

**USING THE FEATURE**
**www science: The Art of Science, p. 182**

This feature highlights the point that science is a creative endeavour. Researchers can build objects at the microscopic and atomic level, and these objects include not only musical instruments but also historically connected pieces such as the Fender Stratocaster. A second highlight is that we are on the verge of being able to build machines atom by atom. These machines will have applications that will affect every part of society from better cleaning rags to custom-designed medicines.

**SECTION 4.1 ASSESSMENT, p. 183**
**Check Your Understanding Answers**
**Checking Concepts**

- (a) Both protons and neutrons are about the same mass. Students may have also mentioned that they are both subatomic particles and are both found in the nucleus.  
(b) Protons and neutrons have different electric charges.
- Proton and neutron
- The neutron is nearly equal to the mass of the proton plus the mass of the electron.
- (a) Protons and neutrons  
(b) Electrons
- The charges of all the subatomic particles in an atom add up to zero.
- (a) 2+  
(b) The nuclear charge equals the number of protons in the nucleus.
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	Element	Atomic Number	Number of Protons	Number of Electrons
(a)	Pb	82	82	82
(b)	O	8	8	8
(c)	Zn	30	30	30
(d)	Fe	26	26	26
(e)	Ag	47	47	47
(f)	Cl	17	17	17

8.


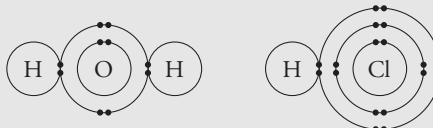
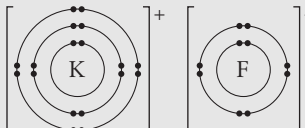

Element	(a) Period	(b) Group
Cs	6	1
S	3	16
Kr	36	36
C	2	14

Element	(a) Period	(b) Group
Fe	4	8
Hg	6	12

9. For example: alkali metals, alkaline earth metals, halogens, noble gases

**Understanding Key Ideas**

- (a) Electron  
(b) Proton, electron  
(c) Electron  
(d) Neutron  
(e) Proton, neutron  
(f) Proton
- In a covalent compound, atoms bond together by sharing a pair of electrons. In an ionic compound, ions form as a result of the transfer of electrons, and then ions of opposite charge attract each other.
- (a) Bohr and Lewis diagrams are similar in that they show the valence electrons and how they result in bond formation.  
(b) They are different in that Bohr diagrams show all the atoms in each atom or ion, while Lewis diagrams show only valence electrons.

- (a)
 
- (b)
 
- (c)
 
  

- (a)  $\text{H}-\text{H}$        $\text{:}\ddot{\text{F}}-\ddot{\text{F}}\text{:}$   
(b)  $\text{H}-\ddot{\text{O}}-\text{H}$        $\text{H}-\ddot{\text{Cl}}\text{:}$   
(c)  $[\text{Na}]^+$   $[\text{:}\ddot{\text{F}}\text{:}]^-$   $[\text{Li}]^+$   $[\text{:}\ddot{\text{O}}\text{:}]^{2-}$   $[\text{Li}]^+$   
 $[\text{:}\ddot{\text{Cl}}\text{:}]^-$   $[\text{Be}]^{2+}$   $[\text{:}\ddot{\text{Cl}}\text{:}]^-$