 (4) 3

Ans. (1)



Phosphoric acid



Basicity = 2

23. An element 'A' crystallises in HCP lattice. Element 'M' occupies $\frac{2}{3}$ rd of tetrahedral voids. Determine formula of compound.

- (1) M_4A_3 (2) MA
(3) M_2A_3 (4) M_4A

Ans. (1)

Sol. Effective number of particles in HCP lattice unit cell = 6
& number of tetrahedral voids are = 12

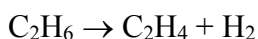
In one unit cell $A = 6$

$$M = \frac{2}{3} \times 12 = 8$$

Therefore formula of compound M_8A_6

Or M_4A_3

24. Determine $\Delta_r H$ of the reaction



given : Bond energy (in KJ/mol)

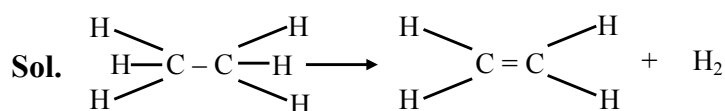
C – C : 340

C = C : 602

C – H : 411

H – H : 432

Ans. (128)



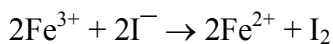
$$\Delta_r H = [E_{C-C} + 6E_{C-H}] - [E_{C=C} + 4E_{C-H} + E_{H-H}]$$

$$= E_{C-C} + 2E_{C-H} - E_{C=C} - E_{H-H}$$

$$= 340 + 822 - 602 - 432$$

$$= 128 \text{ KJ/mol}$$

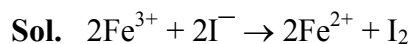
25. Calculate ΔG° of reaction.



Given : $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.77 \text{ V}$

$$E^\circ_{\text{I}_2/\text{I}^-} = 0.53 \text{ V}$$

Ans. (46)



$$E^\circ_{\text{Cell}} = E^\circ_c - E^\circ_a$$

$$= 0.77 - 0.53$$

$$= 0.24 \text{ V}$$

$$\Delta G^\circ = -2 \times 96500 \times 0.24$$

$$= -46320 \text{ J}$$

$$= -46.32 \text{ KJ}$$

Ans. 46

26. Assertion : $\text{Mg}(\text{HCO}_3)_2$ on heating produces MgCO_3

Reason : $\text{Mg}(\text{OH})_2$ has greater solubility than MgCO_3 .

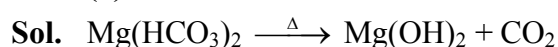
(1) Assertion is correct but reason is wrong

(2) Both assertion and reason are correct and reason is correct explanation of assertion

(3) Both assertion and reason are correct but reason is not correct explanation of assertion

(4) Assertion is wrong but reason is correct.

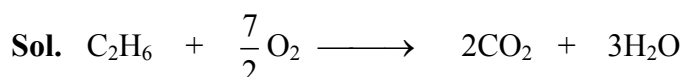
Ans. (4)



27. Number of H_2O molecules produced from complete combustion of 3g ethane = $N \times 10^{22}$.

Determine N. ($N_A = 6.023 \times 10^{23}$)

Ans. (18)



$$\text{Moles} = \frac{3}{20} = 0.1$$

$$\text{Moles} = 0.3$$

$$\therefore \text{Molecules} = 0.3 \times 6.022 \times 10^{23}$$

$$= 18.066 \times 10^{22}$$

$$\therefore N = 18$$

28. Match the column

Column – I

(A) Contact process

(B) Deacon's process

(C) Hydrogenation of vegetable oil

(D) Cracking of hydrocarbon

(1) A–Q ; B–R, C–S, D–P

(3) A–Q ; B–S, C–R, D–P

Column – II

(P) ZSM-5

(Q) V_2O_5

(R) CuCl_2

(S) Particle Ni

(2) A–Q ; B–R, C–P, D–S

(4) A–R ; B–Q, C–S, D–P

Ans. (1)