Q1 (20 July 2021 Shift 1)

The number of lone pairs of electrons on the central I atom in I_3^- is ___

Q2 (20 July 2021 Shift 2)

The hybridisations of the atomic orbitals of nitrogen in NO_2^-, NO_2^+ and NH_4^+ respectively are.

(1) sp^3, sp^2 and sp

(2) sp, sp^2 and sp^3

(3) sp^3, sp and sp^2

(4) sp^2, sp and sp^3

Q3 (22 July 2021 Shift 1)

Match List-I with List-II :

List-I (Species)	List-II (Hybrid Orbitals)
(a) SF_4	(i) sp^3d^2
(b) IF_5	(ii) d^2sp^3
(c) NO_2^+	(iii) sp^3d
(d) NH_4^+	(iv) sp^3
	(v) sp

Choose the correct answer from the options given below:

(1) (a)-(i), (b)-(ii), (c)-(v) and (d)-(iii)

(2) (a)-(ii), (b)-(i), (c)-(iv) and (d)-(v)

(3) (a)-(iii), (b)-(i), (c)-(v) and (d)-(iv)

(4) (a)-(iv), (b)-(iii), (c)-(ii) and (d)-(v)

Q4 (25 July 2021 Shift 2)

In the following the correct bond order sequence is:

(1) $O_2^{2-} > O_2^+ > O_2^- > O_2$

(2) $O_2^+ > O_2^- > O_2^{2-} > O_2$

(3) $O_2^+ > O_2 > O_2^- > O_2^{2-}$

(4) $O_2 > O_2^- > O_2^{2-} > O_2^+$

Q5 (25 July 2021 Shift 2)

Identify the species having one π -bond and maximum number of canonical forms from the following :

(1) SO_3

(2) O_2

(3) SO_2

(4) CO_3^{2-}

Q6 (27 July 2021 Shift 1)

Given below are two statements: One is labelled as Assertion $\mathbf{A}$ and the other labelled as Reason $\mathbf{R}$.

Assertion A : Lithium halides are some what covalent in nature.

Reason $\mathbf{R}$: Lithium possess high polarisation capability.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) $\mathbf{A}$ is true but $\mathbf{R}$ is false

(2) $\mathbf{A}$ is false but $\mathbf{R}$ is true

(3) Both $\mathbf{A}$ and $\mathbf{R}$ are true but $\mathbf{R}$ is NOT the correct explanation of $\mathbf{A}$

(4) Both $\mathbf{A}$ and $\mathbf{R}$ are true and $\mathbf{R}$ is the correct explanation of $\mathbf{A}$

Q7 (27 July 2021 Shift 1)

In gaseous triethyl amine the "-C-N-C-" bond angle is _____ degree.

Q8 (27 July 2021 Shift 1)

The difference between bond orders of CO and $NO^{\oplus}$ is $\frac{x}{2}$ where $x =$
(Round off to the Nearest Integer)

Q9 (27 July 2021 Shift 2)

The total number of electrons in all bonding molecular orbitals of O_2^{2-} is .....
(Round off to the nearest integer)

Answer Key

Q1 (3) **Q2** (4) **Q3** (3) **Q4** (3)

Q5 (4) **Q6** (4) **Q7** (108) **Q8** (0)

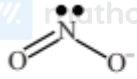
Q9 (10)

Q1

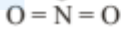
I_3^- :

The number of lone pairs of electron on the central atom is 3.

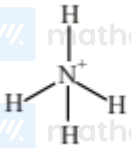
Q2



$2\sigma + 1$ lp
$\therefore$ sp^2



$2\sigma + 0$ lp
$\therefore$ sp



$4\sigma + 0$
$\therefore$ sp^3

Q3

(a) SF_4 – $sp^3 d$ hybridisation

(b) IF_5 – $sp^3 d^2$ hybridisation

(c) NO_2^+ – sp hybridisation

(d) NH_4^+ – sp^3 hybridisation

Q4

O_2 (16 electrons) $\sigma_{1s}^2, \sigma_{1s}^{*2}, \sigma_{2s}^2, \sigma_{2s}^{*2}, \sigma_{2p_z}^2$

$\pi_{2p_x}^2 = \pi_{2py_y}^2, \pi_{2p_x}^{*1} = \pi_{2py_y}^{*1}, \sigma_{2p_p}^*$

Bond order of $O_2 \Rightarrow 2$

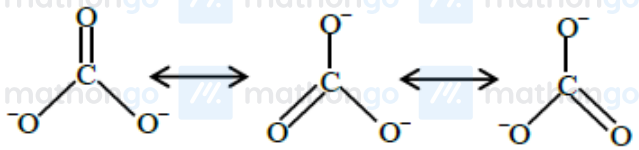
Bond order of $O_2^- \Rightarrow 1.5$

Bond order of $O_2^{2-} \Rightarrow 1$

Bond order of $O_2^+ \Rightarrow 2.5$

Q5

Among SO_3, O_2, SO_2 and CO_3^{2-}, only O_2 and CO_3^{2-} has only one π -bond



Q6

Lithium due to small size has very high polarization capability and thus increases covalent nature in Halides.

Q7

In gaseous triethyl amine the "-C-N-C-" bond angle is 108 degree.

Q8

Bond order of $CO = 3$

Bond order of $NO^+ = 3$

Difference $= 0 = \frac{x}{2}$

$x = 0$

Q9

M. O. Configuration of O_2^{2-} $((18\bar{e})$

$\sigma 1\ s^2 \sigma 1\ s^2 \sigma 2\ s^2 \sigma 2\ s^2 \sigma 2p_z^2 \pi 2p_x^2 = \pi 2p_y^2$

$\pi 2p_x^2 = \pi 2p_y^2$

Total B.M.O electrons $= 10$