1) a) N_2O

i) 16 val e^-

ii) N̈=N=Ö (with lone pairs)

iii) Linear, family
Linear, actual

iv) :N≡N−Ö: ↔ :N̈−N≡Ö

v)

vi) N has 3 bonds
O has 1 bond
O is more EN and tends not to share well

b.) H_2S

i) 8

ii) H−S̈:
|
H

iii) Td
bent

iv) no,
not w/o
violating
octet
rule

c) CO_2

i) 16

ii) Ö=C=Ö

iii) linear
linear

iv) yes

v) :Ö−C≡O: ↔ :O≡C−Ö:

vi) carbon has 4 bonds
O has 2 bonds

d) C_2N_2

i) 18

ii) :N≡C−C≡N:

iii) linear
linear

iv) no,
not w/o
violating
octet
rule

2) $Li^{\cdot}_{(g)} + e^-_{(g)} \longrightarrow Li:^{\ominus}_{(g)} + \text{energy}$

Reason for exothermicity in general: a high energy free e^- is stabilized by the nuclear charge of the atom despite making an anion. Making $Li:^{\ominus}$ is most exothermic because the added e^- enters a very stable 2s orbital (as opposed to a higher energy 6s orbital in $Cs:^{\ominus}$). Being closer to the nucleus increases the stability of the ion.

$Be:^{\ominus}$ and $Mg:^{\ominus}$ are both unstable since the added e^- enters a higher energy p orbital. Any stabilization is offset by the higher energy of the p-orbital.

3) best shielding — worst shielding

$s > p > d > f$

s ↓ spherical shape of e^- cloud can shield at all directions around the nucleus

f ↓ finger-like and thin lobes of e^- cloud have many voids which do not act as a shield around the nucleus.

4)

N
2p ↑ ↑ ↑
2s ↑↓
1s ↑↓

Moving e^- have an associated magnetic field. This field can be quantized into 2 states of spin (spin up, spin down)

For the example of N's diagram one can see that there are parallel spin unpaired electrons in the 2p orbitals. These parallel spins can align with an external magnet as these e^-s are magnets themselves.

5)

$Ne \xrightarrow{-1e^-} Ne^{+} \xrightarrow{-1e^-} Ne^{2+} \xrightarrow{-1e^-} Ne^{3+}$

Ne	Ne^{+}	Ne^{2+}	Ne^{3+}
$1s^2 2s^2 2p^6$	$1s^2 2s^2 2p^5$	$1s^2 2s^2 2p^4$	$1s^2 2s^2 2p^3$
$Z_{eff} = +10 - 2 = +8$	$Z_{eff} = +8$	$Z_{eff} = +8$	$Z_{eff} = +8$

$Be \xrightarrow{-1e^-} Be^{+} \xrightarrow{-1e^-} Be^{2+} \xrightarrow{-1e^-} Be^{3+}$

Be	Be^{+}	Be^{2+}	Be^{3+}
$1s^2 2s^2$	$1s^2 2s^1$	$1s^2$	$1s^1$
$Z_{eff} = +4 - 2 = +2$	$Z_{eff} = +2$	$Z_{eff} = +4$	$Z_{eff} = +4$

Ionization of Ne occurs from one type of orbital (2p). Ionization of Be occurs from two types (2s + 1s). The 1s orbital is much more stable and ionization will [illegible]