P-Block Elements: Miscellaneous Questions

SINGLE CORRECT CHOICE TYPE QUESTIONS

1. The fluoride which is soluble in water is
(A) CaF_2
(B) BaF_2
(C) SrF_2
(D) BeF_2

2. Which of the following pair of species is non-linear?
(A) OCN^- and Br_3^-
(B) $(SCN)_2$ and I_5^-
(C) NCN^{2-} and N_3^-
(D) HN_3 and $(CN)_2$

3. Substance A
I. reacts with H_2S to produce white turbidity.
II. changes light green solution of $FeSO_4$ into yellow colour.
III. reacts with moisture to give pungent smelling gas.
Then A is
(A) $KMnO_4$
(B) $K_2Cr_2O_7$
(C) SO_2
(D) Ca(OCl)Cl

4. $A + SbF_5 \rightarrow B$
$B + tert\text{-butane} \rightarrow [tert\text{-butyl}]^+ + X^- + H_2$
Then A is
(A) HCl
(B) HF
(C) HBr
(D) HI

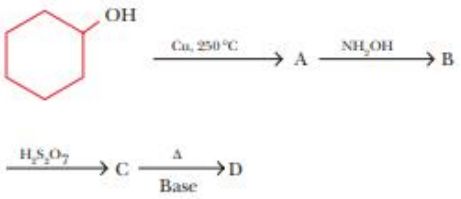
5. Which of the following represents the correct increasing order of pK_a values of the given acids?
(A) $HClO_4 < HNO_3 < H_2CO_3 < B(OH)_3$
(B) $HNO_3 < HClO_4 < B(OH)_3 < H_2CO_3$
(C) $HClO_4 > HNO_3 > H_2CO_3 > B(OH)_3$
(D) $HClO_4 < HNO_3 < B(OH)_3 < H_2CO_3$.

6. Which of the following options are incorrect?
I. α - S $\rightleftharpoons$ β - S; $\Delta H = (-)$ ve
II. α - S $\rightleftharpoons$ β - S; $\Delta H = (+)$ ve
III. Red P $\rightleftharpoons$ Black P; $\Delta H = (-)$ ve
IV. Black P $\rightleftharpoons$ White P; $\Delta H = (-)$ ve
V. Graphite $\rightleftharpoons$ Diamond; $\Delta H = (+)$ve
(A) II, IV and V
(B) II, III and V
(C) I and IV
(D) I and III

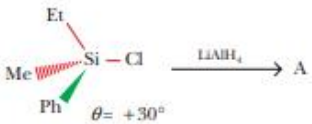
7. SO_2 is passed through a strongly acidic solution of $SnCl_2$. The precipitate obtained consists of S and the oxidation state of S in the precipitate is
(A) –1
(B) zero
(C) –2
(D) the precipitate does not contain S.

8. White compound A $\xrightarrow{HNO_3}$ B $\xrightarrow{I_2}$ C(used to estimate CO). The compound A is
(A) P_2O_5
(B) I_2O_5
(C) I_4O_9
(d) S_2O_9

9. $Fe(CO)_5 + NO \rightarrow M$ (complex). M is
(A) $Fe(NO)_5$
(B) $Fe(CO)_3(NO)_2$
(C) $Fe(CO)_2(NO)_2$
(D) $Fe(CO)_2(NO)_3$

10. 

In the given reaction, compound C is
(A) nylon–6.
(B) caprolactum.
(C) nylon–66.
(D) lactone.

11. 

A will have the optical rotation of
(A) + 30°.
(B) – 30°.
(C) zero.
(D) Cannot be predicted.

12. In the reaction

$NH_3 \xrightarrow[\text{air at 750 °C, Pt catalyst and 6 atm}]{\text{burnt in}} A_{(gas)} \xrightarrow[\text{in presence of HCl}]{\text{Passed into } SnCl_2 \text{ solution}} B$

The compound B is:
(A) NH_2OH
(B) NH_3
(C) N_2O
(D) NH_2–NH_2

13. $FeSO_4$ is a very good absorber for NO. The number of unpaired electrons in the new compound formed by this process is
(A) 4 (C) 3
(B) 5 (D) 6

14. Which of the following compounds give NH_3 on heating?
I. NH_4NO_3
II. NH_4NO_2
III. $(NH_4)_2Cr_2O_7$
IV. $(NH_4)_2CO_3$
V. $Mg(NH_4)PO_4$
(A) I and IV
(B) II and V
(C) IV only
(D) IV and V

15. $Mg(NH_4)PO_4$ and $Na(NH_4)HPO_4$ are heated separately. Which of the following statements is/are completely incorrect regarding the product obtained in the above processes?
I. Same gas is eveolved.
II. Same type of phosphate is formed.
III. Different types of gases are formed.
IV. Different types of phosphates are formed.
(A) I and II
(B) II and IV
(C) I and IV
(D) II and III

16. A mixture of two gases, AsH_3, and SbH_3, is passed through a tube heated at the middle position. Two mirror-like depositions are observed of which (I) is before the hot position and (II) is after the hot position.
These depositions I and II are of
(A) Sb and As
(B) As and Sb
(C) Both As
(D) Both Sb

17. Which of the following reagents does not produce any gaseous product on reaction with PbO_2?
(A) HCl (hot conc.)
(B) $HNO_3 + (CO_2H)_2$
(C) NaOH
(D) H_2SO_4

18. Which is of following options is correct for the given statement?
In the discharge reaction of lead storage cell, the number of Faradays used is equal to
I. twice the number of moles of PbO_2 consumed.
II. half the number of moles of H_2SO_4 consumed.
III. the number of moles of H_2SO_4 produced.
IV. the number of moles of H_2O produced.
(A) I and II
(B) I and IV
(C) II and IV
(D) II and III

19. Reaction of PbO_2 with hot conc. HCl and cold conc. HCl (saturated with Cl_2) separately produces
(A) $PbCl_2$ and $PbCl_4$
(B) $PbCl_2$ and H_2PbCl_6
(C) $PbCl_4$ and $PbCl_2$
(D) H_2PbCl_6 and $PbCl_2$

20. Choose the incorrect statement from the following.
(A) Hydrolysis of $SnCl_4$ is affected by the presence of HCl vapours.
(B) Ammonolysis of $SnCl_4$ is not affected by the presence of NH_4C1 vapours.
(C) Piece of Sn kept with $SnCl_2$ prevents its oxidation.
(D) $SnCl_2$, $SnCl_4$, and $PbCl_4$ all form complex acid with conc. HCl.

MULTIPLE CORRECT CHOICE TYPE QUESTIONS

1. An element(E) + NaOH → disproportionated product $\xrightarrow{\text{on acidification}}$ (E) comes back. The above process is true for which of the following pairs?
(A) Cl_2 and Br_2
(B) S and Br_2
(C) P and F_2
(D) S and I_2

2. When F_2 is passed into water, the products obtained are
(A) F_2O
(B) O_3
(C) O_2
(D) HF

3. Which of the following statements are true for Na in liquid NH_3?
(A) It is blue in colour due to solvated electrons.
(B) $K_2[Ni(CN)_4]$ changes its structure from square planar to tetrahedral when added to it.
(C) It conducts electricity.
(D) None of these.

4. Which of the following statements is/are correct?
(A) NO is a diamagnetic liquid.
(B) B_2 and C_2 are diamagnetic.
(C) N_2O_4 is diamagnetic.
(D) BH_3 loses its planarity on dimerization.

5. Which of the following statements is/are correct?
(A) Cl_2 reacts with liquid NH_3 (excess) to give N_2.
(B) The product obtained by the absorption of N_2 by calcium carbide is a good fertilizer.
(C) Brown-coloured oxide of nitrogen reacts with O_3 to give another oxide with lowest oxidation state of N.
(D) HNO_2 reacts with H_2S to produce a paramagnetic gas.

6. Choose the correct options from the following orders.
(A) Basicity order: $NH_3 > NH_2–NH_2 > NH_2OH > NF_3$
(B) Melting point order: $NH_3 > SbH_3 > AsH_3 > PH_3$
(C) Boiling point order: $NH_3 > SbH_3 > AsH_3 > PH_3$
(D) Thermal stability order: $NH_3 < PH_3 < AsH_3 < SbH_3$

7. N_2O_4 reacts with NaOH to produce a colourless solution. Which are the correct statements among the following for this reaction?
(A) It can give the brown ring test for nitrate.
(B) It reacts with $AgNO_3$ to give white ppt.
(C) It decolorises $KMnO_4$ solution.
(D) After treatment with $AgNO_3$, ppt is filtered and filtrate is treated with Zn + AcOH, and the resulting solution does not respond towards Grises–Ilosvay test.

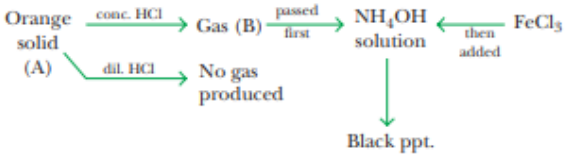
8. Sn^{2+} can be distinguished from Sn^{4+} by
(A) passing H_2S.
(B) adding $Fe[Fe(CN)_6]$.
(C) adding $CuCl_2$ solution.
(D) none of these.

9. Catenation property can be shown by which of the following elements?
(A) Carbon
(B) Silicon
(C) Phosphorus
(D) Sulphur

10. Allotropism is shown by which of the following elements?
(A) Arsenic
(B) Tin
(C) Oxygen
(D) Nitrogen

COMPREHENSION TYPE QUESTIONS

Passage 1: For Questions 1–4

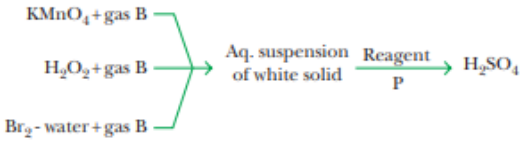


1. The black precipitate is
(A) FeS
(B) Fe_2S_3
(C) (FeS + S)
(D) ($FeS + Fe_2S_3$)

2. The orange solid is
(A) As_2S_3
(B) Sb_2S_3
(C) Sb_2O_3
(D) SbOCl

3. The metal(s) which reacts with gas B under hot condition to produce H_2 is/are
(A) Na
(B) Cu
(C) Pb
(D) All of the above.

4. In the following reactions



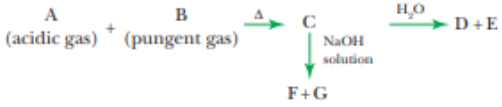
Which of the following options is correct regarding P among the following?

I. O_3
II. excess Cl_2 water
III. HNO_3 (conc.)
IV. HCl
V. H_2O_2

(A) I, II and V
(B) I, II and III
(C) III, IV and V
(D) I and V

Passage 2: For Questions 5–7

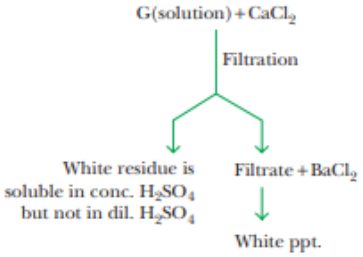
In the following reactions



(i) D and E are both acids and F and G are both salts.

(ii) F(solution) + conc. H_2SO_4 + $K_2Cr_2O_7 \xrightarrow{\Delta}$ reddish brown vapour which is passed into NaOH solution to give yellow solution.

(iii)



5. The gas B is
(A) SO_2
(B) CO_2
(C) CO
(D) Cl_2

6. The compound C is
(A) $COCl_2$
(B) $SOCl_2$
(C) SO_2Cl_2
(D) $CSCl_2$

7. The hybridization state of central atom of the compound present in reddish brown vapour is
(A) sp^3
(B) sp^3d
(C) d^3s
(D) sp^2

Passage 3: For Questions 8–10

Conc. H_2SO_4 can act as a solvent, dehydrating agent and oxidizing agent.

8. When 1 mole of N_2O_5 is added to conc. H_2SO_4, it shows ____ fold freezing point depression.
(A) four
(B) six
(C) eight
(D) two

9. The nitrating mixture used for nitration of benzene is expected to show ___ fold freezing point depression.
(A) six
(B) two
(C) three
(D) four

10. In which of the following reactions conc. H_2SO_4 does not act as a dehydrating agent?

(A) $HCO_2H + H_2SO_4 \rightarrow H_3O^+ + CO + HSO_4^-$

(B) $C_6H_{12}O_6 + H_2SO_4 \rightarrow 5H_2O + 6C + H_3O^+ + HSO_4^-$

(C) $P_2O_5 + H_2SO_4 \rightarrow SO_3 + 2HPO_3$

(D) $H_2C_2O_4 + H_2SO_4 \rightarrow H_3O^+ + HSO_4^- + CO + CO_2$

Passage 4: For Questions 11 – 13

$CuSO_4$ is allowed to react separately with white P (1), PH_3 (2), H_3PO_3 (3) and H_3PO_2(4).

11. In which of the following cases observations are the same?
(A) 1, 2, 4
(B) 2, 3
(C) l, 3, 4
(D) 2, 4

12. In which of the following cases reduction products are the same?
(A) 1, 3
(B) 1, 2, 3
(C) 3, 4
(D) 2, 4

13. Distinction between H_3PO_3 and H_3PO_2 can be made by
(A) treating with $CuSO_4$ only.
(B) treating with $CuSO_4$ followed by addition of water.
(C) treating with $CuSO_4$ followed by addition of dil. HCl.
(D) treating with NaOH solution.

Passage 5: For Questions 14–16

Metallic Sn is reacted with NH_4Cl and the resulting solution is treated with sulphur.

14. The gaseous product(s) is/are
(A) NH_3 only.
(B) $NH_3 + H_2$.
(C) H_2 only.
(D) No gaseous product.

15. The colour of the final precipitate obtained is
(A) dark brown. (C) yellow.
(B) white. (D) pink.

16. The above resulting solution is added to $AuCl_3$ solution resulting in a purple colour solution, which is called as 'purple of cassius.' It consists of
(A) colloidal solution of gold.
(B) colloidal solution of $Sn(OH)_4$ with finely divided gold particles adsorbed on it.
(C) colloidal solution of $Sn(OH)_4$.
(D) mixture of precipitates of Au and $Sn(OH)_4$.

ASSERTION–REASONING TYPE QUESTIONS

In the following set of questions, a Statement I is given and a corresponding Statement II is given below it. Mark the correct answer as:

(A) If both Statement I and Statement II are true and Statement II is the correct explanation of Statement I.

(B) If both Statement I and Statement II are true but Statement II is not the correct explanation for Statement I.

(C) If Statement I is true but Statement II is false.

(D) If Statement I is false but Statement II is true.

1. Statement I: C_3O_2 and N_5^+ are isosteric yet they are not isostructural.

Statement II: C_3O_2 is linear while N_5^+ is bent.

2. Statement I: P_2O_5 is a stronger dehydrating agent than H_2SO_4.

Statement II: P is more electronegative than S.

3. Statement I: YAS and AS are both oxidizing agents.

Statement II: S(–I) is reduced to S(–II) easily in YAS.

4. Statement I: The bleaching action of SO_2 is not permanent while that of H_2O_2 or Cl_2 is permanent.

Statement II: Bleaching action by SO_2 is due to reduction of the substance which undergoes further oxidation by air; while that of H_2O_2 or Cl_2 is due to oxidation of the substance.

5. Statement I: P_2O_5 is a stronger dehydrating agent than conc. H_2SO_4.

Statement II: P_2O_5 dehydrates conc. H_2SO_4 into SO_3.

INTEGER ANSWER TYPE QUESTIONS

The answer to each of the following questions is a non-negative integer.

1. Among the following, the number of compounds that can act as dehydrating agent is _____.

Conc. H_2SO_4, anhyd. $CaCl_2$, conc. HNO_3, CaO, $CuSO_4 \cdot 5H_2O$, P_2O_5.

2. Among the following, the number of compounds/ions having a linear structure is _____.

C_5O_2, H_2O_5, N_3^-, CN_2^{2-}, N_5^+, H_2S_3, $[I(CN)_2]^-$,

$(CN)_2$, $(SCN)_2$.

3. The number of 90° angles (approximately) in PHF_4 is _____.

4. TlI_3 is isomorphic with CsI_3 and then the oxidation state of Tl in TlI_3 is _____.

5. Among the following, the number of ions/molecules having at least one atom *sp* hybridized is _____.

C_3S_2, NO_2^-, NO_2^+, benzene, benzyne, diazonium cation, $C_6H_5^+$, C_3^{4-}, $Cr_2O_7^{2-}$, CaC_2, $(SCN)_2$

6. When $K_2[Ni(CN)_4]$ is reduced by K in liquid NH_3, the change in co-ordination number is _____.

7. According to Drago's rule, the P atom in PH_3 is not hybridized and formation of PH_4^+ is difficult. The number of identical HPH angles in PH_4^+ ion is _____.

8. The ratio of number of lone pairs on the central atom of ClF_3 and XeF_4 is _____.

9. How many of the following are in the correct order with respect to the given property?

(i) $H_2 > He$: Boiling point order

(ii) $He > Ne > Ar > Kr > Xe$: Boiling point order

(iii) $S > O > Se > Te$: Electron affinity order

(iv) Diamond > graphite : Electrical conductivity order

(v) $HCl < HBr < HF < HI$: Melting point order

10. How many of the following compounds are matched with the incorrect formula?

(i) Butter of tin : $SnCl_4 \cdot 4H_2O$

(ii) Gypsum : $CaSO_4 \cdot 2H_2O$

(iii) Plaster of Paris : $2CaSO_4 \cdot 4H_2O$

(iv) Mustard gas : $S(CH_2CH_2–Cl)_2$

(v) Thionyl chloride : $COCl_2$

(vi) Sulphuryl chloride : $SeCl_2$

MATRIX–MATCH TYPE QUESTIONS

In each of the following questions, statements are given in two columns, which have to be matched. The statements in Column I are labelled as **(A)**, **(B)**, **(C)** and **(D)**, while those in Column II are labelled as **(P)**, **(Q)**, **(R)**, **(S)** and **(T)**. Any given statement in Column I can have correct matching with *one or more* statements in Column II.

1. Match the compounds with effects on heating

Column I	Column II
(A) NH_4NO_3	(P) Leaves no residue on heating.
(B) NH_4NO_2	(Q) Leaves residue on heating.
(C) $(NH_4)_2CO_3$	(R) Produces N_2 on heating.
(D) $(NH_4)_2Cr_2O_7$	(S) Produces NH_3 on heating.
(E) $Mg(NH_4)PO_4$	

2. Match the oxides with their properties.

Column I	Column II
(A) ClO_2	(P) The free electron is present in a hybrid orbital.
(B) NO_2	(Q) Produces the mixed acid on reaction with water.
(C) ClO_3	(R) Molecule is planar.
	(S) Molecule having the lowest possible O–X–O angle.

3. Match the oxides with solutions in which they are absorbed.

Column I	Column II
(A) CO	(P) Absorbed by ethanol amine.
(B) CO_2	(Q) Absorbed by $FeSO_4$ solution.
(C) NO	(R) Absorbed by aqueous suspension of Cu_2Cl_2.
	(S) Absorbed by KOH solution.

4. *Match the compounds with their common names and uses.

Column I	Column II	Column III
(A) $SnCl_4 \cdot 5H_2O$	(P) Mosaic gold	(J) Used as fertilizer.
(B) $(NH_4)_2SnCl_6$	(Q) Nitrolim	(K) Used in calico printing.
(C) SnS_2	(R) Butter of tin	(L) Used in gilding purpose.
(D) $CaCN_2 + C$	(S) Pink salt	(M) Used as mordant in dye.

*Choose only one option from Column II and Column III for each option of Column I.

5. Match the reagent/ characteristic with their use in the detection of compounds.

Column I	Column II
(A) $Pb(OAC)_2$	(P) NH_3
(B) Nesslar's reagent	(Q) PH_3
(C) Rotten fish smell	(R) H_2S
(D) Violet layer	(S) I_2

ANSWERS

Single Correct Choice Type Questions

1. (D)	5. (A)	9. (C)	13. (C)	17. (C)
2. (B)	6. (C)	10. (B)	14. (D)	18. (B)
3. (D)	7. (C)	11. (D)	15. (D)	19. (B)
4. (B)	8. (A)	12. (A)	16. (A)	20. (B)

Multiple Correct Choice Type Questions

1. (A), (B), (D)	3. (A), (B), (C)	5. (A), (B), (D)	7. (B), (C)	9. (A), (B), (C), (D)
2. (B), (C), (D)	4. (A), (C), (D)	6. (A), (B)	8. (A), (B), (C)	10. (A), (B), (C)

Comprehension Type Questions

1. (C)	5. (D)	9. (D)	13. (C)
2. (B)	6. (C)	10. (C)	14. (B)
3. (D)	7. (C)	11. (C)	15. (C)
4. (B)	8. (B)	12. (A)	16. (B)

Assertion–Reasoning Type Questions

1. (A)	2. (C)	3. (D)	4. (A)	5. (A)

Integer Answer Type Questions

1. 4	3. 6	5. 6	7. 6	9. 2
2. 5	4. 1	6. 0	8. 1	10. 4

Matrix–Match Type Questions

1. (A) → (P)
   (B) → (P), (R)
   (C) → (P) (S)
   (D) → (Q), (R)
   (E) → (Q), (S)

2. (A) → (Q), (R)
   (B) → (P), (Q), (R)
   (C) → (P), (Q), (S)

3. (A) → (R)
   (B) → (P), (S)
   (C) → (Q)

4. (A) → (R), (M)
   (B) → (S), (K)
   (C) → (P), (L)
   (D) → (Q), (J)

5. (A) → (R)
   (B) → (P)
   (C) → (Q)
   (D) → (S)