

6.4 review questions

1.

| Incomplete Valence Octet | Valence Octet | Expanded Valence Octet |
|--------------------------|---------------|------------------------|
| H | C | Si |
| Be | N | P |
| B | O | S |
| Al | F | Cl |

2. Helium and neon are both invisible totally unreactive gases whose similar behaviour qualifies each of them as members of the family which includes other unreactive gases. They do have a different number of outer electrons, but the outer electron cloud of each is a particularly stable configuration.

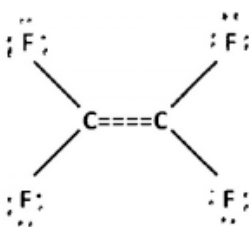
Helium only has 2 electrons, and those are represented by the 2 dots in its Lewis structure. That single pair of outer electrons fills the 1s sublevel and also completes the 1st energy level, which explains why helium is unreactive.

Neon has 8 outer electrons represented as 4 pairs of dots. Those 8 electrons fill the 2s and 2p sublevels, complete the 2nd energy level, and give neon a stable valence octet consisting of 4 pairs of electrons. As a result, neon is also unreactive.

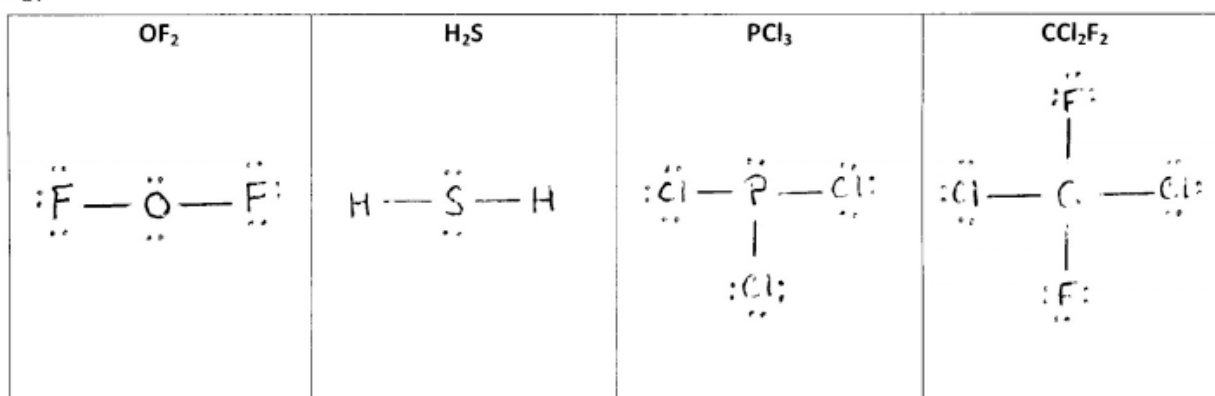
3.

| Element Pair | Probable Central Atom | Probable Peripheral Atom |
|-----------------------------|-----------------------|--------------------------|
| (a) phosphorus and chlorine | phosphorus | chlorine |
| (b) nitrogen and oxygen | nitrogen | oxygen |
| (c) carbon and sulphur | carbon | sulphur |
| (d) nitrogen and hydrogen | nitrogen | hydrogen |
| (e) oxygen and fluorine | oxygen | fluorine |

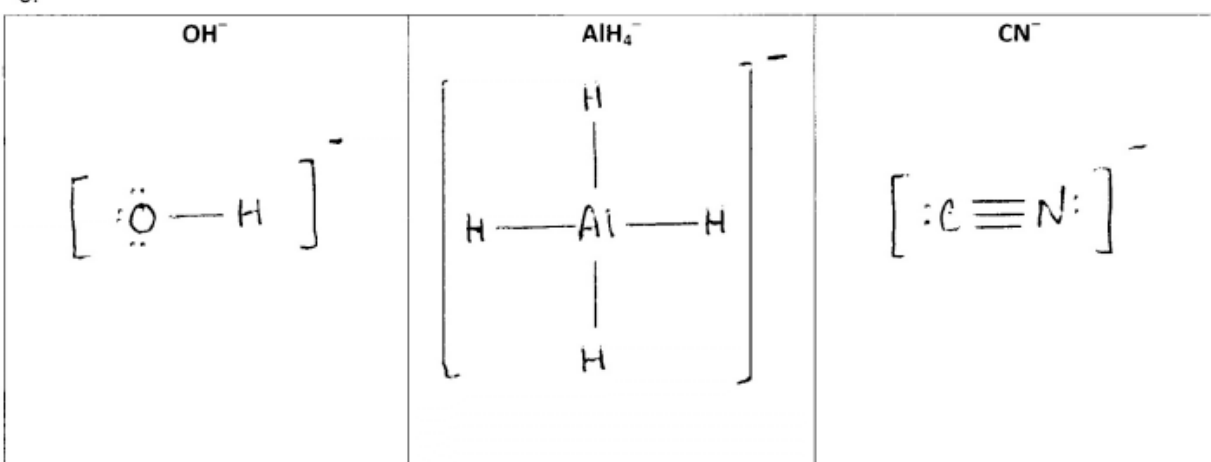
4.



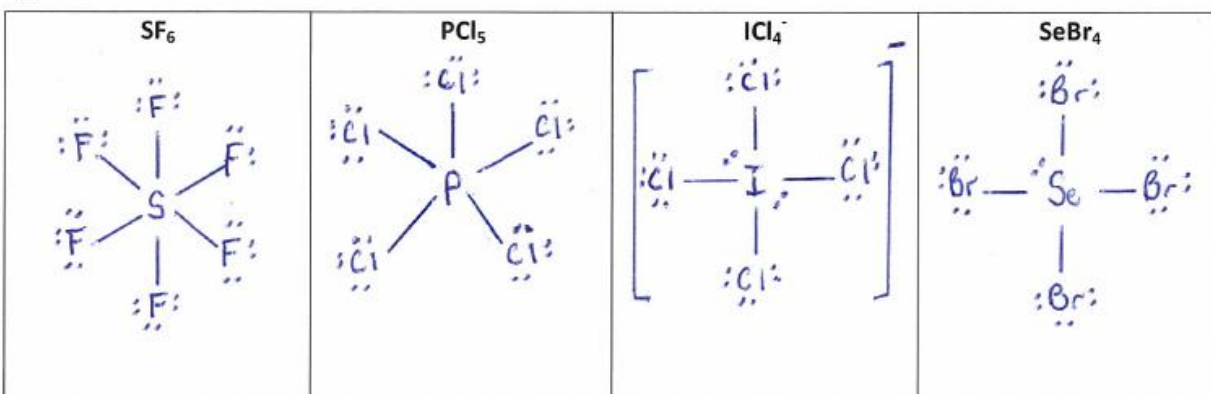
5.



6.



7.



8.

| CS_2 | SCO (C is central) | O_3 (Extension: Draw 2 resonance structures) | NO_3^- (Extension: Draw 3 resonance structures) |
|--|--|---|---|
| $\text{:}\ddot{\text{S}}=\text{C}=\ddot{\text{S}}\text{:}$ | $\text{:}\ddot{\text{S}}=\text{C}=\ddot{\text{O}}\text{:}$ | $\begin{array}{c} [\text{:}\ddot{\text{O}}-\ddot{\text{O}}=\ddot{\text{O}}\text{:}] \\ \updownarrow \\ [\text{:}\ddot{\text{O}}=\ddot{\text{O}}-\ddot{\text{O}}\text{:}] \end{array}$ | |

9.

| | | | |
|--|---|---|---|
| $\text{H}-\text{C}\equiv\text{C}-\text{H}$ | $\text{H}-\ddot{\text{O}}-\ddot{\text{O}}-\text{H}$ | $\begin{array}{cc} \text{H} & \text{H} \\ & \\ \text{C} & = & \text{C} \\ & \\ \text{H} & \text{H} \end{array}$ | $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\ddot{\text{O}}-\text{H} \\ \\ \text{H} \end{array}$ |
|--|---|---|---|