JEE (MAIN) JANUARY 2023 DATE-30/01/2023 (SHIFT-1)

CHEMISTRY

1. Which of the following is water soluble?

(a) $BeSO_4$ (b) $MgSO_4$ (c) $CaSO_4$ (d) $SrSO_4$

(e) $BaSO_4$

(1) (a) only (2) (a) & (b) (3) (c) only (4) (c) & (d)

Ans. **(2)**

Sol. $BeSO_4$ & $MgSO_4$ are water soluble.

2. During the qualitative analysis of SO_3^{2-} using dil. H_2SO_4, SO_2 gas is evolved which turns $K_2Cr_2O_7$ solution.

(1) Green (2) Black (3) Blue (4) Red

Ans. (1)

Sol. $SO_3^{2-} \xrightarrow[H_2SO_4]{dil} SO_2 \xrightarrow[H^+]{K_2Cr_2O_7} \underset{(green)}{Cr^{3+}} + SO_4^{2-}$

3. Match the following

Atomic number			
(a)	52	(p)	s block
(b)	37	(q)	p block
(c)	65	(r)	d block
(d)	78	(s)	f block

(1) a – (q), b – (p), c – (r), d – (s) (2) a – (q), b – (p), c – (s), d – (r)

(3) a – (s), b – (r), c – (p), d – (q) (4) a – (r), b – (p), c – (q), d – (s)

Ans. (2)

Sol. 52 $\longrightarrow$ p-block

37 $\longrightarrow$ s-block

65 $\longrightarrow$ f-block

78 $\longrightarrow$ d-block

4. If volume of ideal gas is increased isothermally than its internal energy

(1) Increased (2) Remain constant

(3) Decreased (4) Can be increased or decreased

Ans. (2)

Sol. Isothermal process

$\Delta T = 0$

$\Delta U = nC_v dT = 0$

5. Which of the following compounds acts as an inhibitor for cancer growth.

(1) Cisplatin (2) EDTA (3) Cobalt (4) Ethane 1,2-diamine

Ans. (1)

Sol. Cisplatin $[Pt(NH_3)_2Cl_2]$

6. Order of strength of ligands S^{-2}, CO, en, $C_2O_4^{-2}$, NH_3

(1) $S^{-2} < C_2O_4^{-2} < NH_3 < en < CO$

(2) $C_2O_4^{-2} < S^{-2} < NH_3 < CO < en$

(3) $NH_3 < C_2O_4^{-2} < S^{-2} < CO < en$

(4) $CO < en < NH_3 < C_2O_4^{-2} < S^{-2}$

Ans. (1)

Sol. Order of strength of ligand $S^{-2} < C_2O_4^{-2} < NH_3 < en < CO$

7. Number of lone pairs in central atom of following species
IF_7, ICl_4^-, XeF_2 & XeO_3

(1) 0, 2, 3, 1 (2) 3, 2, 1, 0 (3) 1, 2, 0, 3 (4) 0, 2, 3, 1

Ans. (1)

Sol.

Species	No. of lone pair
IF_7	0
ICl_4^-	2
XeF_2	3
XeO_3	1

8. Which of the following reaction can be used to prepared $LiAlH_4$

(1) $LiCl + AlCl_3$ (2) $LiH + Al(OH)_3$ (3) $LiH + AlCl_3$ (4) None of these

Ans. (3)

Sol. $8LiH + 2AlCl_3 \rightarrow 2LiAlH_4 + 6LiCl$

9. Permanganate reacts in acidic medium to produce Mn^{2+}. Calculate number of electrons used.

Ans. 5

Sol. $5e^- + 8H^+ + MnO_4^- \longrightarrow Mn^{+2} + 4H_2O$

10. Speed of e^- in 7^{th} orbit is 3.6×10^6 m/s then find speed in 3^{rd} orbit

(1) 3.6×10^6 m/s (2) 8.4×10^6 m/s (3) 7.5×10^6 m/s (4) 1.8×10^6 m/s

Ans. (2)

Sol. $V = 2.18 \times 10^6 \times \frac{Z}{n}$ m/s

$3.6 \times 10^6 = 2.18 \times 10^6 \times \frac{Z}{7}$,,,,,, (1)

$V = 2.18 \times 10^6 \times \frac{Z}{3}$

$= \frac{3.6 \times 10^6}{V} = \frac{Z}{7} \times \frac{3}{Z}$

$= \frac{3.6 \times 10^6}{V} = \frac{1 \times 3}{7}$

$V = \frac{3.6 \times 10^6 \times 7}{3}$

$= 8.4 \times 10^6$ m/s

11. If rate constant K is 2.011 min^{-1} for radioactive decay reaction. Calculate time period for changing mass of radioactive element from 7 gram to 2 gram.

$[\log_{10}7 = 0.84, \log_{10}2 = 0.30]$

Ans. 0.618 min.

Sol. $t = \frac{1}{K} \ln\left[\frac{7}{2}\right]$

$= \frac{1}{2.011} \ln 3.5$

$= \frac{2.303}{2.011} \log_{10} 3.5$

$= \frac{2.303}{2.011} [0.84 - 0.30]$

$= \frac{2.303}{2.011} \times 0.54 = 0.618$

12. Molarity of CO_2 in soft drink is 0.2M. The volume of soft drink is 300 ml. Volume of CO_2 (in L) at STP present in soft drink is

Ans. 1.362 L

Sol. $n_{CO_2} = M \times V = \frac{0.2 \times 300}{1000} = \frac{6}{100}$

V_{CO_2} at STP = $\frac{6}{100} \times 22.7$

= 1.362 L

13. Find mole of a non-volatile solute dissolved in 30g water. The solution have boiling point 373.52K & $K_{b\,(water)}$ = 0.52 K Kg/mol.

Ans. 0.03 mole

Sol. (i = 1) Considering solute to be non-electrolyte

$\Delta T_b = K_b.m$ $\Delta T_b = 373.52 - 373 = 0.52$ K

$0.52 = 0.52 \times m$

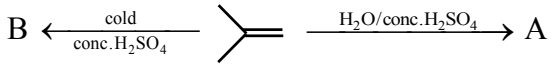
$\Rightarrow m = 1$

$m = \frac{n_{solute}}{W_{solvent(g)}} \times 1000$

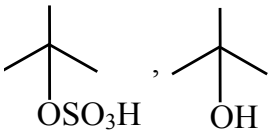
$1 = \frac{n_{solute}}{30} \times 1000$

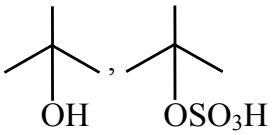
n_{solute} = 0.03 mol

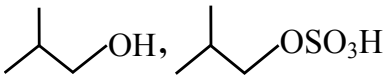
14. Observe the following reactions

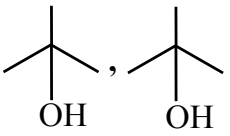


A and B are respectively.

(1) 

(2) 

(3) 

(4) 

Ans. (2)

15. Which of the following acts as antacid?

(1) Brompheniramine (2) Terfenadine

(3) Ranitidine (4) Iproniazid

Ans. (3)

16. Caprolactum when heated at high temperature gives

(1) Nylon-6,6 (2) Nylon-6 (3) Teflon (4) Buna-S

Ans. (2)

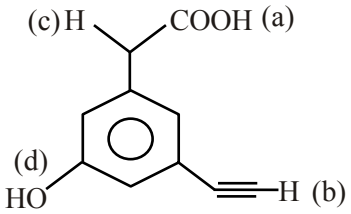
17. Match the following

Column – I	**Column – II**
(p) $CH_3–Cl + NaI \xrightarrow{\text{Acetone}} CH_3–I$	(i) Swart's reaction
(q) $Ph–Cl \xrightarrow[\text{dry ether}]{Na} Ph–Ph$	(ii) Finkelstein reaction
(r) $CH_3–Cl \xrightarrow[DMF]{AgF} CH_3–F$	(iii) Fittig reaction
(s) $Ph-\overset{\oplus}{N}\equiv N\overset{\ominus}{Cl} \xrightarrow{Cu_2Cl_2 + HCl} Ph–Cl$	(iv) Sandmeyer's reaction

	p	q	r	s
(1)	iii	i	ii	iv
(2)	ii	iii	i	iv
(3)	iv	iii	ii	i
(4)	i	ii	iii	iv

Ans. (2)

18. Which of the following is correct acidic strength order for the marked hydrogen in the given compound ?



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

Ans. (1)

19. Consider the following reactions.

$NO_2 \xrightarrow{UV} A + B$

$A + O_2 \longrightarrow C$

$B + C \longrightarrow NO_2 + O_2$

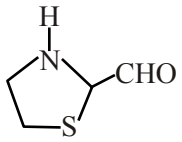
Find A,B & C respectively

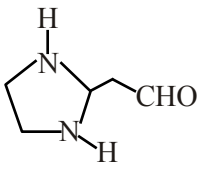
(1) NO, O_3, O (2) O, NO, O_3

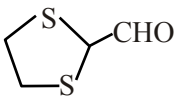
(3) NO, O , O_3 (4) O_3, O, NO

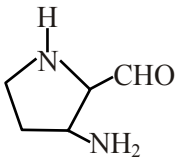
Ans. (2)

20. Which of the following compound gives positive test with Fehling solution and blood red colour when fused with sodium metal followed by neutral $FeCl_3$ solution?

(1) 

(2) 

(3) 

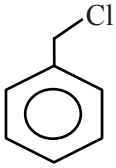
(4) 

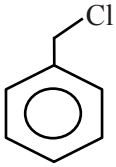
Ans. (1)

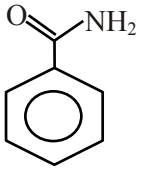
Sol. –CHO group gives positive Tollen′s test where as,

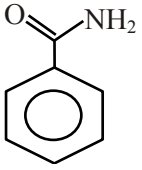
$Na + S + C + N \xrightarrow{\Delta} NaSCN \xrightarrow{FeCl_3} \underset{\text{Blood red colour}}{Fe(SCN)_3}$

21. Which of the following reaction will yield benzyl isocyanide as a major product?

(1)  + KCN $\longrightarrow$

(2)  + AgCN $\longrightarrow$

(3)  + Br_2 $\xrightarrow{NaOH}$

(4)  + $LiAlH_4$ $\longrightarrow$

Ans. (2)

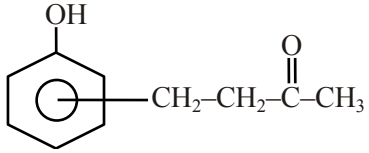
22. Mark correct answer on the basis of following two statements.
Statement-I : Ketoses give seliwanoff's test faster than aldose.
Statement-II : When heated, fructose (ketose sugar) is more rapidly dehydrated than glucose (aldose sugar).
(1) Both statements are true.
(2) Both statements are false.
(3) (I) is true (II) is false.
(4) (II) is true (I) is false.

Ans. (1)

23. Compound (A) $(C_{10}H_{12}O_2)$ $\xrightarrow{FeCl_3}$ Positive test
Compound (A) $(C_{10}H_{12}O_2)$ $\xrightarrow{NaOI}$ Positive test

Find the number of π bonds present in compound A

Ans. 4

Sol.  DU = 5 ; no. of π bonds = 4

Since compound gives $FeCl_3$ test so phenolic group is present.
Compound gives NaOI test (Iodoform test), so methyl ketone group should present.