



2018-2019 Chemistry in Action **Practice** **Questions**

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

(1) Decaffeinated coffee is made by soaking coffee beans in dichloromethane, which dissolves the caffeine but not the beans. What property is used to separate caffeine from coffee beans?

- A. Boiling point
- B. Density
- C. Melting point
- D. Solubility

(2) The National Cherry Blossom Festival takes place in Washington, DC every year. Essential oils from cherry blossom petals can be isolated by distillation and added to products such as perfume. What processes take place during distillation?

- A. Boiling and condensation
- B. Decomposition and synthesis
- C. Freezing and melting
- D. Oxidation and reduction

(3) Based on the portion of the periodic table shown below, which sample contains the greatest number of atoms?

13 Al Aluminum 26.9815	14 Si Silicon 28.086	15 P Phosphorus 30.9738
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- A. 50 g aluminum
- B. 50 g silicon
- C. 50 g phosphorus
- D. All three have the same number of atoms

(4) The famous Hope Diamond was formed deep in the earth’s crust over one billion years ago. It is currently on display in Washington, DC’s National Museum of Natural History. What type of bonds **must** be present in the Hope Diamond?

- A. Covalent
- B. Ionic
- C. Metallic
- D. Both A and B



(5) Cirrus ice-crystal clouds tend to form at higher altitudes than altocumulus water-droplet clouds. Which atmospheric conditions at higher altitudes most likely explain why?

- I. More gravitational potential energy
- II. Higher temperature
- III. Lower temperature

- A. II only
- B. III only
- C. I and II
- D. I and III

(6) Which application takes advantage of freezing point depression?

- A. Balloons are more commonly filled with He(g) than H₂(g)
- B. CaCl₂ is added to liquid caramel in caramel-filled chocolate bars
- C. KHCO₃ is used in fire extinguishers
- D. NaCl is added to water during cooking at high altitudes

(7) The average human body contains a solution of 0.10 M sodium chloride, which has a molar mass of roughly 60 g. If an adult has 40 L of fluid in their body, what mass of sodium chloride is present?

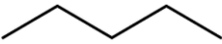
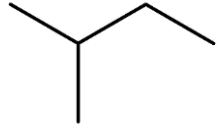
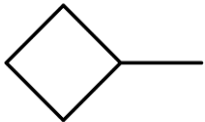
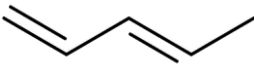
- A. 4 g
- B. 7 g
- C. 15 g
- D. 240 g

(8) The light used to develop photographs in darkrooms must be visible to the human eye, but low energy enough not to develop the film. Based on the wavelengths below, which type of light would be best to use in a darkroom?

Light	Wavelength
UV light	200 nm
Green light	510 nm
Red light	650 nm
Infrared light	5,000 nm

- A. UV light
- B. Green light
- C. Red light
- D. Infrared light

- (9) The compound 2-pentene is found in household appliances like refrigerators and freezers. Which compound in the table below has the same chemical formula as 2-pentene?

Compound	Structure
1	
2	
3	
4	

- A. Compound 1
B. Compound 2
C. Compound 3
D. Compound 4
- (10) Fireworks produce light when a metal ion moves from an excited state back to its ground-state electron configuration. Sr^{2+} (element 38) produces the colored light in red fireworks. What is the lowest-energy orbital that an electron could be excited into in Sr^{2+} ?

- A. 4d
B. 4p
C. 5d
D. 5s



Answer Key

See how you did! Check out the answers below.

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