

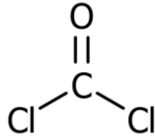
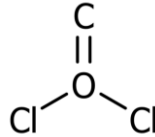
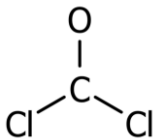
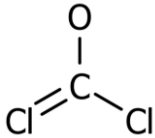
## 2018-2019 Chemistry Connections **Practice** **Questions**

**Please note:** CEF does not endorse or approve the use of any CEF Challenge questions for the purposes of preparing for any level of the Challenge. Challenge competition questions (including the Challenge Qualifier) are for competition purposes ONLY. Students should NOT receive or use questions (from the current year) at any point to study. Use of Challenge competition questions for study purposes is grounds for disqualification.

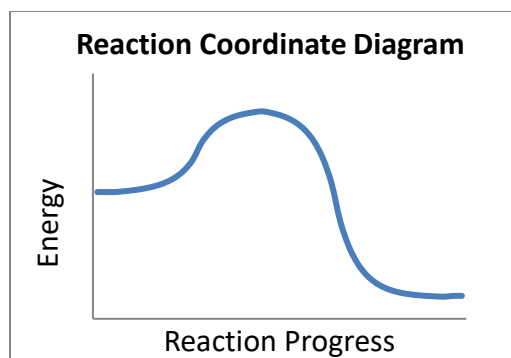
—Students should be provided with CEF’s periodic table (competition version).—

- (1) What happens to electrons when a covalent bond is formed?
- A. They are transferred from metals to nonmetals
  - B. They are transferred from nonmetals to metals
  - C. They are shared between two metals
  - D. They are shared between two nonmetals
- (2) In which form is an oxygen atom most likely to have the largest mass number?
- A. As pure oxygen gas
  - B. In a covalent compound with nitrogen
  - C. In an ionic compound with calcium
  - D. All of the above are equally likely
- (3) When aluminum metal is exposed to air, an aluminum oxide coating forms and protects the metal underneath. Which reaction best describes the formation of an oxide coating on aluminum metal?
- A.  $\text{Al(s)} + \text{O(g)} \rightarrow \text{AlO(s)}$
  - B.  $\text{Al(s)} + \text{O}_2\text{(g)} \rightarrow \text{AlO}_2\text{(s)}$
  - C.  $3\text{Al(s)} + \text{O}_2\text{(g)} \rightarrow \text{Al}_3\text{O}_2\text{(s)}$
  - D.  $4\text{Al(s)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{Al}_2\text{O}_3\text{(s)}$

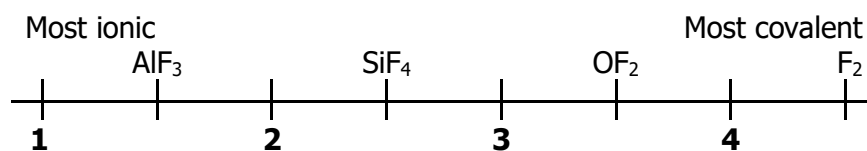
- (4) Four potential Lewis structures for phosgene,  $\text{COCl}_2$ , are shown below with all lone pairs omitted. Which Lewis structure best describes the bonds in phosgene?

Diagram	Lewis Structure
1	
2	
3	
4	

- A. Diagram 1  
B. Diagram 2  
C. Diagram 3  
D. Diagram 4
- (5) When humans digest food it travels from the stomach, where the pH is roughly 2.5, to the small intestine, where the pH is 7.5. What is true of the small intestine?
- A. It does not have an excess of  $\text{H}^+$  ions or  $\text{OH}^-$  ions  
B. It has a higher concentration of  $\text{H}^+$  ions than the stomach  
C. It has a higher concentration of  $\text{OH}^-$  ions than the stomach  
D. It is five times more basic than the stomach
- (6) Which statement **must** be true of the reversible reaction shown below?

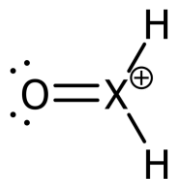


- A. The forward reaction and reverse reaction occur at the same rate  
 B. The reverse reaction is endothermic  
 C. The transition state of the forward reaction is more stable than that of the reverse reaction  
 D. Both B and C
- (7) Four compounds are shown below on a scale from most ionic to most covalent bonding. Based on the second and third rows of the periodic table, where does sulfur difluoride,  $\text{SF}_2$ , fit on this scale?



- A. Location 1  
 B. Location 2  
 C. Location 3  
 D. Location 4
- (8) A chemical reaction has an activation energy of 100 kJ and  $\Delta E$  equal to  $-25$  kJ. What is the activation energy of the reverse reaction?
- A. 25 kJ  
 B. 75 kJ  
 C. 100 kJ  
 D. 125 kJ

(9) Lewis structure of  $\text{H}_2\text{XO}^+$  is shown below. What element does X represent?



- A. Boron
- B. Carbon
- C. Nitrogen
- D. Oxygen

(10) Aluminum chlorohydrate,  $\text{Al}_2\text{Cl}(\text{OH})_5$ , is used in many deodorants because it plugs sweat ducts. Roughly  $8 \times 10^{20}$  atoms of aluminum are used to make one stick of deodorant. How many atoms of oxygen are needed to make enough aluminum chlorohydrate for one stick of deodorant?

- A.  $2 \times 10^{21}$  atoms**
- B.  $4 \times 10^{20}$  atoms
- C.  $4 \times 10^{21}$  atoms
- D.  $8 \times 10^{20}$  atoms

## ***Answer Key***

See how you did! Check out the answers below.

- (1) D
- (2) D
- (3) D
- (4) A
- (5) C
- (6) B
- (7) C
- (8) D
- (9) C
- (10) A