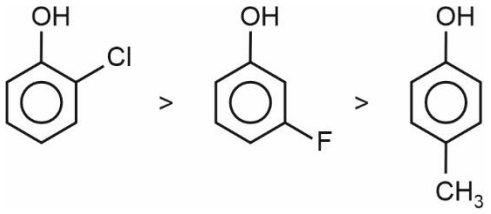
CHEMISTRY

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer:

1. **Assertion:** Acidic nature



Reason: F is better electron withdrawing group than Cl

(1) Assertion & Reason, both are correct and Reason is correct explanation of Assertion

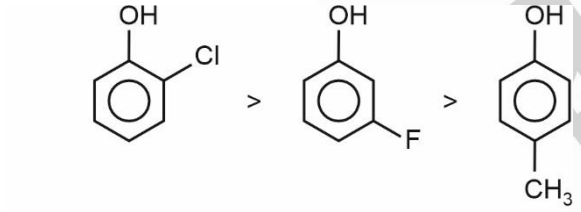
(2) Assertion and Reason, both are correct but Reason is not correct explanation of Assertion

(3) Assertion is correct, Reason is incorrect

(4) Assertion is incorrect, Reason is correct

Answer (2)

Sol.



pK_a 8.56 9.29 10.2

2. Which of the following the best method for preparation of BeF_2

(1) $Be + F_2 \rightarrow BeF_2$

(2) $BeH_2 + F_2 \rightarrow BeF_2$

(3) $BeH_2 + NaF \rightarrow$

(4) By $(NH_4)_2BeF_4$ (thermal decomposition)

Answer (4)

Sol. Best method for preparation of BeF2 is by thermal decomposition of $(NH_4)_2\ BeF_4$

$$(NH_4)_2BeF_4 \xrightarrow{\Delta} NH_4F + BeF_2$$

Ref. NCERT (s-block)

3. The correct increasing order of the magnitude of standard enthalpies of formation for group-1 halides is

(1) NaI < NaF < NaBr < NaCl

(2) NaI < NaBr < NaCl < NaF

(3) NaF < NaCl < NaBr < NaI

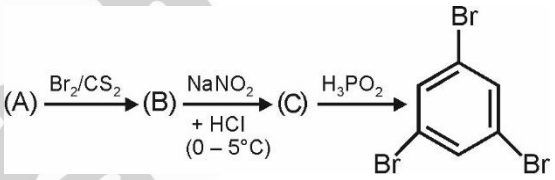
(4) NaCl < NaBr < NaF < NaI

Answer (2)

Sol.

Halide		ΔH_f° (kJ mol^{-1})
NaF	–	569
NaCl	–	400
NaBr	–	360
NaI	–	288

4. Consider the following reaction and identify the reactant (A)



(1) Aniline

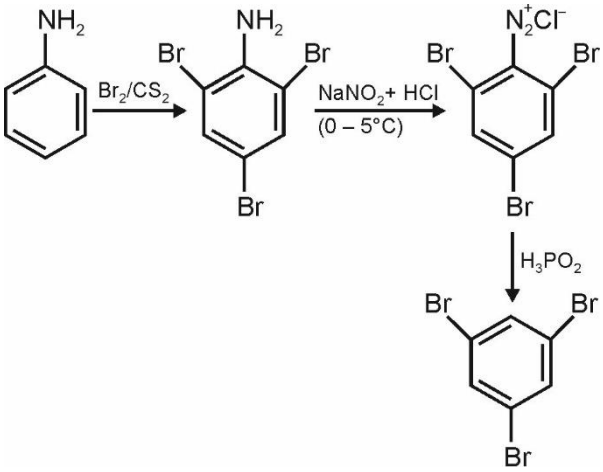
(2) Phenol

(3) Salicylic acid

(4) Acetanilide

Answer (1)

Sol. The reactant (A) is likely to be aniline because option will undergo monobromination on reaction with Br_2 dissolved in CS_2.



5. **Assertion A :** Bond angle of SO_2 is less than H_2O

Reason R : Both form V-shaped structure.

(1) Assertion & Reason, both are correct and Reason is correct explanation of Assertion

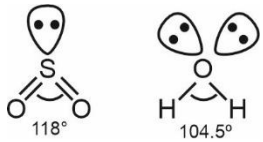
(2) Assertion and Reason, both are correct but Reason is not correct explanation of Assertion

(3) Assertion is correct, Reason is incorrect

(4) Assertion is incorrect, Reason is correct

Answer (3)

Sol.



6. Ba^{+2} cannot be precipitated as

(1) $BaCO_3$

(2) $Ba(OH)_2$

(3) $BaCrO_4$

(4) $BaSO_4$

Answer (2)

Sol. $Ba(OH)_2$ is soluble in water

$BaCO_3$ & $BaSO_4$ are white ppt

$BaCrO_4$ - Yellow ppt

7. Which of the following is oxidised by oxygen in acidic medium?

(1) Cl^-, Br^-

(2) Br^-, I^-

(3) Br^-

(4) I^-

Answer (2)

Sol. Reduction potential

$E^{o}_{I_2/I^-} = 0.54$ V

$E^{o}_{Br_2/Br^-} = 1.09$ V

$E^{o}_{O_2/H_2O} = 1.23$ V

$E^{o}_{Cl_2/Cl^-} = 1.36$ V

R. P. is in order $Cl_2 > Br_2 > I_2$

O.P. is revers in order

So, I^- and Br^- ion will get oxidised

8. A naturally occurring amino acid that contains only one basic functional group.

(1) Arginine

(2) Lysine

(3) Histidine

(4) Isoleucine

Answer (4)

Sol. Isoleucine has single nitrogenous base group.

9. Match the polymers given in column-I with their characteristics given in column-II

	Column-I		**Column-II**
(A)	Nylon 66	(P)	Thermosetting
(B)	Nylon 6	(Q)	Polyester
(C)	Phenol formaldehyde resin	(R)	Homopolymer
(D)	Dacron	(S)	Polyamide

(1) (A)-(P); (B)-(Q); (C)-(S); (D)-(R)

(2) (A)-(Q); (B)-(P); (C)-(R); (D)-(S)

(3) (A)-(P,Q); (B)-(R, S); (C)-(Q); (D)-(P)

(4) (A)-(S); (B)-(R, S); (C)-(P); (D)-(Q)

Answer (4)

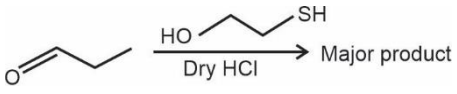
Sol. (A) Nylon 66 is a copolymer obtained by condensation polymerisation of hexamethylene diamine and adipic acid. It is a polyamide.

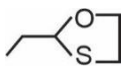
(B) Nylon 6 is a homopolymer of caprolactam. It is a polyamide.

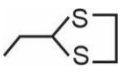
(C) Phenol formaldehyde resin is obtained by condensation polymerisation of phenol and formaldehyde. It is a thermosetting polymer.

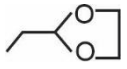
(D) Dacron is a copolymer obtained by condensation polymerisation of terephthalic acid and ethylene glycol. It is a polyester.

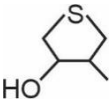
10. Identify the major product formed in the following reaction.



(1) 

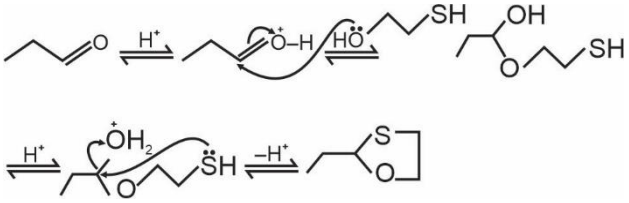
(2) 

(3) 

(4) 

Answer (1)

Sol.



11. Match reagent in Column-I with product in Column-II.

	Column-I Reagent 2-Bromopropane		Column-II Product
A	Alc.KOH	1	Nitrile
B	alc.KCN	2	Alkene
C	$AgNO_2$	3	Ester
D	CH_3COOAg	4	Nitro

(1) A–2; B–1; C–3; D–4

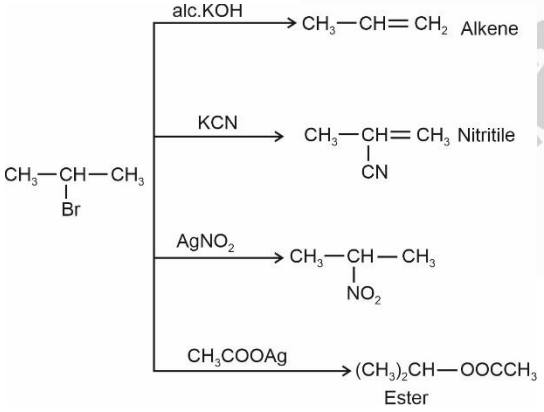
(2) A–2; B–1; C–4; D–3

(3) A–2; B–3; C–1; D–4

(4) A–1; B–2; C–4; D–3

Answer (2)

Sol.



12. S-I : Tropolone has 8π electron in total.

S-II : π-electrons of C (=O) are involved in aromaticity of tropolone.

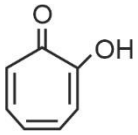
(1) Both S-I and S-II are true

(2) S-I is true, S-II is false

(3) S-I is false, S-II is true

(4) Both S-I and S-II are false

Answer (2)

Sol. Tropolone 

13.

14.

15.

16.

17.

18.

19.

20.

SECTION - B

Numerical Value Type Questions: This section contains 10 questions. In Section B, attempt any five questions out of 10. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g., 06.25, 07.00, –00.33, –00.30, 30.27, –27.30) using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

21. Consider the reaction

$$Cr_2O_7^{-2} + xH^{\oplus} + Fe^{+2} \longrightarrow yFe^{+3} + 2Cr^{+3} + zH_2O$$

Sum of x, y, z = ?

Answer (27)

Sol. $14H^{\oplus} + Cr_2O_7^{-2} + 6Fe^{+2} \longrightarrow 6Fe^{+3} + 2Cr^{+3} + 7H_2O$

x =14, y = 6, z = 7

x + y + z = 27

22. If the formula of Borax is

$Na_2B_yO_x(OH)_y \cdot zH_2O$, find the value of x + y + z?

Answer (17)

Sol. Formula is $Na_2B_4O_5(OH)_4.8H_2O$

$\therefore$ x = 5

y = 4

z = 8

x + y + z = 17

23. Given length of body diagonal of unit cell is 4 Å. Find the radius of Na atom forming bcc lattice (in Å).

Answer (1)

Sol. $4r = \sqrt{3}a$

$$r = \frac{\sqrt{3}\,a}{4}$$

$$r = \frac{4}{4} = 1\ \text{Å}$$

24. Find the orbital angular momentum of 3*s* orbital.

Answer (0)

Sol. Orbital angular momentum is given by $\sqrt{l(l+1)}$, l is the azimuthal quantum number.

For 's' orbital l = 0

$\therefore$ Orbital angular momentum = 0

25. Number of stereoisomers of $[Cr(OX)_2ClBr]^-$

Answer (03.00)

Sol. cis-2

Trans-1

26. Find out PH of resultant solution obtained when 20 mL of 0.1 M NaOH is mixed with 50 mL of 0.1 M CH_3COOH

pK_a of CH_3COOH = 4.74

log2 = 0.30; log3 = 0.47

Answer (04.57)

Sol.

$$\underset{\substack{2\\\downarrow\\0}}{CH_3COOH} + \underset{\substack{5\\\downarrow\\3}}{NaOH} \longrightarrow \underset{\substack{-\\\downarrow\\2}}{CH_3COONa} + \underset{-}{H_2O}$$

$$pH = pK_a + \log\frac{2}{3}$$

$$= 4.74 + 0.30 - 0.47$$

$$= 4.57$$

27. 23% NaCl and 19.5% $MgCl_2$ is present in salt water by weight. The degree of dissociation of both the salts is 100%. Find the normal boiling point of salt water (in ºC). (K_b = 0.52 K kg mol^{-1}) (Nearest integer)

Answer (113)

Sol. $\Delta T_b = iK_bm$

$$= \left(\frac{23\times2\times1000}{(58.5)\times57.5} + \frac{3\times19.5\times1000}{95\times57.5}\right)\times0.52$$

$$= \frac{(7.86+6.16)\times0.52}{57.5}\times100 \simeq 12.66$$

$\therefore$ Boiling point $\simeq 113^oC$

28. Consider a reaction

$A(g) \rightarrow 2B(g) + C(g)$

Initial pressure (P_i) = 800 mm Hg.

At 10 minutes, total pressure is 1600 mm Hg, then find the total pressure at 30 minutes. (in mm Hg)

Answer (2200)

Sol.

$A(g) \rightarrow 2B(g) + C(g)$

800 — —

800-p 2p p

At 10 minutes, $P_{total} = 800 + 2p = 1600$

p = 400 mm Hg.

$\therefore$ 10 minutes means 1 half life

At t = 30 minutes, $p = \frac{7\times800}{8} = 700$ minutes

$\therefore P_{total} = (800 - 700) + 2 \times 700 + 700$

= 800 + 1400

= 2200 mm Hg.

29.

30.