1. In which of the dimerisation process, the achievement of the octet is not the driving force.

(1) $2AlCl_3 \longrightarrow Al_2Cl_6$

(2) $BeCl_2 \longrightarrow BeCl_2$ (solid)

(3) $2ICl_3 \longrightarrow I_2Cl_6$

(4) $2NO_2 \longrightarrow N_2O_4$

2.

Column I	**Column II**
(A) B_2H_6	(P) (3C–4e^-) bond
(B) Be_2H_4	(Q) (3C–2e^-) bond
(C) Be_2Cl_4	(R) Vacant orbital participation in hybridisation
(D) $Al_2(CH_3)_6$	(S) sp^3 hybridisation
	(T) sp^2 hybridisation

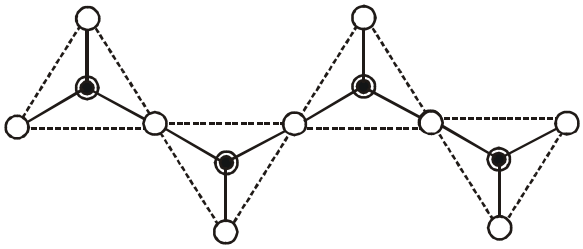
(1) (A) – Q,R,S; (B) – Q,R,T; (C) – P,R,T; (D) – Q,R,S

(2) (A) – Q,R,S,T; (B) – R,T; (C) – P,R,T; (D) – R,S

(3) (A) – S,T; (B) – R,T; (C) – P,R,T; (D) – R,S,T

(4) (A) – Q,S,T; (B) – R,T; (C) – P,R; (D) – R,S,T

3. A mineral contain following tetrameric anion in which ● = Si, ○ = oxygen



Select **correct** option (s) about anion in mineral–

(1) Formula of anion is $(SiO_3)_n^{2n-}$ (where n = 4).

(2) The total 10 negative charges are present in this anion.

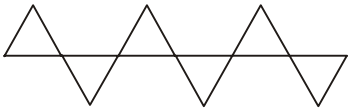
(3) It has three shared oxygen/corners and ten unshared oxygen/corners.

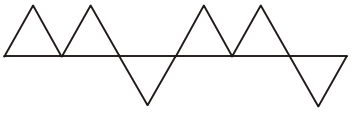
(4) It is non planar

4. Silicate are existing mainly in the polymeric form. Several categories are available with us which depend on the mode of sharing of corners of SiO_4^{4-} tetrahedron.

Which of the following pyroxene chain silicate is having same formula.

(1) 

(2) 

(3) 

(4) All of these

5. The geometry with respect to the central atom of the following molecules are:

$N(SiH_3)_3$; Me_3N ; $(SiH_3)_3P$

(1) planar, pyramidal, planar

(2) planar, pyramidal, pyramidal

(3) pyramidal, pyramidal, pyramidal

(4) pyramidal, planar, pyramidal

6.

Column–I	**Column–II**
(A) $\underline{N}(SiH_3)_3$	(P) pπ–dπ back bonding
(B) $\underline{N}(CH_3)_3$	(Q) sp^3 hybridisation for underlined atom
(C) $\underline{B}_2H_6$	(R) pπ–pπ back bonding
(D) $\underline{B}F_3$	(S) neither pπ–pπ nor pπ–dπ back bonding
	(T) Underlined atom combine with electron rich molecule

(1) (A) – P; (B) – Q,S; (C) – Q,S,T; (D) – R,T

(2) (A) – P,Q; (B) – Q,S,T; (C) – R,T; (D) – S,T

(3) (A) – P,Q; (B) – R,T; (C) – S,T; (D) – R,S,T

(4) (A) – R,S,T; (B) – Q,R,S,T; (C) – S,T; (D) – P,Q,S,T

7. Choose the correct on the Cl–O bond length in $NaClO_4$.

(1) All Cl–O bonds are of equal length.

(2) Three Cl–O bonds are of equal of length one longer.

(3) Two Cl–O bonds are of same length which are longer compound to other two Cl–O bond length.

(4) All Cl–O bond lengths are different

8.

Column I (Pair of species)	**Column II (Identical Property in pairs of species)**
(A) PCl_3F_2, PCl_2F_3	(P) Hybridisation of central atom
(B) BF_3 & BCl_3	(Q) Shape of molecule / ion
(C) CO_2 & CN_2^{-2}	(R) μ (dipole moment)
(D) C_6H_6 & $B_3N_3H_6$	(S) Total number of electrons

(1) (A) – P,Q; (B) – P,Q,R; (C) – P,Q,RS; (D) – P,Q,R,S

(2) (A) – P,Q,R,S; (B) – P,Q; (C) – R,S; (D) – P,Q

(3) (A) – P,Q; (B) – S,R; (C) – Q,R,S; (D) – R,S

(4) (A) – P,Q; (B) – S,R; (C) – P,R; (D) – P,Q,R

9. Match the Column :

Column–I	**Column–II**
(A) $(CH_3)_2PF_3$	(P) Lone pair of electrons on central atom = 1
(B) SF_4	(Q) Central atom is sp^3d hybridised
(C) XeF_4	(R) Equal length of all central atom–fluorine bond
(D) BrF_3	(S) Total number of lone pair of electrons is more than 9

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

10. Select correct statement about hydrolysis of BCl_3 and NCl_3
(1) NCl_3 is hydrolysed and gives HOCl but BCl_3 is not hydrolysed.
(2) Both NCl_3 and BCl_3 on hydrolysis gives HCl
(3) NCl_3 on hydrolysis gives HOCl but BCl_3 gives HCl
(4) Both NCl_3 and BCl_3 on hydrolysis gives HOCl

11. Which of the following statements are correct for SOF_4 molecule.
(1) It is square pyramidal in shape
(2) On hydrolysis it produces H_2SO_4 and HF
(3) All S–F bond lengths are of identical length
(4) Two S–F bond lengths are longer compared to other two S–F bond lengths

12. **Statement-1 :** H_3BO_3 in water behaves as monobasic acid.
Statement-2 : The ionisation reaction is:

$$H_3BO_3 + H_2O \rightleftharpoons B(OH)_4^- + H^+$$

(1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
(3) Statement-1 is true, statement-2 is false.
(4) Statement-1 is false, statement-2 is true.

13. For H_3PO_3 and H_3PO_4, the correct choice is
(1) H_3PO_3 is dibasic and reducing agent.
(2) H_3PO_3 is dibasic and non reducing agent.
(3) H_3PO_4 is tribasic and reducing agent
(4) H_3PO_4 is tribasic and non reducing agent.

14. Which of the following statement is **incorrect**?
(1) Oxidizing power order : $SiCl_4 < SnCl_4 < PbCl_4$
(2) Ionic character order : CsBr > RbBr > KBr > NaBr > LiBr
(3) The ionic character of lead (II) halides decreases with increase in atomic no. of halogen
(4) The oxidation state of T/ in T/I_3 is +3.

15. Choose the correct statement regarding bond angle:-
(1) $\widehat{FCF}$ in F_2CO < $\widehat{HCH}$ in H_2CO
(2) $\widehat{BrPBr}$ in PBr_3 < $\widehat{FPF}$ in PF_3
(3) $\widehat{FSF}(eq) > \widehat{FSF}(ax)$ in SF_4
(4) All $\widehat{FIF}$ angles in IF_5 are identical

16.

Column I	**Column II**
(A) Dithionous acid	(P) S–O–S bond is not present
(B) Thiosulphuric acid	(Q) All S atom in the molecule has oxidation state +3
(C) Caro's acid	(R) Acidic strength of –OH groups present in the molecule is different
(D) Pyrosulphurous acid	(S) at least one S atom has oxidation state +5 in molecule

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

17. Structure of $Na_2[B_4O_5(OH)_4] \cdot 8H_2O$ contains
(1) Two triangular and two tetrahedral units
(2) Three triangular and one tetrahedral units.
(3) All tetrahedral units.
(4) All triangular units.

18. Which of the following statement is incorrect :-
(1) The free electron of ClO_3 molecule is present in d-orbital of Cl-atom
(2) The free electron of $\dot{C}F_3$ is present in sp^3 hybrid orbital
(3) NO is polar
(4) The free electron of ClO_2 molecule is present in d-orbital of Cl-atom

19. Which of the following statement is incorrect regarding the structure of XeO_2F_4 molecule :-

(1) Xe = O bonds are present in axial position

(2) All Xe–F bond lengths are identical

(3) $\widehat{FXeF}$ angles are 90°

(4) Shape of the molecule is octahedral

20.

	Column I	Column II
(A)	ClO_2	(P) Non planar
(B)	ClO_3	(Q) $\mu \neq 0$
(C)	NO_2	(R) Linear
(D)	NO	(S) planar
		(T) sp^3 hybridisation

(1) (A) – Q,S; (B) – P,Q,T; (C) – Q,S; (D) – Q,R,S

(2) (A) – P,Q,S; (B) – P,Q,T; (C) – P,Q,S; (D) – Q,S

(3) (A) – Q,S; (B) – P,Q,T; (C) – P,Q,R,S,T; (D) – P,T

(4) (A) – P,Q,R,S; (B) – P,Q,S; (C) – Q,S; (D) – P,Q,R,S

21.

	Compound	Properties
A	B_2H_6, H_3^+	3c 2e bond
B	HNO_3, H_2SO_4	pp bond
C	AlF_3, $AlCl_3$	Hypovalent
D	NCl_3, $SbCl_3$	Equal bond angles

Correct code is :

(1) A (2) A,C (3) A,D (4) All

22. In which of the following options all species contain X–O–X bonds in structure (X = central atom)

(1) $H_2S_2O_5$, S_3O_9, $S_2O_6^{-2}$

(2) P_4O_{10}, P_4O_6, $H_3P_3O_9$

(3) N_2O_5, N_2O, N_2O_4

(4) $H_4P_2O_7$, $H_4P_2O_6$, $H_4P_2O_5$

23. Which is not correct ?

(1) Borax : Cyclic, 2-(six member ring)

(2) Calgon : Cyclic, (10 member ring)

(3) Beryl : Cyclic silicate

(4) P_4O_{10} : Cyclic, four -(Six member ring)

24. Which of the following reaction is nonspontaneous:-

(1) $2F_2 + 2H_2O \longrightarrow 4HF(aq) + O_2$

(2) $Cl_2 + H–OH \longrightarrow HCl + HOCl$

(3) $Br_2 + H–OH \longrightarrow HBr + HOBr$

(4) $2I_2 + 2H_2O \longrightarrow 4HI + O_2$

25. Which of the following group of molecules can act both as oxidant as well as reductant :-

(1) $KMnO_4$, O_3, SO_3

(2) $HC\ell O_4$, HNO_3, H_2O_2

(3) HNO_3, SO_2, O_3

(4) HNO_2, SO_2, H_2O_2

26. Which of the following order is not correct :-

(1) $CO_2 < SiO_2 < GeO_2 < SnO_2 < PbO_2$ (Oxidising nature)

(2) $MnO_4^- > TeO_4^- > ReO_4^-$ (Oxidising nature)

(3) $CH_4 < SiH_4 < GeH_4 < SnH_4 < PbH_4$ (Reducing nature)

(4) $HOCl < HClO_2 < HClO_3 < HClO_4$ (Oxidising nature)

27. Which of the following halides cannot be hydrolysed?

(1) TeF_6 (2) SF_6 (3) PCl_5 (4) PCl_3

28. Which of the following is not correctly matched

(1) XeF_2 and XeF_4 $\Rightarrow$ Non polar but planar.

(2) XeF_6 $\Rightarrow$ exists in solid state as XeF_5^+ and F^-

(3) $XeOF_4$ $\Rightarrow$ sp^3d^2, square pyramidal shape, all identical B.L.

(4) XeO_3 $\Rightarrow$ pyramidal, all bond angles are identical.

29. S^{2-} and SO_3^{2-} can be distinguished by using:

(1) $(CH_3COO)_2Pb$ (2) $Na_2[Fe(CN)_5NO]$

(3) both (1) and (2) (4) none of these

30. Chromyl chloride test is given by -

(1) CH_3Cl (2) AgCl

(3) Hg_2Cl_2 (4) NH_4Cl

ANSWER KEY — Exercise-I

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	1	2,3	4	2	1	1	1	1	3
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	2,4	1	1,4	4	1	1	1	1	1	1
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	1	2	2	4	4	4	2	3	3	4

PREVIOUS YEARS' QUESTIONS EXERCISE-II

1. Graphite is a soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that graphite : **[AIEEE-2003]**
(1) Has molecules of variable molecular masses like polymers
(2) Has carbon atoms arranged in large plated of rings of strongly bonded carbon atoms with weak interplate bonds
(3) Is a non crystalline substance
(4) Is an allotropic form of diamond

2. The soldiers of Napolean army while at Alps during freezing winter suffered a serious problem as regards to the tin buttons of their uniforms. White Metallic tin buttons get converted to grey powder. This transformation is related to:- **[AIEEE-2004]**
(1) An interaction with water vapour contained in humid air
(2) A change in crystalline structure of tin
(3) A change in the partial pressure of O_2 in air
(4) An interaction with N_2 of air at low temperature

3. Which is the most thermodynamically stable allotropic form of phosphorus? **[IIT- 2004]**
(1) Red (2) White (3) Black (4) Yellow

4. The number of hydrogen atoms attached to phosphorus atom in hypophosphorous acid is : **[AIEEE-2005]**
(1) Zero (2) Two (3) One (4) Three

5. Which one of the following is the correct statement **[AIEEE-2005]**
(1) Boric acid is a protonic acid
(2) Beryllium exhibits coordination number of six
(3) Chlorides of both beryllium and aluminium have bridged chloride structures in solid phase
(4) B_2H_6, $2NH_3$ is known as "inorganic benzene"

6. In silicon dioxide : **[AIEEE-2005]**
(1) Each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bonded to two silicon atoms
(2) Each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bonded to two silicon atoms
(3) Silicon atom is bonded to two oxygen atoms
(4) There are double bonds between silicon and oxygen atoms

7. Which of the following is not oxidised by O_3? **[IIT- 2005]**
(1) KI (2) $FeSO_4$
(3) $KMnO_4$ (4) K_2MnO_4

8. When PbO_2 reacts with conc. HNO_3 the gas evolved may be : **[IIT 2005]**
(1) NO_2 (2) O_2 (3) N_2 (4) N_2O

9. The stability of dihalides of Si, Ge, Sn and Pb increases steadily in the sequence: **[AIEEE-2007]**
(1) $GeX_2 << SiX_2 << SnX_2 << PbX_2$
(2) $SiX_2 << GeX_2 << PbX_2 << SnX_2$
(3) $SiX_2 << GeX_2 << SnX_2 << PbX_2$
(4) $PbX_2 << SnX_2 << GeX_2 << SiX_2$

10. Among the following, the paramagnetic compound is – **[IIT- 2007]**
(1) Na_2O_2 (2) O_3 (3) N_2O (4) KO_2

11. Among the following substituted silanes the one which will give rise to cross linked silicone polymer on hydrolysis is **[AIEEE-2008]**
(1) R_4Si (2) $RSiCl_3$ (3) R_2SiCl_2 (4) R_3SiCl

12. Which of the following statements regarding sulphur is incorrect ? **[AIEEE-2011]**
(1) At 600°C the gas mainly consists of S_2 molceules
(2) The oxidation state of sulphur is never less than +4 in its compounds
(3) S_2 molecule is paramagnetic
(4) The vapour at 200°C consists mostly of S_8 rings

13. The number of S–S bonds in SO_3, $S_2O_3^{2-}$, $S_2O_6^{2-}$ and $S_2O_8^{2-}$ respectively are :- **[JEE Main(Online)-2012]**
(1) 1, 0, 1, 0 (2) 0, 1, 1, 0
(3) 1, 0, 0, 1 (4) 0, 1, 0, 1

14. Which one of the following depletes ozone layer ? **[JEE Main(Online)-2012]**
(1) NO and freons (2) SO_2
(3) CO (4) CO_2

15. The formation of molecular complex $BF_3 - NH_3$ results in a change in hybridisation of boron :- **[JEE(Main) Online–2012]**
(1) from sp^3 to sp^3d (2) from sp^2 to dsp^2
(3) from sp^3 to sp^2 (4) from sp^2 to sp^3

16. Which of the following xenon-OXO compounds may not be obtained by hydrolysis of xenon fluorides ? **[JEE Main(Online)-2014]**
(1) XeO_2F_2 (2) XeO_3 (3) XeO_4 (4) $XeOF_4$

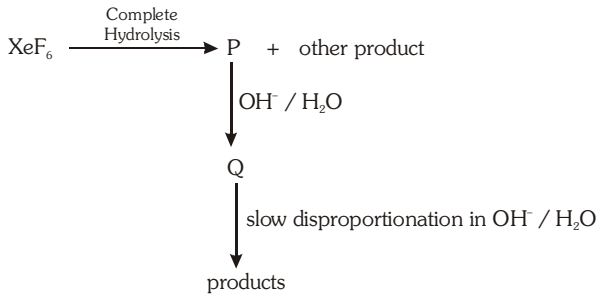
17. Consider the reaction **[JEE Main(Online)-2014]**

$$H_2SO_{3(aq)} + Sn^{4+}_{(aq)} + H_2O_{(l)} \rightarrow Sn^{2+}_{(aq)} + HSO^-_{4(aq)} \quad 3H_{(aq)}$$

Which of the following statements is correct?
(1) H_2SO_3 is the reducing agent because it undergoes oxidation
(2) H_2SO_3 is the reducing agent because it undergoes reduction
(3) Sn^{4+} is the reducing agent because it undergoes oxidation
(4) Sn^{4+} is the oxidizing agent because it undergoes oxidation

18. Under ambient conditions, the total number of gases released as products in the final step of the reaction scheme shown below is

[JEE Adv. 2014]



(1) 0 (2) 1 (3) 2 (4) 3

19. Which of the following compounds has a P-P bond:-

[JEE Main(Online)-2015]

(1) $H_4P_2O_5$ (2) $(HPO_3)_3$
(3) $H_4P_2O_7$ (4) $H_4P_2O_6$

20. Which among the following is the most reactive ?

[JEE Main-2015]

(1) I_2 (2) ICl (3) Cl_2 (4) Br_2

21. From the following statements regarding H_2O_2, choose the incorrect statement : **[JEE Main-2015]**

(1) It has to be stored in plastic or wax lined glass bottles in dark
(2) It has to be kept away from dust
(3) It can act only as an oxidizing agent
(4) It decomposes on exposure to light

22. The reaction of zinc with dilute and concentrated nitric acid, respectively produces :

[JEE (Main) 2016]

(1) NO_2 and N_2O (2) N_2O and NO_2
(3) NO_2 and NO (4) NO and N_2O

23. Which intermolecular force is most responsible in allowing xenon gas to liquefy?

[JEE (Main) Online 2016]

(1) Ionic
(2) Instantaneous dipole- induced dipole
(3) Dipole - dipole
(4) Ion - dipole

24. The crystalline form of borax has

[JEE Adv. 2016]

(1) Tetranuclear $[B_4O_5(OH)_4]^{2-}$ unit
(2) All boron atoms in the same plane
(3) Equal number of sp^2 and sp^3 hybridized boron atoms
(4) One terminal hydroxide per boron atom

25. Which of the following reactions is an example of a redox reaction ? **[JEE (Main) 2017]**

(1) $XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$
(2) $XeF_2 + PF_5 \rightarrow [XeF]^+PF_6^-$
(3) $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$
(4) $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

26. The products obtained when chlorine gas reacts with cold and dilute aqueous NaOH are :-

[JEE (Main) 2017]

(1) ClO^- and ClO_3^- (2) ClO_2^- and ClO_3^-
(3) Cl^- and ClO^- (4) Cl^- and ClO_2^-

27. The order of the oxidation state of the phosphorus atom in H_3PO_2, H_3PO_4, H_3PO_3 and $H_4P_2O_6$ is

[JEE Adv. 2017]

(1) $H_3PO_4 > H_4P_2O_6 > H_3PO_3 > H_3PO_2$
(2) $H_3PO_3 > H_3PO_2 > H_3PO_4 > H_4P_2O_6$
(3) $H_3PO_2 > H_3PO_3 > H_4P_2O_6 > H_3PO_4$
(4) $H_3PO_4 > H_3PO_2 > H_3PO_3 > H_4P_2O_6$

28. The option(s) with only amphoteric oxides is (are):

[JEE Adv. 2017]

(1) Cr_2O_3, CrO, SnO, PbO
(2) NO, B_2O_3, PbO, SnO_2
(3) Cr_2O_3, BeO, SnO, SnO_2
(4) ZnO, Al_2O_3, PbO, PbO_2

29. The colour of the X_2 molecules of group 17 elements changes gradually from yellow to violet down the group. This is due to -

[JEE Adv. 2017]

(1) the physical state of X_2 at room temperature changes from gas to solid down the group
(2) decrease in HOMO-LUMO gap down the group
(3) decrease in π^*-σ^* down the group
(4) decrease in ionization energy down the group

30. Xenon hexafluoride on partial hydrolysis produces compounds 'X' and 'Y' Compounds 'X' and 'Y' and the oxidation state of Xe are respectively :

[JEE (Main) ONLINE 2018]

(1) XeO_2F_2(+6) and XeO_2(+4)
(2) $XeOF_4$(+6) and XeO_2F_2(+6)
(3) $XeOF_4$(+6) and XeO_3(+6)
(4) XeO_2(+4) and XeO_3(+6)

PREVIOUS YEARS QUESTIONS				ANSWER KEY						Exercise-II
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**2**	**2**	**3**	**2**	**3**	**1**	**3**	**2**	**3**	**4**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**2**	**2**	**2**	**1**	**4**	**3**	**1**	**3**	**4**	**2**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**3**	**2**	**2**	**1,3,4**	**1**	**3**	**1**	**3,4**	**2,3**	**2**