MO Diagram of CO & NO Molecules

By

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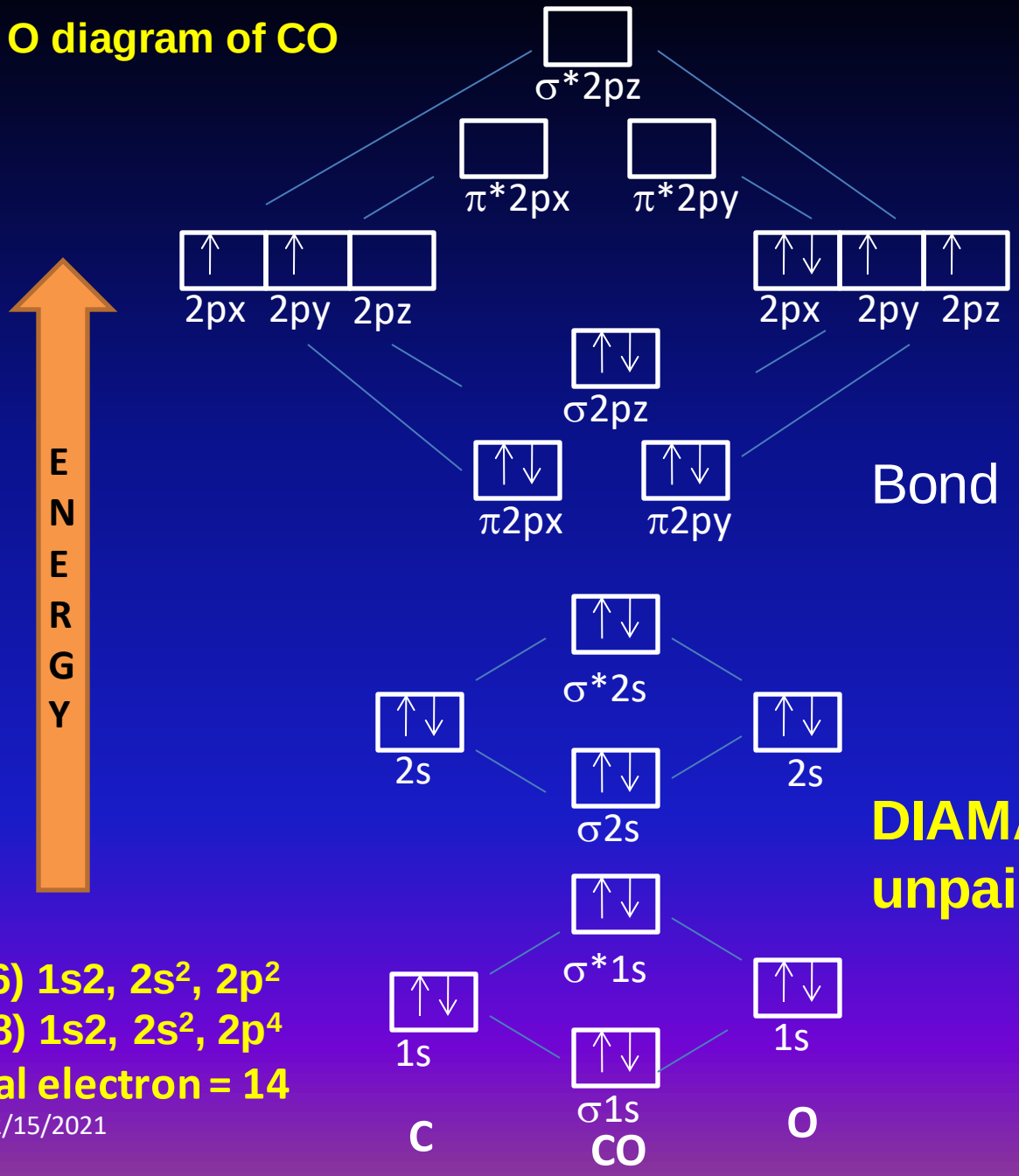
$\sigma 1s^2,\ \sigma^* 1s^2,\ \sigma 2s^2,\ \sigma^* 2s^2,\ \pi 2p_x^2 = \pi 2p_y^2,\ \sigma 2p_z^2$

M O diagram of CO



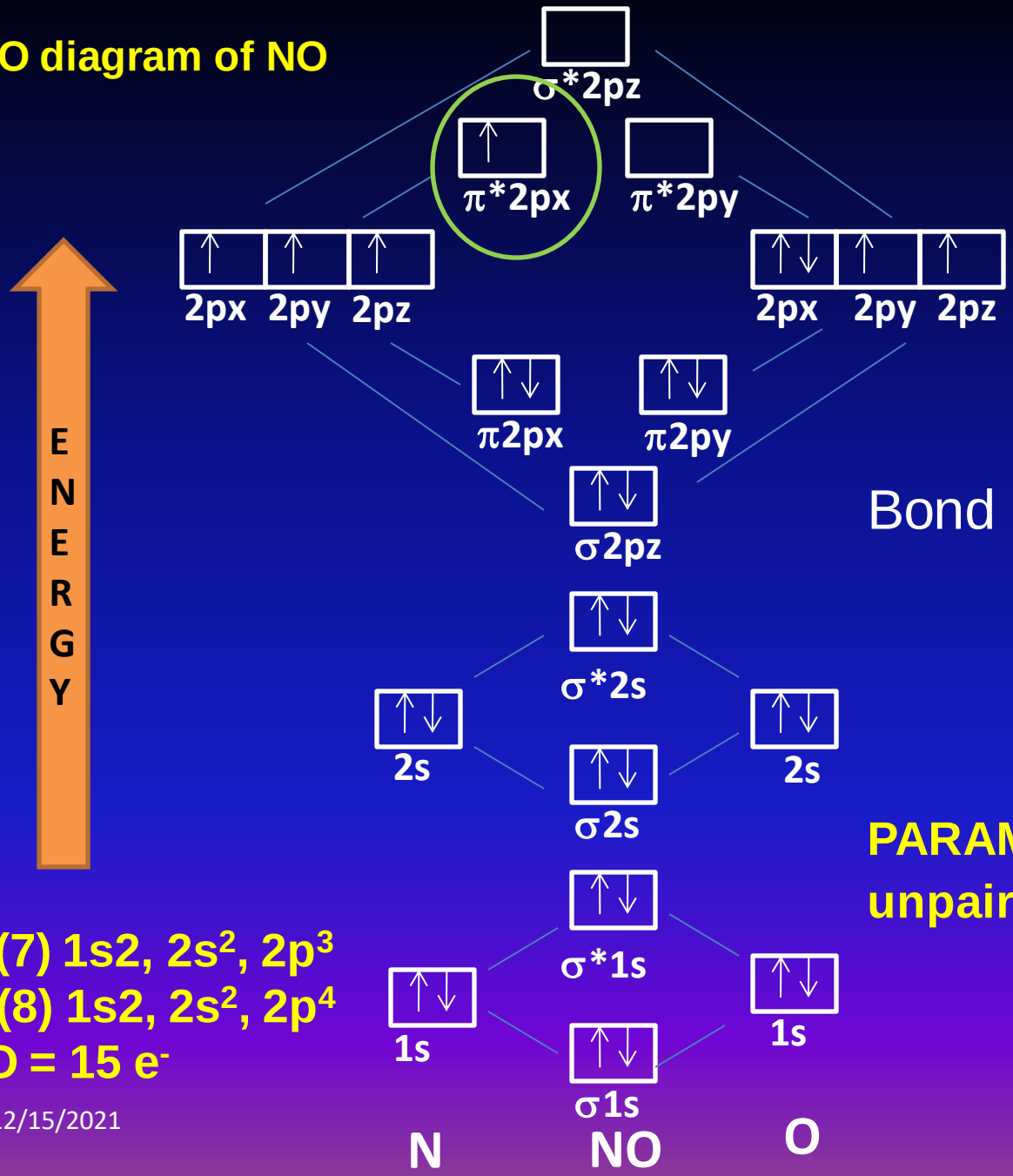
Bond Order $= \frac{1}{2}(N_b - N_a)$
$= \frac{1}{2}(10 - 4)$
$= 3$

DIAMAGNETIC due to no unpaired e^- in MOs

C (6) 1s2, $2s^2$, $2p^2$
O (8) 1s2, $2s^2$, $2p^4$
Total electron = 14

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

MO diagram of NO



Bond Order $= \frac{1}{2}(N_b - N_a)$
$= \frac{1}{2}(10 - 5)$
$= 2.5$

PARAMAGNETIC due to 1 unpaired e present in $\pi^* 2p_x$

N (7) 1s2, $2s^2$, $2p^3$
O (8) 1s2, $2s^2$, $2p^4$
NO = 15 e^-

Q.1 Show that

a. Size of CO < NO molecule
b. NO is more reactive than CO molecule
c. NO is paramagnetic while CO is diamagnetic

Solution

CO molecule

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

NO Molecule

$\sigma 1s^2,\ \sigma^* 1s^2, \sigma 2s^2,\ \sigma^* 2s^2, \sigma 2p_z^2,\ \pi 2p_x^2 = \pi 2p_Y^2,\ \pi^* 2p_x^1 = \pi^* 2p_Y$

Bond Order of CO $= \frac{1}{2}(N_b - N_a)$
$= \frac{1}{2}(10 - 4)$
$= 3$

Bond Order of NO $= \frac{1}{2}(N_b - N_a)$
$= \frac{1}{2}(10 - 5)$
$= 2.5$

a. Size $\propto$ 1/Bond Order, B.O. of CO molecule > B.O. of NO molecule
Thus, Size of CO < NO molecule

b. Reactivity $\propto$ 1/ Bond Order
Thus, NO is more reactive than CO molecule

c. NO has one unpaired electron. So, Paramagnetic
CO has no unpaired electron. So, Diamagnetic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Thank you