PART : CHEMISTRY

1. Match the following :

	List-I (Atomic Number)		List-II (Block)
(A)	63	(P)	s-block
(B)	37	(Q)	p-block
(C)	76	(R)	d-block
(D)	54	(S)	f-block

(1) A – S ; B – P ; C – R ; D – Q (2) A – P ; B – S ; C – Q ; D – R
(3) A – R ; B – S ; C – P ; D – Q (4) A – Q ; B – P ; C – S ; D – R

Ans. (1)

Sol.

Atomic number	Electronic configuration	Block
(A) Z = 63	[Xe] $4f^7\ 6s^2$	f-block
(B) Z = 37	[$_{36}$Kr] $5s^1$	s-block
(C) Z = 76	[$_{54}$Xe] $4f^{14}\ 6s^2\ 6d^6$	d-block
(D) Z = 54	[$_{36}$Kr] $4f^{10}\ 5s^2\ 5p^6$	p-block

2. Which of the following are readily soluble in water

(A) $BeSO_4$ (B) $MgSO_4$ (C) $SrSO_4$ (D) $BaSO_4$

(1) A & B only (2) D & E only (3) C & D only (4) None of these

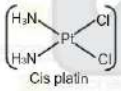
Ans. (1)

Sol. $BeSO_4$ and $MgSO_4$ are readily soluble in water. The greater hydration enthalpies of Be^{2+} and Mg^{2+} ions overcome the lattice enthalpy factor and hence sulphates of Be^{+2} & Mg^{+2} are soluble in water.

3. The compound effectively inhibit the growth of tumors is :

(1) Cis-platin (2) EDTA (3) Cobalt (4) $[(Ph_3P)_2RhCl]$

Ans. (1)

Sol.  used to inhibit the growth of tumors.

Cis platin

4. The SO_2 gas evolved during qualitative analysis of SO_3^{-2} using dilute H_2SO_4, turns $K_2Cr_2O_7$ solution to ..... colour.

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

Ans. (1)

Sol. $Cr_2O_7^{-2} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$
(Orange Red) (Green)

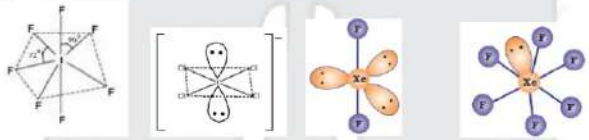
5. Match the following :

	Column-I (Species)		Column-II (No. of lone pairs on central atom)
(A)	IF_7	(P)	0
(B)	ICl_4^-	(Q)	1
(C)	XeF_2	(R)	2
(D)	XeF_6	(S)	3

(1) A – R ; B – P ; C – S ; D – Q (2) A – P ; B – R ; C – Q ; D – S
(3) A – P ; B – R ; C – S ; D – Q (4) A – P ; B – S ; C – R ; D – Q

Ans. (3)

Sol.



IF_7 ICl_4^- XeF_2 XeF_6

6. Volume of an ideal gas double isothermally, then change in internal energy is ..... J.

Ans. (0)

Sol. $\Delta U = \frac{F}{2} nR\Delta T$ (where F = degree of freedom)

as process is isothermal so $\Delta T = 0$

so $\Delta U = 0$

7. The formation of $LiAlH_4$ can be done by using :

(1) $LiCl + Al_2H_6$ (2) $LiH + Al(OH)_3$
(3) $LiH + AlCl_3$ (4) $LiCl + Al + H_2$

Ans. (3)

Sol. $4LiH + AlCl_3 \longrightarrow Li[AlH_4] + 3LiCl$

8. How many electrons are involved in the reduction of MnO_4^- to MnO_2 in acidic medium ?

Ans. (3)

Sol. $\overset{+7}{MnO_4^-} + 4H^+ + 3e^- \longrightarrow \overset{+4}{MnO_2} + 2H_2O$

Number of electrons involved in this reaction is 3.

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9. 600 ml, 0.01 M HCl is mixed with 400 mL 0.01 M H_2SO_4 solution. The pH of mixture solution is __$\times 10^{-2}$.
(Given log7 = 0.845, log 2 = 0.3010)

Ans. (185)

Sol.

	$HCl \longrightarrow$	$H^+ + Cl^-$
Mili moles	0.01×600	6
	$H_2SO_4 \longrightarrow$	$2H^+ + SO_4^{-2}$
Mili moles	0.01×400	$2\times4=8$

$$[H^+] = \frac{8+6}{1000} = 14\times10^{-3}$$

$pH = -\log(14\times10^{-3})$
$= 3 - \log14$
$= 3-\log(2\times7)$
$= 3-\log2-\log7$
$= 3 - 0.301 - 0.845$
$= 1.854 = 185.4\times10^{-2}$

10. Which of the following statements are correct regarding OF_2 molecule ?
(a) It has two lone pairs on oxygen atom.
(b) Oxidation state of oxygen is –2
(c) Shape of the molecule is linear
(d) Shape of the molecule is bent
(e) The F–O–F bond angle is less than 104.5°.
(1) A, D and E only (2) A, B and C only
(3) A, B, D and E only (4) A, C and E only

Ans. (1)

Sol.  (Bent shape)

Oxidation number of oxygen is +2.

11. The speed of electron in the 7th orbit of hydrogen atom is 3.6×10^6 m/s, then the speed of electron in the 3rd orbit is :
(1) 3.6×10^6 m/s (2) 8.4×10^6 m/s (3) 7.5×10^5 m/s (4) 1.8×10^6 m/s

Ans. (2)

Sol. $V_n = V_1 \times \frac{Z}{n}$ m/s

$(V_7)_H = V_1 \times \frac{1}{7}$ m/s

$3.6\times10^6 = V_1 \times \frac{1}{7}$

$(V_1)_H = V_1 = 3.6\times7\times10^6$ m/s

$(V_3)_H = V_1 \times \frac{Z}{3}$

$= 1.2\times7\times10^6$ m/s
$= 8.4\times10^6$ m/s

12. The mass of CO_2 in 0.01 M, 300 ml soft drink is ___$\times10^{-3}$ gram (nearest integer)

Ans. (132)

Sol. Number of mole of $CO_2 = M\times V\times10^{-3}$

12. The mass of CO_2 in 0.01 M, 300 ml soft drink is ___$\times 10^{-3}$ gram (nearest integer)

Ans. (132)

Sol. Number of mole of $CO_2 = M \times V \times 10^{-3}$

$= 0.01 \times 300 \times 10^{-3}$

$= 0.01 \times 0.3$

$= 3 \times 10^{-3}$ mole

Mass of $CO_2 = 44 \times 3 \times 10^{-3}$ gram

$= 132 \times 10^{-3}$ gram

13. Decomposition of a compound A takes place with first order reaction with $K = 2.011 \times 10^{-2}$ sec^{-1}, then time required to reduce mass of substance from 7 gram to 2 gram is _____ sec. [Nearest integer]
[log7 = 0.84, log2 = 0.30]

Ans. (62)

Sol. $K = \frac{1}{t}\ln\left(\frac{a}{a-x}\right)$

$K = \frac{1}{t}\ln\left(\frac{w_0}{w_t}\right)$

$t = \frac{1}{K}\ln\left(\frac{7}{2}\right)$

$t = \frac{2.303}{K}[\log 7 - \log 2]$

$= \frac{2.303}{K}[0.84 - 30]$

$= \frac{2.303}{2.011\times 10^{-2}} \times 0.54 = 61.8$ sec

14. The increasing order of field strength of following ligands is :
S^{2-}, $C_2O_4^{2-}$, NH_3, en, CO

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

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

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

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

Ans. (1)

Sol. From spectro chemical series

$I^- < Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4^{2-} < H_2O$

$NCS^- < edta^{4-} < NH_3 < en < CN^- < CO$.

15. In qualitative analysis of cations which of the following is not a group IV cation :

(1) Fe^{3+} (2) Ni^{2+} (3) Zn^{2+} (4) Co^{2+}

Ans. **(1)**

Sol. Group IV cations are :

Zn^{2+}, Mn^{2+}, Co^{2+} and Ni^{2+}

Hence answer is Fe^{3+}

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16. The role of SiO_2 in copper extraction is :

(1) Converts FeO to $FeSiO_3$

16. The role of SiO_2 in copper extraction is :
(1) Converts FeO to $FeSiO_3$
(2) Converts CaO to $CaSiO_3$
(3) Reduces Cu_2S to Cu
(4) Reduces Cu_2O to Cu

Ans. (1)

Sol. The ore is heated in a reverberatory furnace after mixing with silica. In the furnace, iron oxide 'slags of' as iron silicate

$FeO + SiO_2 \longrightarrow FeSiO_3$ (slag)

17. A solution containing 2 g a solute and 20 g water has boiling point 373.52 K. The molecular mass (g/mol) of solute is : (Given $k_b = 0.52$ K.kg/mol & solute is non-electrolyte)

Ans. 100

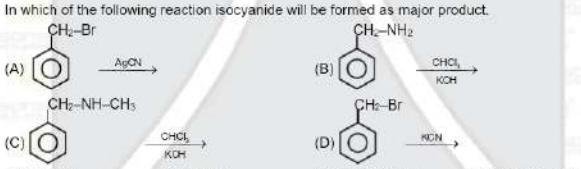
Sol. $\Delta T_b = k_b m$

$$(373.52 - 373) = 0.52 \times \left(\frac{2 \times 1000}{M \times 20}\right)$$

$$M = \frac{2 \times 1000}{20} = 100 \text{ g/mol}$$

Molecular mass of solute = 100 gm/mol.

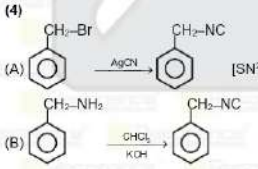
18. In which of the following reaction isocyanide will be formed as major product.



(1) (A) only (2) (B) only (3) (B) & (C) only (4) (A) & (B) only

Ans. **(4)**

Sol.



19. **Statement-1 :** Ketose give seliwanoff test faster than aldose.
Statement-2 : Ketose give furfuraldehyde derivative with α-Napthol and conc. H_2SO_4.
(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

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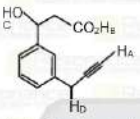
Ans. (1)

Sol. **Statement-1**: Ketose-(example Fructose) gives fiery red solution at faster rate than aldose

Ans. (1)

Sol. **Statement-1**: Ketose-(example Fructose) gives fiery red solution at faster rate than aldose
Statement-2: All carbohydrate (Aldose or Ketose) gives furfural derivative with 5% α-Napthol solution and a few drops of conc. H_2SO_4.

20.



Which of the given hydrogen is most acidic.
(1) A (2) B (3) C (4) D

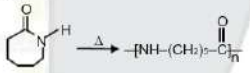
Ans. (2)

Sol. (–COOH) carboxylic acid is more acidic than alcohol or terminal alkyne.

21. Caprolactam when heated at high temperature gives :
(1) Nylon 6, 6 (2) Dacron (3) Teflon (4) Nylon 6

Ans. (4)

Sol.

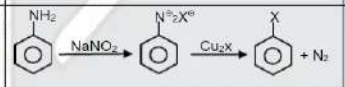
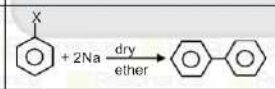
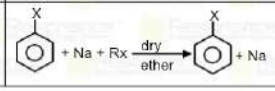


22. Which of the following is Antacid.
(1) Ranitidine (2) Brompheniramine (3) Iproniazid (4) Morphine

Ans. (1)

Sol. Ranitidine is an antacid. It is an antihistamine and decreases the reaction of gastric juice in stomach.

23. Match the column :

	Column-I		Column -II
(A)	$C_2H_5Cl + NaI \rightarrow C_2H_5\text{-}I + NaCl$	(i)	Sandmeyer's reaction
(B)		(ii)	Finkelstein reaction
(C)		(iii)	Wurtz-fitting reaction
(D)		(iv)	Fitting reacting

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

Ans. (4)

Sol. Based on historical facts.

24. The reactions taking place in photochemical smog formation is :

24. The reactions taking place in photochemical smog formation is :

(i) $NO_2 \xrightarrow{h\nu} A + B$

(ii) $B + O_2 \longrightarrow C$

(iii) $A + C \longrightarrow NO_2 + O_2$

A, B, C are respectively.

(1) NO, O, O_3 (2) O_3, NO, O (3) N_2O, O, O_3 (4) NO, O, NO_2

Ans. **(1)**

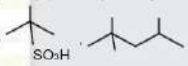
Sol. (i) $NO_2 \xrightarrow{h\nu} \underset{A}{NO} + \underset{B}{O}$

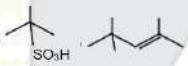
(ii) $O + O_2 \longrightarrow \underset{C}{O_3}$

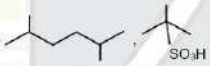
(iii) $NO + O_3 \longrightarrow NO_2 + O_2$

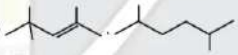
25. (A) $\xleftarrow[H_2SO_4]{\text{cold}}$ $\xrightarrow[80°C\ (Hot)]{H_2SO_4}$ (B)

(A) and (B) are respectively.

(1) 

(2) 

(3) 

(4) 

Ans. **(2)**

Sol.