

SECTION A

1 Select the incorrect statement for classical smog:

1.	It occurs in a cool humid climate.
2.	It is also called oxidizing smog.
3.	It is a mixture of smoke, fog, and sulfur dioxide.
4.	A mixture of smoke, fog, and sulfur dioxide is reducing in nature.

2 The compound prepared by prolonged electrolysis of water is-

1. CO₂
2. Methanol
3. Formaldehyde
4. Heavy water

3 The following do/does not cause water pollution:

1. Heavy metals such as Cd, Pb, Hg
2. Detergents
3. Polychlorobiphenyls
4. Freons

4 Considering Ellingham diagram, which of the following metals can be used to reduce alumina?

1. Fe
2. Zn
3. Mg
4. Cu

5 The element whose salts cannot be detected by the flame test is

1. Mg
2. Na
3. Ca
4. Sr

6 Why does hydrogen iodide (HI) have a higher boiling point than hydrogen bromide (HBr)? [Atomic numbers: bromine = 35; iodine = 53]

1.	The iodide ions in HI are larger than the bromide ions in HBr
2.	The H – I covalent bond is stronger than the H – Br covalent bond.
3.	There are hydrogen bonds between HI molecules but not between HBr molecules.
4.	The dispersion forces between HI molecules are stronger than those between HBr molecules.

7 CaCl₂ and Ca(OCl)₂ are components of:

1. gypsum
2. Portland cement
3. bleaching powder
4. lime water

8 Match the items of Column I with items of Column II and assign the correct code.

Column I	Column II
A Blistered Cu	1. Aluminium
B Blast furnace	2. $2\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \rightarrow 6\text{Cu} + \text{SO}_2$
C Reverberatory furnace	3. Iron
D Hall-Heroult process	4. $\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3$
	5. $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$

Codes

	A	B	C	D
1.	2	3	4	1
2.	1	2	3	5
3.	5	4	3	2
4.	4	5	3	2

9

BCl_3 accepts a lone pair of electrons from NH_3 to form y. The geometry of y is different from that of BCl_3 . Select the correct option for y and change in geometry from BCl_3 to y :

1. $y = \text{BCl}_3 \cdot \text{NH}_3$; planar to tetrahedral.
2. $y = \text{BCl}_3 \cdot \text{NH}_3$; planar to square planar.
3. $y = \text{B}(\text{NH}_3)\text{Cl}_2$; planar to tetrahedral.
4. $y = \text{B}(\text{NH}_2\text{Cl}_3) \text{HCl}$; planar to square planar.

10 Match List-I with List-II.

	List-I		List-II
(a)	Li	(i)	absorbent for carbon dioxide
(b)	Na	(ii)	electrochemical cells
(c)	KOH	(iii)	coolant in fast breeder reactors
(d)	Cs	(iv)	photoelectric cell

Choose the correct answer from the options given below:

	(a)	(b)	(c)	(d)
1.	(ii)	(iii)	(i)	(iv)
2.	(iv)	(i)	(iii)	(ii)
3.	(iii)	(iv)	(ii)	(i)
4.	(i)	(iii)	(iv)	(ii)

11 The correct statement regarding lithium is:

1.	It forms Li_2O when burnt in O_2
2.	It has lower melting and boiling point than other alkali metals.
3.	Its compound shows ionic character.
4.	Lithium is much softer than other alkali metals.

12 Choose the correct statement:

1.	Both diamond and graphite are used as dry lubricants.
2.	Diamond and graphite have a two-dimensional network.
3.	Diamond is covalent and graphite is ionic.
4.	Diamond is sp^3 hybridised and graphite is sp^2 hybridized.

13 Which of the following oxides is acidic in nature?

- B_2O_3
- Al_2O_3
- Ga_2O_3
- In_2O_3

14 Which among the following group metals do not form hydride?

- Group-7, 8 and 9
- Group-6, 7 and 8
- Group-8, 9 and 10
- Group-9, 10 and 11

15 Select the incorrect statement among the following:

1.	Diborane is a highly toxic gas
2.	Higher boranes spontaneously flammable in air
3.	Diborane undergoes cleavage reactions with Lewis acids
4.	Boranes readily hydrolyzed to give boric acid

16 The sum of neutrons and protons in all the isotopes of hydrogen will be

- 3
- 4
- 5
- 6

17 Which of the following can't exist?

- $\text{LiCl} \cdot 2\text{H}_2\text{O}$
- $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
- $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$
- $[\text{BeF}_6]^{4-}$

18

Assertion (A):	Nitrogen and Oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen.
Reason (R):	The reaction between nitrogen and oxygen requires a high temperature.

1.	Both (A) and (R) are true and (R) is the correct explanation of (A).
2.	Both (A) and (R) are true but (R) is not the correct explanation of (A).
3.	(A) is true but (R) is false.
4.	Both (A) and (R) are false.

19 The molecule which is not produced on partial as well as complete hydrolysis of XeF_6 is

- XeOF_2
- XeOF_4
- XeO_2F_2
- XeO_3

20 The reaction of NO with N_2O_4 at 250 K gives :

- N_2O_5
- NO_2
- N_2O
- N_2O_3

21 In which of the following reactions conc. H_2SO_4 is used as an oxidising reagent?

a.	$\text{CaF}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + 2\text{HF}$
2.	$2\text{HI} + \text{H}_2\text{SO}_4 \rightarrow \text{I}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$
3.	$\text{Cu} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
4.	$\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$

Choose the correct option

- (a, b)
- (b, c)
- (c, d)
- (a, d)

22 The oxoacid of sulfur that does not contain a bond between sulfur atoms is:

- $\text{H}_2\text{S}_2\text{O}_7$
- $\text{H}_2\text{S}_2\text{O}_3$
- $\text{H}_2\text{S}_4\text{O}_6$
- $\text{H}_2\text{S}_2\text{O}_4$

23 On heating with concentrated NaOH solution in an inert atmosphere of CO_2 white phosphorus gives a gas. Which of the following statement is incorrect about the gas?

1.	It is highly poisonous and has smell like rotten fish
2.	Its solution in the water, decomposes in the presence of light
3.	It is more basic than NH_3
4.	It is less basic than NH_3

24 The structure of IF_7 is :

- Square pyramidal
- Trigonal bipyramidal
- Octahedral
- Pentagonal bipyramidal

25 In a molecule of pyrophosphoric acid, the number of $\text{P}-\text{OH}$, $\text{P}=\text{O}$ and $\text{P}-\text{O}-\text{P}$ bonds/moiety (ies) respectively are :

- 4, 2 and 0
- 2, 4 and 1
- 4, 2 and 1
- 3, 3 and 3

26 Which one is not a D-sugar?

1.	$\begin{array}{c} \text{CHO} \\ \\ \text{HO}-\text{C}-\text{H} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{CH}_2\text{OH} \end{array}$	2.	$\begin{array}{c} \text{CHO} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{HO}-\text{C}-\text{H} \\ \\ \text{CH}_2\text{OH} \end{array}$
3.	$\begin{array}{c} \text{CHO} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{CH}_2\text{OH} \end{array}$	4.	$\begin{array}{c} \text{CH}_2\text{OH} \\ \\ \text{C}=\text{O} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{CH}_2\text{OH} \end{array}$

27 The most stable ion is :

- $[\text{Fe}(\text{OH})_5]^{3-}$
- $[\text{FeCl}_6]^{3-}$
- $[\text{Fe}(\text{CN})_6]^{3-}$
- $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

28 Assertion: $[\text{Ti}(\text{H}_2\text{O})_6]^{4+}$ is colored while $[\text{Sc}(\text{H}_2\text{O})_6]^{3+}$ is colorless.

Reason: $d-d$ transition is not possible in $[\text{Sc}(\text{H}_2\text{O})_6]^{3+}$.

- Both assertion and reason are true and the reason is the correct explanation of assertion.
- Both assertion and reason are true but the reason is not the correct explanation of assertion.
- Assertion is true but the reason is false.
- Assertion is false but the reason is true.

29 Which one of the following complexes is an outer orbital complex?

(Atomic number $\text{Mn}=25$, $\text{Fe}=26$, $\text{Co}=27$, $\text{Ni}=28$)

- $[\text{Fe}(\text{CN})_6]^{4-}$
- $[\text{Mn}(\text{CN})_6]^{4-}$
- $[\text{Co}(\text{NH}_3)_6]^{3+}$
- $[\text{Ni}(\text{NH}_3)_6]^{2+}$

30 The correct order of the following elements with respect to their density is-

- $\text{Cr} < \text{Zn} < \text{Co} < \text{Cu} < \text{Fe}$
- $\text{Zn} < \text{Cu} < \text{Co} < \text{Fe} < \text{Cr}$
- $\text{Zn} < \text{Cr} < \text{Fe} < \text{Co} < \text{Cu}$
- $\text{Cr} < \text{Fe} < \text{Co} < \text{Cu} < \text{Zn}$

31 Statement I: Cr^{2+} is a stronger reducing agent than Fe^{2+} .

Statement II: Fe^{2+} is a stronger reducing agent than Cr^{2+} .

- Both statements I and II are true.
- Statement I is true and statement II is false.
- Both statements I and II are false.
- Statement I is false, statement II is true.

32 Both Co^{3+} and Pt^{4+} have a coordination number of six. Which of the following pairs of complexes will show approximately the same electrical conductance in dilute aqueous solutions?

- $\text{CoCl}_3 \cdot 6\text{NH}_3$ and $\text{PtCl}_4 \cdot 5\text{NH}_3$
- $\text{CoCl}_3 \cdot 4\text{NH}_3$ and $\text{PtCl}_4 \cdot 4\text{NH}_3$
- $\text{CoCl}_3 \cdot 3\text{NH}_3$ and $\text{PtCl}_4 \cdot 5\text{NH}_3$
- $\text{CoCl}_3 \cdot 6\text{NH}_3$ and $\text{PtCl}_4 \cdot 3\text{NH}_3$

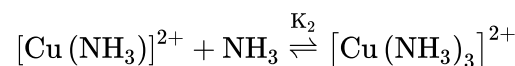
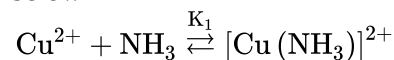
33 Among the following, the species that is both tetrahedral and diamagnetic is-

- $[\text{Ni}(\text{CN})_4]^{2-}$
- $[\text{Ni}(\text{CO})_4]$
- $[\text{NiCl}_4]^{2-}$
- $[\text{Cu}(\text{NH}_3)_4]^{2+}$

34 In a mildly alkaline medium, thiosulphate ion is oxidized by MnO_4^- to "A". The oxidation state of sulphur in "A" is-

- +4
- +2
- 2
- +6

35 The stepwise formation of $[\text{Cu}(\text{NH}_3)_4]^{2+}$ is given below



The value of stability constants K_1 , K_2 , K_3 and K_4

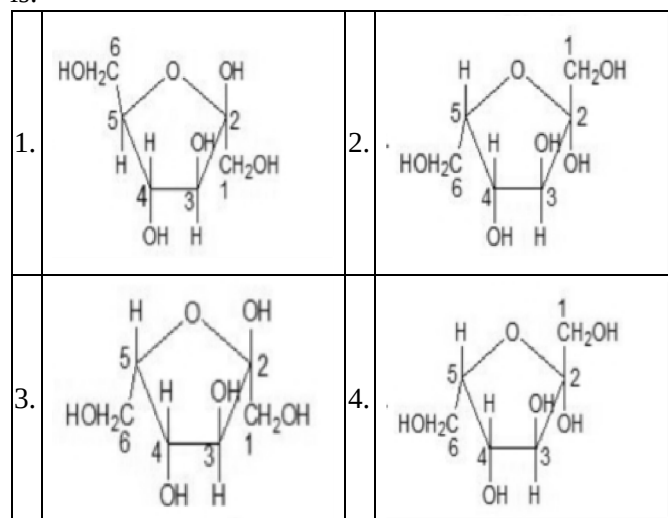
are 10^4 , 1.58×10^3 , 5×10^2 and 10^2 respectively. The overall equilibrium constants for the dissociation of $[\text{Cu}(\text{NH}_3)_4]^{2+}$ is $x \times 10^{-12}$. The value of x is _____.

(Rounded off to the nearest integer)

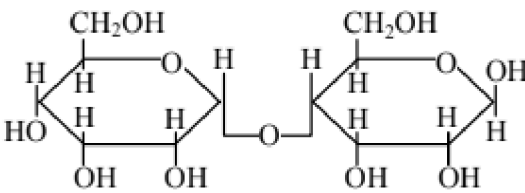
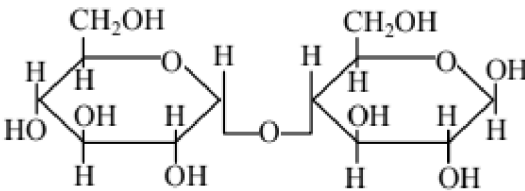
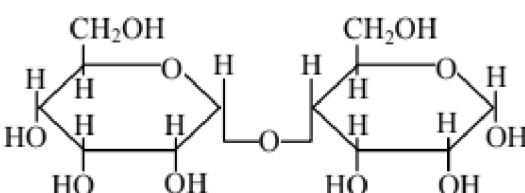
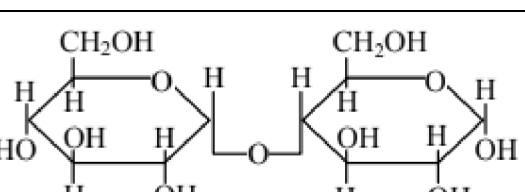
- 2
- 4
- 3
- 1

SECTION B

36 The correct cyclic structure of β -D-fructofuranose is:



37 The correct structure of α -anomer of maltose, among the following is-

1.	
2.	
3.	
4.	

38 In which of the following the metallic bond is the strongest?

1. V
2. Fe
3. Cr
4. Sc

39 The IUPAC name of the complex-
[Ag(H₂O)₂][Ag(CN)₂] is:

1. diaquasilver(I) dicyanidoargentate (I)
2. dicyanidosilver(II) diaquaargentate(II)
3. diaquasilver(II) dicyanidoargentate(II)
4. dicyanidosilver(I) diaquaargentate(I)

40 The factors that may be regarded as the main cause of lanthanoid contraction among the following is-

1.	Greater shielding of 5d electron by 4f electrons
2.	Poorer shielding of 5d electron by 4f electrons
3.	Effective shielding of one of the 4f electrons by another in the sub-shell
4.	Poor shielding of one of the 4f electrons by another in the sub-shell

41 In $[Cr(NH_3)_6][Co(CN)_6]$, the oxidation state of Cr and Co, respectively, are

1. 0 and +6
2. +2 and +4
3. +3 and +3
4. +4 and +2

42 The correct statements among the following are:

(I).	Valence bond theory cannot explain the color exhibited by transition metal complexes.
(II).	Valence bond theory can predict quantitatively the magnetic properties of transition metal complexes.
(III).	Valence bond theory cannot distinguish ligands as weak and strong field ones.

1. (I), (II), and (III)
2. (II), and (III) only
3. (I), and (II) only
4. (I), and (III) only

43 Which of the following is an anionic detergent?

1. Sodium stearate
2. Sodium lauryl sulphate
3. Cetyltrimethyl ammonium bromide
4. Glyceryl oleate

44 Terylene is prepared by the condensation of Ethylene glycol with:

1. Benzene-1,2-dicarboxylic acid
2. Benzene-1,3-dicarboxylic acid
3. Benzene-1,4-dicarboxylic acid
4. Benzoic acid

45 Which of the following compounds is not an antacid?

1. Aluminium hydroxide
2. Cimetidine
3. Phenelzine
4. Ranitidine

46 Step-growth polymer, amongst the following, is

1. Polythene
2. PVC
3. Teflon
4. Nylon-6,6

47 H_2O_2 on oxidation gives :

1. O^{-2}
2. OH^{-}
3. O_2^{-}
4. O_2

48 Which of the following statements about low-density polythene is FALSE?

1. Its synthesis requires high pressure.
2. It is a poor conductor of electricity.
3. Its synthesis requires dioxygen or a peroxide initiator as a catalyst.
4. It is used in the manufacture of buckets, dustbins, etc.

49 Generally water soluble vitamins i.e. B and C cannot be stored in our body except which of the following vitamins:

1. Vitamin B₁
2. Vitamin B₆
3. Vitamin B₁₂
4. Vitamic C

50 The correct match between Item-I and Item-II :

	Item-I		Item-II
(a)	Natural rubber	(I)	1,3-butadiene + styrene
(b)	Neoprene	(II)	1,3-butadiene + acrylonitrile
(c)	Buna-N	(III)	Chloroprene
(d)	Buna-S	(IV)	Isoprene

Options:

	(a)	(b)	(c)	(d)
1.	(III)	(IV)	(I)	(II)
2.	(IV)	(III)	(II)	(I)
3.	(IV)	(III)	(I)	(II)
4.	(III)	(IV)	(II)	(I)

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