JEE Mains 2019 Chapter wise Question Bank

p-Block Elements - Questions

Q1

The one that is extensively used as a piezoelectric material is:

(1) tridymite (2) amorphous silica
(3) quartz (4) mica

9 Jan Morning

Q2

Correct statements among a to d regarding silicones are:
(a) They are polymers with hydrophobic character.
(b) They are biocompatible.
(c) In general, they have high thermal stability and low dielectric strength.
(d) Usually, they are resistant to oxidation and used as greases.
(1) (a), (b), (c) and (d)
(2) (a), (b) and (c) only
(3) (a) and (b) only
(4) (a), (b) and (d) only

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Q3

Good reducing nature of H_3PO_2 is attributed to the presence of:

(1) Two P — OH bonds
(2) One P — H bond
(3) Two P — H bonds
(4) One P — OH bond

9 Jan Evening

Q4

Wilkinson catalyst is:

(1) $[(Ph_3P)_3\ IrCl]$
(2) $[(Et_3P)_3\ RhCl]$
(3) $[(Ph_3P)_3\ RhCl]$
(4) $[(Et_3P)_3\ IrCl]$

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Q5

The type of hybridisation and number of lone pair(s) of electrons of Xe in $XeOF_4$, respectively, are:

(1) sp^3d^2 and 1 (2) sp^3d and 2
(3) sp^3d^2 and 2 (4) sp^3d and 1

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Q6

Among the following reactions of hydrogen with halogens, the one that requires a catalyst is:

(1) $H_2 + I_2 \rightarrow 2\ HI$ (2) $H_2 + Cl_2 \rightarrow 2\ HCl$
(3) $H_2 + Br_2 \rightarrow 2\ HBr$ (4) $H_2 + F_2 \rightarrow 2\ HF$

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Q7

The pair that contains two P–H bonds in each of the oxoacids is:

(1) $H_4P_2O_5$ and $H_4P_2O_6$
(2) H_3PO_2 and $H_4P_2O_5$
(3) H_3PO_3 and H_3PO_2
(4) $H_4P_2O_5$ and H_3PO_3

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Q8

The number of 2-centre-2-electron and 3-centre-2-electron bonds in B_2H_6, respectively, are:

(1) 2 and 1 (2) 4 and 2
(3) 2 and 2 (4) 2 and 4

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Q9

The chloride that CANNOT get hydrolysed is :

(1) $PbCl_4$ (2) $CC1_4$

(3) $SnCl_4$ (4) $SiCl_4$

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Q10

The hydride that is **NOT** electron deficient is:

(1) SiH_4 (2) B_2H_6

(3) GaH_3 (4) AlH_3

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Q11

Iodine reacts with concentrated HNO_3 to yield Y along with other products. The oxidation state of iodine in Y, is :

(1) 5 (2) 7

(3) 3 (4) 1

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Q11

The element that does NOT show catenation is :

(1) Ge (2) Si

(3) Sn (4) Pb

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Q12

Chlorine on reaction with hot and concentrated sodium hydroxide gives :

(1) Cl^- and ClO_3^- (2) Cl^- and ClO^-

(3) ClO_3^- and ClO_2^- (4) Cl^- and ClO_2^-

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Q13

The element that shows greater ability to form $p\pi - p\pi$ multiple bonds, is :

(1) Sn (2) C

(3) Ge (4) Si

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Q14

Diborane (B_2H_6) reacts independently with O_2 and H_2O to produce, respectively;

(1) B_2O_3 and H_3BO_3 (2) B_2O_3 and $[BH_4]^-$

(3) H_3BO_3 and B_2O_3 (4) HBO_2 and H_3BO_3

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Q14

The correct statement about ICl_5 and ICl_4^- is :

(1) both are is isostructural.

(2) ICl_5 is trigonal bipyramidal and ICl_4^- is tetrahedral.

(3) ICl_5 is square pyramidal and ICl_4^- is tetrahedral.

(4) ICl_5 is square pyramidal and ICl_4^- is square planar.

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Q15

The ion that has sp^3d^2 hydridization for the central atom, is:

(1) $[ICl_4]^-$ (2) $[ICl_2]^-$ (3) $[IF_6]^-$ (4) $[BrF_2]^-$

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Q16

The correct order of the oxidation states of nitrogen in NO, N_2O, NO_2 and N_2O_3 is:

(1) $NO_2 < NO < N_2O_3 < N_2O$

(2) $NO_2 < N_2O_3 < NO < N_2O$

(3) $N_2O < N_2O_3 < NO < NO_2$

(4) $N_2O < NO < N_2O_3 < NO_2$

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Q17

C_{60}, an allotrope of carbon cantains:

(1) 12 hexagons and 20 pentagons.

(2) 18 hexagons and 14 pentagons.

(3) 16 hexagons and 16 pentagons.

(4) 20 hexagons and 12 pentagons.

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Q18

HF has highest boiling point among hydrogen halides, because it has:

(1) strongest van der Waals' interactions

(2) lowest ionic character

(3) strongest hydrogen bonding

(4) lowest dissociation enthalpy

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Q19

The amorphous form of silica is:

(1) Tridymite (2) Kieselguhr

(3) Cristobalite (4) Quartz

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Q20

The oxoacid of Sulphur that does not contain bond between Sulphur atoms is :

(1) $H_2S_4O_6$ (2) $H_2S_2O_3$ (3) $H_2S_2O_7$ (4) $H_2S_2O_4$

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Q21

The correct order of catenation is :

(1) C > Sn > Si ≈ Ge (2) C > Si > Ge ≈ Sn

(3) Si > Sn > C > Ge (4) Ge > Sn > Si > C

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Q22

The number of pentagons in C_{60} and trigons (triangles) in white phosphorous, respectively, are :

(1) 20 and 3 (2) 12 and 4

(3) 12 and 3 (4) 20 and 4

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Q23

The noble gas that does NOT occur in the atmosphere is :

(1) He (2) Kr (3) Ne (4) Ra

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Q24

The basic structural unit of feldspar, zeolites, mica, and asbestos is :

(1) $(SiO_3)^{2-}$ (2) SiO_2

(3) $(SiO_4)^{4-}$ (4) $-\left(\begin{matrix}R\\|\\Si-O\\|\\R\end{matrix}\right)_n-$ (R = Me)

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Q25

The C – C bond length is maximum in :

(1) graphite (2) C_{70}

(3) C_{60} (4) diamond

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JEE Mains 2019 Chapter wise Question Bank

p-Block Elements - Answers

Q1

(3) Quartz exhibits piezoelectricity and thus can be used as a piezoelectric material.

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Q2

(4) Silicones are polymers containing Si—O—Si linkages with strong hydrophobic character.
Generally, they exhibit high thermal stability with high dielectric strength. Silicon greases are resistant to oxidation which are commonly used for greasing purposes.

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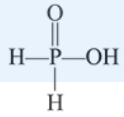
Q3

(3) Structure of H_3PO_2:



Greater the number of P—H bonds present in the acid, greater will be its reducing property.

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Q4

(3) Wilkinson's catalyst is $[Rh(PPh_3)_3Cl]$

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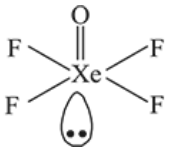
Q5

(1)  , sp^3d^2, no. of lone pair = 1

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Q6

(1) The reaction between I_2 and H_2 requires catalyst, whereas all other halogens react with H_2 without the requirement of a catalyst.

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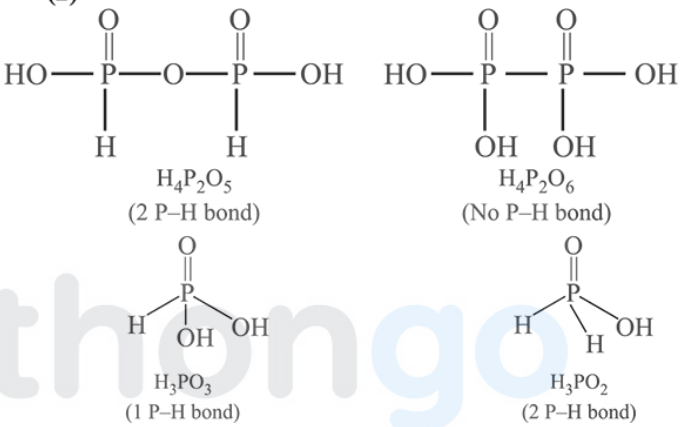
Q7

(2)



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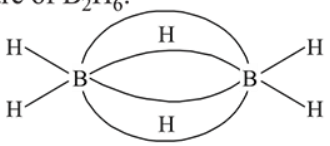
Q8

(2) Structure of B_2H_6:



$\therefore$ No. of 2-centre-2 electron bonds = 4,
No. of 3-centre-2 electron bonds = 2.

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Q9

(2) CCl_4 cannot be hydrolysed due to absence of *d* orbitals at carbon atom.

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Q10

(1) SiH_4 : Electron precise hydride
B_2H_6, GaH_3 and $Al H_3$ are electron deficient

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Q11

(1) Conc. HNO_3 oxidises I_2 to iodic acid (HIO_3).

$$I_2 + 10HNO_3 \rightarrow \underset{Y}{2HIO_3} + 10NO_2 + 4H_2O$$

In HIO_3 oxidation state of iodine is +5.

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Q11

(4) Catenation power of the elements decreases as we move down in the group. Therefore, Pb does not show catenation property.

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Q12

(1) $3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$

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Q13

(2) Due to the small size of carbon atom, effective lateral overlapping between $2p$ and $2p$ occurs.

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Q14

(1) $B_2H_6 + 3O_2 \longrightarrow B_2O_3 + 3H_2O$

$B_2H_6 + 6H_2O \longrightarrow 2H_3BO_3 + 6H_2$

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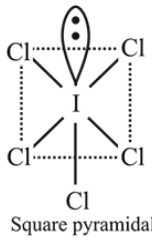
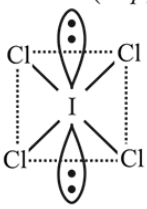
Q14

(4) ICl_5 is sp^3d^2 hybridised (5 *bp*, 1 *lp*)



Square pyramidal

ICl_4^- is sp^3d^2 hybridised (4 *bp*, 2 *lp*)



Square planar

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Q15

(1)

Species	Hybridisation
ICl_2^-	sp^3d
ICl_4^-	sp^3d^2
BrF_2^-	sp^3d
IF_6^-	sp^3d^3

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Q16

(4)

(Oxide)	(Oxidation state)
N_2O	+1
NO	+2
N_2O_3	+3
NO_2	+4

So, $N_2O < NO < N_2O_3 < NO_2$

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Q17

(4) Fullerene (C_{60}) contains 20 hexagons (six membered) rings and 12 pentagons (five membered rings):

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Q18

(3) Due to strong H-bonding between HF molecules. HF has highest boiling point among the hydrogen halides.

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Q19

(2) Quartz, tridymite and cristobalite are crystalline forms of silica, while kieselguhr is an amorphous form of silica.

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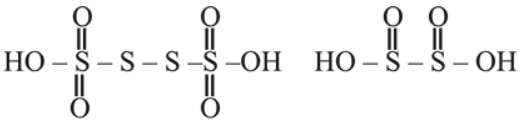
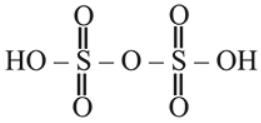
Q20

(3)

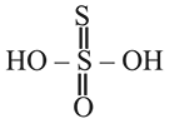


$(H_2S_4O_6)$

$(H_2S_2O_4)$



$(H_2S_2O_7)$



$(H_2S_2O_3)$

$H_2S_2O_7$ does not show bonding between sulphur atoms.

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Q21

(2) The catenation property among 14^{th} group elements is based on bond enthalpy value of bond between the same element. The decreasing order of bond enthalpy values is

Bond enthalpy in kJ/mol $\underset{348}{C-C} > \underset{297}{Si-Si} > \underset{260}{Ge-Ge} \approx \underset{240}{Sn-Sn}$

$\therefore$ Decreasing order of catenation is

$C > Si > Ge \approx Sn$

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Q22

(2) Number of pentagons in C_{60} (Buckminsterfullerene) = 12

Number of triangles in P_4 (White phosphorous) = 4

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Q23

(4) Radon is radioactive element and not present in atmosphere.

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Q24

(3) These are examples of silicates, the basic unit of each of them is SiO_4.

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Q25

(4) Carbon-carbon bond length is maximum in diamond because diamond has all single bonds while graphite, C_{70} and C_{60} have single and double bonds.

Carbon allotrope	**C – C bond length**
Diamond	154 pm
Graphite	141.5 pm
C_{60}	138.3 pm and 143.5 pm
C_{70}	eight type of bond lengths from 0.137 pm to 0.146 pm.

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