	CHEMISTRY RE	VISION-2025	
ENV	Model Paper- 09	Time: 60 minutes	
 Electronic configuration i. ns²np⁴ ii. n 	n of the element with the lowest ns ² np ³ iii. ns ² np ²	t first ionization energy is, iv. ns ² np ⁵ v. ns ² n	ıp ⁶
2. Which of the following hydrogen?	statements is correct regarding	the atomic emission spectrun	n of
i. The radiation correstwavelength.ii. The 3 to 2 transition	sponding to the n = 2 to n = 1 tra n corresponds to the H∝ line.	ansition has the longest	
iii. The first series of lineiv. In a given series, the increasing energy.	nes (Lyman) occurs in the infra-r e separation between adjacent	red region. lines increases in the directior	n of
v. Emission of radiation lower levels.	on occurs when electrons underg	go transition to higher levels f	rom
3. Standard combustion e respectively. Standard e	nthalpies of $C(s)$, $H_2(g)$ and CH enthalpy of formation of CH_3CH	G_3 CH ₂ OH(l) are x, y and z kJ m M_2 OH(l) in kJ mol ⁻¹ is,	nol ⁻¹
i. x + 3y – z iv. 2x + 3y – 2z	ii. 2x + 3y – z v. 3x + 2y – 2z	iii. 2x + y – z	
4. Compound Y contains (C = 52.17%, H = 13.04%, O =	34.79% by mass. Y can be,	
i. CH ₃ CH ₂ OH iv. CH ₃ CH ₂ CHO	ii. CH ₃ OCH ₂ CH ₃ v. CH ₃ CH ₂ CH ₂ OH	iii.CH ₃ – C – CH	3
5. $0.025 \text{ mol dm}^{-3} \text{ KMnC}$ solution in the presence KMnO ₄ was used up. W	O_4 solution was used to titrate 1 e of excess PO_4^{3-} ions. End point What is the oxidation number of	0 cm ³ of 0.1 mol dm ⁻³ FeSC was obtained when 10 cm ³ on Mn at the end point?) ₄ of
i. +2 ii	+3 iii. +4	iv. +5 v. +6	
 5 cm³ of 0.1 mol dm⁻³ solution. Mass of the Pl is completely insoluble 	3 Pb(NO ₃) ₂ solution was mixed bI ₂ (s) precipitate formed in this in water.) (Pb = 207, I = 127)	with 10 cm ³ of 0.02 mol dm reaction is, (Consider that Pb	⁻³ KI I ₂ (s)

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i. 46.1×10^{-2} g	ii. 4.61×10^{-2} g	iii. 4×10^{-3} g	iv. 2×10^{-4} g	v. 1×10^{-3} g
- 0	0	- 0	- 0	- 0

- 7. 10 cm³ of a gaseous hydrocarbon Z was reacted explosively with 100 cm³ of oxygen(excess). Volume of the gaseous products obtained was 80 cm³. When it was bubbled through an alkaline solution, the volume decreased till 40 cm³. If all readings were taken at same temperature and pressure, molecular formula of Z is,
 i. C₃H₈
 ii. C₄H₄
 iii. C₄H₆
 iv. C₄H₈
 v. C₃H₁₀
- 8. Which one of the following will not react with (CH₃)₂CHMgBr?

i. D ₂ (C	ii.	C ₆ H₅CHO	iii. CH₃COOH
iv.	$(CH_3)_2 C = CH_2$		v. HCHO	

9. $0.6 \text{ g of urea} (\text{NH}_2\text{CONH}_2)$ was completely reacted with 12.5 cm³ of 2.0 mol dm⁻³ NaOH until all ammonia evolved. 10 cm³ of HCl solution was required to neutralize the solution resulted above. The concentration of HCl solution is,

 $\begin{array}{cccc} & 2 \text{ NaOH} + \text{ NH}_2\text{CONH}_2 \rightarrow \text{Na}_2\text{CO}_3 + 2 \text{ NH}_3 \\ \text{i. 0.1 mol } dm^{-3} & \text{ii. 0.5 mol } dm^{-3} & \text{iii. 1.0 mol } dm^{-3} \\ \text{iv. 1.5 mol } dm^{-3} & \text{v. 2.5 mol } dm^{-3} \end{array}$

 $10.1.61 \times 10^{-3}$ mol of MnO₄ was required to oxidize 2.68×10^{-3} mol of Aⁿ⁺ to AO₃ in the
presence of NaOH. What is the best value of **n**?i. 1ii. 2iii. 3iv. 4v. 5

11.Number of moles of $KMnO_4$ required to completely react with 144 g of FeC_2O_4 in the
acidic medium is, (R.M.M. Fe = 56, C = 12, O = 16)i. 5ii. 5/3iii. 3iv. 1/5v. 3/5

12. Which of the following answers contain only basic oxides?

i. V ₂ O ₃ , Mn ₂ O ₇ , CrO ₃	ii. K ₂ 0, Cr ₂ 0 ₃ , MnO ₂	iii. K ₂ 0, VO, MnO
iv. K_2O , MnO_2 , ZnO	v. VO ₂ , MnO ₂ , ZnO	

13. The inorganic compound **X** forms a precipitate with aqueous NH_3 solution which doesn't dissolve in excess NH_3 . When the compound **X** reacts with H_2SO_4 without forming a white but a colourless gas evolves. This gas decolourizes $H^+/KMnO_4$ solution and doesn't change colour of a $Cu(NO_3)_2$ solution. **X** can be,

i. $MgCO_3$ ii. Na_2SO_3 iii. CuS iv. BaS v. $MgSO_3$

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14. Which of the following answers correctly shows the variation of bond angle in the molecules NH₃, PH₃ and AsH₃?

i. $NH_3 > PH_3 > AsH_3$ ii. $AsH_3 > PH_3 > NH_3$ iii. $PH_3 = NH_3 = AsH_3$ iv. $PH_3 > AsH_3 > NH_3$ v. $AsH_3 > NH_3 > PH_3$

Follow the instructions given below for the questions from 15 to 20.

(1)	(2)	(3)	(4)	(5)
Only (<i>a</i>) and	Only (b) and	Only (c) and	Only (<i>d</i>) and (<i>a</i>)	Any other number
(<i>b</i>) are	(c) are correct.	(<i>d</i>) are correct.	are correct.	or combination of
correct.				response is correct.

15. False statement regarding a real gas is,

- a) Always has a higher pressure than an ideal gas.
- b) Never reaches ideal conditions by changing pressure.
- c) For some gases, value of Z can be a positive value.
- d) Cannot be liquefied by applying a pressure all the time.

16. Correct statement/s regarding ionic compounds is/are?

- a) All the ionic compounds dissolve in water.
- b) Aqueous solutions of all the ionic compounds conduct electricity.
- c) Identifying ions in an ionic compound is not possible at solid state.
- d) The solution becomes cold when NaCl dissolves in water.
- 17. Which of the following substances give/s NH_3 gas when heated with NaOH?

a) $CO(NH_2)_2$ b) $Ca(NO_3)_2 + Al$ c) $NaNO_2$ d) $NaNO_3$

18. Correct regarding XeF_2 molecule is,

a) Electron pair geometry of the molecule is trigonal bipyramidal.

- b) Shape of the molecule is linear
- c) Number of repulsive units around the central atom is 3.
- d) Number of atoms in the plane of the molecule is 2.

19. Which of the following statement/s is/are false regarding Sc and Zn?

- a) Compounds formed by Sc and Zn are generally white coloured
- b) Sc and Zn are both not transition elements.
- c) There are no d electrons in the aqueous ions formed by Sc and Zn
- d) Oxides formed by Sc and Zn are insoluble in HCl

20. Which of the following statements/statement concerning hydrogen bonds are/is true?

- a. Hydrogen bonds occur in CH₃CH₂NH₂
- b. Hydrogen bonds occur, in CH₃SiH₂OCH₃
- c. Hydrogen bonds occur in CH₂CH₂OSiCH₃
- d. Hydrogen bonds occur in liquid NH₃.

Follow the instructions given below for the questions from 21 to 25.

In questions No. 21 to 25 two statements are given in respect of each question. From the Table given below, select the response out of the responses (1), (2), (3), (4) and (5) that best fits the two statements given for each of the questions and mark appropriately on your answer sheet.

Response	First Statement	Second Statement
1	True	True and is a correct explanation of the first statement.
2	True	True but does not explain the first statement correctly.
3	True	False.
4	False	True.
5	False	False.

	First Statement	Second Statement
21	A real gas always approaches ideal conditions when the temperature <i>increases</i> .	Rate of collisions increases when the temperature increases.
22	Electrons fills in orbitals with equal energy such that their spins are parallel.	When orbitals with equal energy are present, they first get filled singly and pairs up later.
23	An important step pertaining to the addition of HBr to propene under polar conditions can be depicted as shown below. $CH_3-CH = CH_2 H-Br$	This is an addition reaction in which two free radicals participate.
24	A CuCl ₂ solution can be used to differentiate between SO_2 and H_2S gases.	$CuCl_2$ reacts with H ₂ S and forms S as a product.
25	NO_2^- ion is a linear ion.	There are no lone pair electrons on the central atom of this ion.

STRUCTURED ESSAY / ESSAY QUESTIONS

- 1. a) 20.0 cm³ of KMnO₄ was acidified by dilute H₂SO₄, then reacted with 20.0 cm³ of H₂O₂ completely. 10.0 cm³ of MnSO₄(aq) was reacted with same amount of KMnO₄ solution in basic medium. Then it precipitated dark brown MnO₂. In the presence of dilute H₂SO₄, solution of Na₂C₂O₄ 10.0 cm³ of 0.2 mol dm⁻³ completely dissolved the brown precipitate to form a colourless solution.
 - (i) Write the ionic balanced equation for the reaction between $KMnO_4$ and $H_2O_2(aq)$ in dilute H_2SO_4 medium.
 - Write the ionic balanced equation for the reaction between MnSO₄(aq) and KMnO₄(aq) in basic medium.

- (iii) Write the ionic balanced equation for the reaction between $Na_2C_2O_4$ and MnO_2 in dilute H_2SO_4 medium.
- (iv) Calculate the molarity of $H_2O_2(aq)$ using the reactions you wrote above.

b) Several bottles containing chemicals in the laboratory have come off labels. They contain the following chemicals.

 $K_2CO_3(s)$, $MnO_2(s)$, $Ca(NO_3)_2$, $NaNO_3(s)$, KI(s) and KCI(s). These are named **P**, **Q**, **R**, **S**, **T**, **U** (not in the order written) and the tests and observations made to identify them chemically are provided to you as shown in the table below.

Experiment	Observation
1) Reaction with concentrated HCI.	Only P gave light green gases with bleaching
	properties.
2) Reaction with dilute HCI.	Gaseous bubbles are released from both P and
	Q
3) Adding a little R to the mixture of P	A reddish-brown solution is formed.
and dilute HCl.	
4) Thermal decomposition of	Only S and T are thermally decomposed.
compounds.	
5) Addition of dilute HCI to the residue	Here a gas evolved similar to the gas evolved
from thermal decomposition of S .	from thermal decomposition of S and T . That
	gas is V .

- (i) Identify compounds **P**, **Q**, **R**, **S**, **T**, **U** and gas **V** by analysing the information in the table.
- (ii) Write the balanced chemical equation for obtaining gas **V** from **S**.
- (iii) Write the balanced chemical equation for the reaction between KCl, MnO₂ and H₂SO₄.
- (iv) Which of the given compounds can act as a catalyst?

c) **X** contains *2 cations* from 3d block elements and *2 anions* in aqueous solution. The following procedure was followed for their chemical identification.



v. NF₃, NH₃, CCl₄, AlCl₃, (Bond angle)

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vi. NaCl, KCl, RbCl, LiCl (Melting point)

b. The following questions (i) to (v) are based on the amino acid. The Skelton of which is given below.

i. Draw the most acceptable Lewis structure for the above amino acid.

ii. Draw the 3 resonance structures for the given amino acid molecule and comment on their relative stability.

- iii. Based on the Lewis structure drawn in part (1) state, the following regarding the N¹, C², C³ and C⁴ atoms given in the table.
 - a) VSEPR pairs around atom.
 - b) Electron pair geometry around atom.
 - c) Hybridization of the atom.
 - d) Shape around the atom.

		N ¹	C ²	C ³	C ⁴
a.	VSEPR Paris				
b.	Electron Pair				
	geometry				
C.	Hybridization				
d.	Shape				

iv) Identify the atomic/hybrid orbitals involved in the formation of the following σ bonds in the Lewis structure drawn in Part (i)

e.	$N^1 - C^2$	N^1	 C ²
f.	$C^2 - C^3$	C ²	 C ³
g.	$C^4 - C^5$	N^1	 C ⁵

v) Sketch the shape of the Lewis structure of amino acid drawn in Part (i) indicating approximate values for the bond angles.

b) With respect to each of the species given in the table below, Identify the types of interactions present in each case.

Species	Primary interaction	Secondary interaction
CaCl _{2(s)}		
H ₂ O _(I)		
Graphite _(s)		
Ar _(g)		
K _(s)		



Compound **A** exhibits geometric isomerism while compound **B** and **C** exhibits optical isomerism.

i) Write down the structure of **B**.

Identify each of the carbon atoms in **B** which underwent a change in hybridization in its formation from **A**. Mark these carbon atoms by drawing a circle around each of them in the structure of **B** written by you above.

- ii) **Strike out** the incorrect terms/symbols within the brackets in the sentences given below. note that these sentences refer to the carbon atoms circled by you in (i) above.
 - The hybridization changes from [sp/sp²/sp³] in A to [sp/sp²/sp³] in B.The geometry around the carbon atoms changes from [linear/planar triangular/tetrahedral/octahedral] in A to [linear/planar triangular/tetrahedral/octahedral] in B

iii) Name the reaction mechanism that operates in the conversion of
I) A → B :
c) Citronella is a colourless natural product. $CH_3-C=CH-CH_2-CH_2-C=CH-C-H$ Citronella $\begin{vmatrix} & & & \\ & & & \\ & & & & \\ & & & & \\ & & & CH_3 & O \end{vmatrix}$
 i) Give one chemical test (with observation) to show the presence of the following in citronella: i) carbon carbon double bond test :
observation:
ii) Draw all stereoisomers of citronella.
iii) Citronella may be reduced to an alcohol E with relative molecular mass = 156. E

exhibits optical isomerism. Write down the structure of **E**.

Additional question

P, **Q** and **R** are three coordination complexes. They all have octahedral molecular geometries. Only two of the ligands in each complex **P**, **Q** and **R** are linked to the metal ions. Metal ions in all three complexes have some oxidation number. Molecular formula of the compounds are $CoCl_2H_{12}N_4$, $CoI_2H_{16}N_4O_2$, $CoCl_2H_{15}N_3O_3$ (not in order). Aqueous solution of the above compounds were allowed to react with Pb(CH₃COO)₂ separately and the observations are given below.

Compound	$Pb (CH_3COO)_{2(aq)}$
Р	White precipitate that dissolves in hot water.
Q	Not precipitate.
R	Yellow precipitate that dissolves in hot water.

i. Give the structures of **P**, **Q** and **R**.

ii. Give the chemical formulae of the precipitates formed during the reaction of **P** and **R** with $Pb(CH_3COO)_2$

iii. Give a test for anion / anions in the above compounds, which is / are not linked with the metal ion. (Should not include the tests already given)