UNIT-7: p - BLOCK ELEMENTS

Group-15 elements						
Give reasons for the following (one mark each):						
1.	In group 15 elements, there is considerable increase in covalent radius from N to P					
	but small increase from As to Bi. Why?					
2.	The ionization enthalpies of group 15 elements are higher than those of					
	corresponding members of group 14 and 16 elements.	U				
3.	Bi (V) is a strong oxidizing agent.	U				
4.	$(CH_3)_3P = O$ exists but $(CH_3)_3N = O$ does not.	U				
5.	The boiling point of PH_3 is lesser than NH_3 .	U				
6.	Metallic character increases down the 15th group elements.	U				
7.	NO_2 dimerises to form N_2O_4 .	U				
8.	Cr, Al do not dissolve in concentrated HNO ₃ .	U				
9.	White phosphorus is the most reactive allotrope of the element.	U				
10	. PCl ₃ fumes in moist air.	U				
11	. The five bonds in $PCl_{5(g)}$ are not equivalent.	U				
12	. The basicity of H_3PO_3 is 1.	U				
13	13. H_3PO_2 is a stronger reducing agent than H_3PO_3					
On	e mark questions					
1.	Name the 15th group element that does not exhibit allotropy.	К				
2.	Complete the equation: $3HNO_2 \xrightarrow{disproportionation}$	к				
3.	Write the formula of the halide of nitrogen that is known to be stable.	к				
4.	Give an example for a neutral oxide of nitrogen.	к				
5.	Complete the equation: $PCl_3 + 3H_2O \longrightarrow$	к				
6.	Which oxyacid of phosphorus on disproportionation gives H_3PO_4 and PH_3 ?	К				
Tw	vo mark questions					
1.	N_2 molecule is chemically inert while white phosphorus is more reactive. Give					
	reasons.	U				
2.	2. How is nitrogen prepared in the laboratory? Write the equation for the reaction					
	involved.	к				
2	Ammonium salt $\xrightarrow{+caustic soda} X(g) \xrightarrow{Cu_{aq}^{2+}} Y$ What are X and Y?	к				
J.	$\frac{1}{\Delta} = \frac{1}{\Delta} = \frac{1}$					
4.	4. Complete the following equations :					
	i) $(NH_4)_2Cr_2O_7 \xrightarrow{heat}$ ii) $Ca_3P_2 + 6H_2O_{(I)} \longrightarrow$					

5.	Complete the following equations :					
	i) $Ba(N_3)_2 \xrightarrow{heat}$ ii) $PH_4I + KOH \longrightarrow$	К				
6.	Complete the following equations :					
	i) $Cu + 4HNO_{3 (conc.)} \longrightarrow$ ii) $I_2 + 10HNO_{3}(conc.) \longrightarrow$	К				
7.	Complete the following equations :					
	i) $4Zn + 10HNO_{3(cii)} \longrightarrow$ ii) $P_4 + 20HNO_{3(conc)} \longrightarrow$	к				
8.	Complete the following equation and name the gas liberated:					
٩	P_4 + 3NaOH + 3H ₂ O \longrightarrow					
5.	i) In the solid state PCL exists as an ionic solid. Write the cation and anion in it	к				
10	h_{1} in the solid state PC_{15} exists as an only solid. Write the cation and alloci in h_{1}	S				
11	Draw the structure of $H = 0$. What is its basisity?	S				
11	What is the formula of evolution to the solution $P_{4}P_{2}O_{7}$. What is its basicity:					
12.	what is the formula of cyclotrimetaphosphoric acid? How many P–O–P bonds are	ç				
		5				
Th	ree mark questions:					
1.	Arrange: NH_3 , PH_3 , AsH_3 , SbH_3 , BiH_3 as directed.					
	i) increasing order of base strength ii) decreasing order of stability					
	iii) decreasing order of reducing character	U				
2.	For the preparation of ammonia by Haber's process,					
	i) Write the balanced chemical equation ii) mention the reaction conditions					
	iii) Draw the flow chart					
3.	How is HNO ₃ prepared commercially by Ostwald process? Write chemical					
	equations for the reactions involved.					
4.	Give differences between white phosphorus and red phosphorus based on					
	i) structure ii) solubility in CS_2 iii) reaction with air.	U				
5.	P_4 + 10Cl ₂ \longrightarrow X $\xrightarrow{1 \text{ mol } H_2O}$ Y $\xrightarrow{3 \text{ mol } H_2O}$ Z. What are X, Y, Z? (All are					
	compounds of phosphorus)	А				
Fiv	e mark questions:					
1.	a) Give appropriate reason for the following anomalous behaviour of nitrogen:					
	i) it is a diatomic gas ii) it has least catenation property					
	iii) it does not form a pentahalide					
	b) Complete the following equations:					
	i) $4H_3PO_3 \xrightarrow{heat}$ ii) $3HgCl_2 + 2PH_3 \longrightarrow$	U				

2.	2. An unknown salt 'X' reacts with hot conc. H_2SO_4 to produce a reddish brown gas 'Y'				
	which intensifies on adding on copper turnings. On adding dilute ferrous sulphate				
	solution to an aqueous solution of X and then carefully adding conc. $\rm H_2SO_4$ along				
	the sides of the test tube, a brown complex 'Z' is formed at the interface between				
	the solution and H_2SO_4 . Identify X, Y and Z and write the chemical equations				
	involved in the reaction.				
3.	3. a) How is PH_3 prepared in the laboratory? How is it purified? Write the chemical				
	equations for the reactions involved.				
	b) Name the gas liberated when a solution of PH_3 in water is exposed to light.	К			
4.	A white waxy, translucent solid, X, insoluble in water but soluble in CS_2 , glows in				
	dark. X dissolves in NaOH in an inert atmosphere giving a poisonous gas (Y). X				
	catches fire in air to give dense white fumes of Z.				
	i) Identify X, Y and Z and write the chemical equations of the reactions involved.	А			
	Group-16 elements				
Giv	ve reasons for the following (one mark each):				
1.	There is large difference between the melting and boiling points of oxygen and				
	sulphur.	U			
2.	Oxygen has less negative electron gain enthalpy than sulphur.	U			
3.	In group 16, +4 oxidation state becomes more stable than +6 oxidation state on				
	going down the group.	U			
4.	Oxygen can show a maximum covalency of 4 and it cannot form hexavalent				
	compound.	U			
5.	Boiling point of H_2O is higher than that of H_2S .	U			
6.	H_2S is more acidic than H_2O	U			
7.	O_3 is thermodynamically unstable than O_2	U			
8.	Ozone is a powerful oxidising agent.	U			
9.	Sugar chars in concentrated sulphuric acid.	U			
10	. SF ₆ is exceptionally stable.	U			
11	. The bond lengths O–O in ozone are identical.	U			
Or	e mark questions:				
1.	Name the radioactive element in the 16th group.	К			
2.	What is the oxidation number of oxygen in OF ₂ ?	К			
3.	Write the structure of oleum.	S			
1					

Two mark questions:			
1. Write the chemical formula of : a) Gypsum saltb) Epsom salt	К		
2. Complete the equations: i) $2Pb_3O_{4(s)} \xrightarrow{heat}$ ii) $4AI + 3O_2 \xrightarrow{heat}$	К		
Which among these is (i) basic oxide ii) mixed oxide?			
a) Al ₂ O ₃ b) Na ₂ O c) Cl ₂ O ₇ d) Fe ₃ O ₄	U		
4. How is ozone prepared? Mention the conditions required and write an equation	on. K		
5. How is ozone estimated quantitatively?	К		
6. Complete the following equations :			
i) $C_{12}H_{22}O_{11} \xrightarrow{conc.H_2SO_4}$ ii) $2KCIO_3 \xrightarrow{MnO_2}{heat}$	к		
7. How do you prepare β -sulphur from α -sulphur?	К		
8. Above 1000°C which species of sulphur is dominant? What is its mag	netic		
property?	к		
9. $SO_3^{2-} + 2H^+ \longrightarrow A(gas) \xrightarrow{+Cl_2}{charcoal} B.$ What are A and B?	к		
10. High pressure and low temperature favours maximum yield of sulphur trioxid	de in		
contact process. Give reasons.	U		
11. Complete the equation: i) Cu + $2H_2SO_{4 (conc.)} \longrightarrow ii$ CaF ₂ + $H_2SO_{4 (conc)} \longrightarrow ii$	→ К		
12. Write the formula of any two oxoacids of Sulphur.	К		
13. Draw the structure of $H_2S_2O_8$ and name the acid.	S		
14. Complete the following equations :			
i) $3S + 2H_2SO_4 \xrightarrow{conc}$ ii) $PbS + 4O_3 \longrightarrow$	К		
15. Complete the following equations :			
i) $2KI + H_2O + O_3 \longrightarrow$ ii) $NaNO_3 + H_2SO_4 \longrightarrow$	К		
Three mark questions:			
1. Give any three reasons for the anomalous behaviour of oxygen.	К		
2. Arrange: H_2O , H_2S , H_2Se , H_2Te as directed:			
i) decreasing acidity ii) increasing reducing property			
iii) increasing thermal stability	U		
3. Out of the following hydrides : H_2S , H_2O , H_2Te which one will have :			
i) lowest boiling point ii) highest bond angle			
iii) highest electropositive hydrogen.			
4. Write chemical equations involved during the manufacture of sulphuric aci	id by		
contact process mentioning the reaction conditions.	К		

Group-17 elements			
Giv	e reasons for the following (one mark each):		
1.	The negative value of electron gain enthalpy of fluorine is less than that of		
	chlorine.	U	
2.	Bond dissociation enthalpy of F_2 is less than that of Cl_2 .	U	
3.	Most of the reactions of fluorine are exothermic.	U	
4.	HF is the weakest acid among hydrogen halides.	U	
5.	Thermal stability of hydrogen halides decreases from fluoride to iodide.	U	
6.	HF is a liquid while other hydrogen halides are gases.	U	
7.	Halogens have maximum negative electron gain enthalpy in their corresponding		
	periods.	U	
8.	Halogens are coloured.	U	
9.	Halogens are strong oxidizing agent.	U	
10.	Interhalogen compound is more reactive than the halogens from which it is		
	formed.	U	
11.	HCl reacts with finely powdered iron to form ferrous chloride, but not ferric		
	chloride.	U	
On	e mark questions:		
1.	Name the gas liberated when fluorine reacts with water.	К	
2.	Name the only oxyacid of fluorine.	к	
3.	Arrange these in the decreasing order of their stability: I_2O_4 , CIO_2 , BrO_2 .	U	
4.	Name the iodine oxide that is used in estimation of carbon monoxide.	К	
5.	Complete the equation: $I_2 + 6H_2O + 5CI_2 \longrightarrow$	К	
6.	Write the composition of bleaching powder.	К	
7.	What is the composition of aqua regia?	К	
8.	Write the structure of perchloric acid.	S	
9.	Which one of the interhalogen compound is not known: ICl_3 or ICl_2 ?	U	
Tw	o mark questions		
1.	Fluorine exhibits only -1 oxidation state whereas other halogens exhibit positive		
	oxidation states also.	U	
2.	Compare the reaction of fluorine and chlorine with water. Give equations.	К	
3.	Describe how chlorine is manufactured by Deacon's process. Give the equation.	К	
4.	$KMnO_4 + HCI \longrightarrow P_{(g)} \xrightarrow{+H_2S} Q$ (yellow solid). What are P and Q?	А	

5.	Complete the following equations :					
	i) $SO_2 + 2H_2O + Cl_2 \longrightarrow$ ii) $2Ca(OH)_2 + 2Cl_2 \longrightarrow$				К	
6.	Complete the fo	ollowing equ	uations :			
	i) 8NH _{3(Excess)} +	3 Cl ₂ ——	→ ii) C	$I_2 + 2NaOH_{(cold and dil)}$	\longrightarrow	К
7.	Complete the fo	llowing equ	uations :			
	i) NH ₃ +3Cl _{2(Ex}	_{cess)} ——	ii) C	I_2 + 6NaOH (hot & conc) -	\longrightarrow	К
8.	Complete the fo	ollowing equ	uations :			V
0	i) Fe + 2HCl —	\rightarrow	ii) C	$I_2 + 3F_{2(Excess)} \xrightarrow{573K}$	\rightarrow	ĸ
9.	what is the caus	se for bleac	ning action of o	chiorine water? Expla	in it with equations.	ĸ
10	. How are interna	llogen com	ounds formed	I? IF ₇ is possible but n	ot ICI ₇ . Why?	r c
11	. What is the shap	pe of: i) C	IF ₃ ii) IF ₇	?		2
Th	ree mark questio	ns:				
1.	Arrange the foll	owing in the	e order of the J	property indicated fo	r each set.	
	i) F ₂ , Cl ₂ , Br ₂ , I	2 (Increasin	g bond dissocia	ation energy).		
	ii) HF, HCl, HBr, HI (decreasing acid strength)					
	iii) Cl ₂ O, Cl ₂ O ₆ ,	CIO_2, CI_2O_7	(increasing oxi	dation state of chlorin	ne).	U
2.	Match the follow	wing:				
		Formula	Property	Use		
		i) O ₂ F ₂	Bleaching	Estimation of CO		
		ii) ClO ₂	Fluorinating	Pu from spent fuel		
		iii) I ₂ O ₅	Oxidising	Water treatment		А
3.	X_2 is a greenish	n yellow ga	s with punger	nt smell used in puri	fication of water. It	
	partially dissolve	es in H ₂ O to	give a solutio	n which turns blue lit	mus red. When X ₂ is	
	passed through	NaBr soluti	on, Y ₂ is liberat	ted. Identify X_2 and Y	V_2 . What is the colour	
	of Y ₂ ?					А
4.	4. What is aqua regia? How does it dissolve noble metals like Au? Write the ionic					
	equations for the reactions involved.				К	
Fi	Five mark questions:					
1	a) Name two r	oronerties e	each that have	excentionally high a	nd exceptionally low	
1.	values for fl	uorine				
	b) Complete the equation: $XX' + H_2 O \longrightarrow$				К	
2	2 a) Identify A B and C: MnO ₂ + HCl $\xrightarrow{\text{heat}}$ A $(x) \xrightarrow{\text{Nal}(aq)}$ B $\xrightarrow{\text{A}(excess)}$ C					
	b) i) Between PbCl ₂ and PbCl ₄ which is more covalent?					
	ij) Arrange		/Br. MI in decr	reasing order of their	ionic character	U
					0	

	Group-18 elements		
Giv	ve reasons for the following (one mark each):		
1.	Group 18 elements have very high ionisation enthalpy.	U	
2.	Noble gases have large positive value for electron gain enthalpy.	U	
3.	Group 18 elements have very low boiling and melting point.	U	
On	e mark questions:		
1.	Name the main commercial source of helium.	К	
2.	Radon is obtained by radioactive decay of the isotope	К	
3.	3. Name the most abundant noble gas present in dry air.		
4.	4. The first ionisation enthalpy of which molecule is almost similar to ionisation		
	enthalpy of xenon?		
5.	5. Arrange the following in the increasing number of lone pair of electrons on xenon:		
	XeF ₄ , XeF ₆ , XeF ₂	U	
6. Name the noble gas that has lowest boiling point known and also diffuses through			
	rubber.	К	
7.	Complete the equation: $2XeF_{2(s)} + 2H_2O_{(I)} \longrightarrow$	к	
8. Complete the equation: $XeF_6 + NaF \longrightarrow$			
Tw	o mark questions:		
1.	Noble gases are chemically inert. Give two reasons.	К	
2.	Complete the following equations:		
	i) $XeF_6 + 3H_2O \xrightarrow{Complete hydrolysis}$ ii) $PtF_6 + Xe \longrightarrow$	К	
3.	Draw the structures of : i) XeF_2 ii) XeO_3 .	S	
4.	What is the geometry of i) XeF_4 ii) XeF_6 .	S	
5.	How many lone pair of electrons in: i) XeOF ₄ ii) XeO ₃ ?	К	