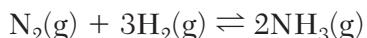


- 26 Given the equation representing a system at equilibrium:

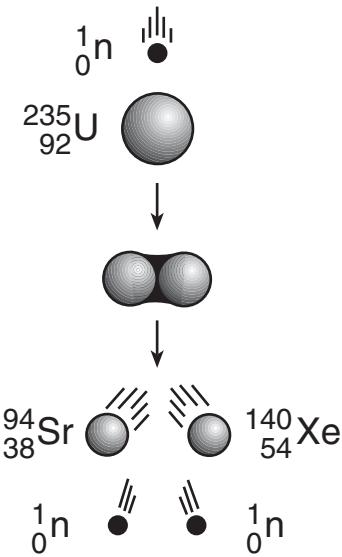


Which statement describes this reaction at equilibrium?

- (1) The concentration of  $\text{N}_2(\text{g})$  decreases.
  - (2) The concentration of  $\text{N}_2(\text{g})$  is constant.
  - (3) The rate of the reverse reaction decreases.
  - (4) The rate of the reverse reaction increases.
- 27 The acidity or alkalinity of an unknown aqueous solution is indicated by its
- (1) pH value
  - (2) electronegativity value
  - (3) percent by mass concentration
  - (4) percent by volume concentration
- 28 The laboratory process in which the volume of a solution of known concentration is used to determine the concentration of another solution is called
- (1) distillation
  - (2) fermentation
  - (3) titration
  - (4) transmutation

- 29 Which list of nuclear emissions is arranged in order from the greatest penetrating power to the least penetrating power?
- (1) alpha particle, beta particle, gamma ray
  - (2) alpha particle, gamma ray, beta particle
  - (3) gamma ray, alpha particle, beta particle
  - (4) gamma ray, beta particle, alpha particle

- 30 Given the diagram representing a reaction:



Which type of change is represented?

- (1) fission
- (2) fusion
- (3) deposition
- (4) evaporation

## Part B–1

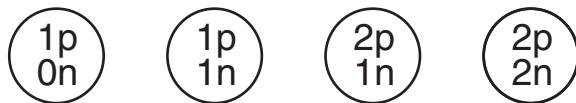
**Answer all questions in this part.**

*Directions (31–50): For each statement or question, record on your separate answer sheet the number of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the 2011 Edition Reference Tables for Physical Setting/Chemistry.*

31 Which electron shell contains the valence electrons of a radium atom in the ground state?

- (1) the sixth shell      (3) the seventh shell  
(2) the second shell      (4) the eighteenth shell

32 Each diagram below represents the nucleus of an atom.



How many different elements are represented by the diagrams?

- (1) 1      (3) 3  
(2) 2      (4) 4

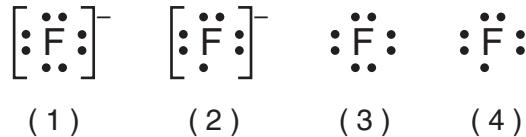
33 Chlorine and element X have similar chemical properties. An atom of element X could have an electron configuration of

- (1) 2-2      (3) 2-8-8  
(2) 2-8-1      (4) 2-8-18-7

34 Which group of elements contains a metalloid?

- (1) Group 8      (3) Group 16  
(2) Group 2      (4) Group 18

35 Which Lewis electron-dot diagram represents a fluoride ion?



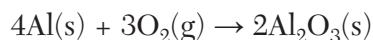
36 In the formula for the compound  $XCl_4$ , the  $X$  could represent

- (1) C      (3) Mg  
(2) H      (4) Zn

37 The formula  $C_2H_4$  can be classified as

- (1) a structural formula, only  
(2) a molecular formula, only  
(3) both a structural formula and an empirical formula  
(4) both a molecular formula and an empirical formula

38 Given the balanced equation representing a reaction:



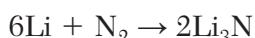
How many moles of Al(s) react completely with 4.50 moles of  $\text{O}_2\text{(g)}$  to produce 3.00 moles of  $\text{Al}_2\text{O}_3\text{(s)}$ ?

- (1) 1.50 mol      (3) 6.00 mol  
(2) 2.00 mol      (4) 4.00 mol

39 What is the percent composition by mass of oxygen in  $\text{Ca}(\text{NO}_3)_2$  (gram-formula mass = 164 g/mol)?

- (1) 9.8%      (3) 48%  
(2) 29%      (4) 59%

- 40 Given the balanced equation representing a reaction:



Which type of chemical reaction is represented by this equation?



- 41 Which elements can react to produce a molecular compound?

- (1) calcium and chlorine
  - (2) hydrogen and sulfur
  - (3) lithium and fluorine
  - (4) magnesium and oxygen

- 42 Compared to a 1.0-mole sample of  $\text{NaCl}(s)$ ,  
a 1.0-mole sample of  $\text{NaCl}(\ell)$  has a *different*

- (1) number of ions
  - (2) empirical formula
  - (3) gram-formula mass
  - (4) electrical conductivity

- 43 Which property of an unsaturated solution of sodium chloride in water remains the same when more water is added to the solution?

- (1) density of the solution
  - (2) boiling point of the solution
  - (3) mass of sodium chloride in the solution
  - (4) percent by mass of water in the solution

- 44 Which ion combines with  $\text{Ba}^{2+}$  to form a compound that is most soluble in water?



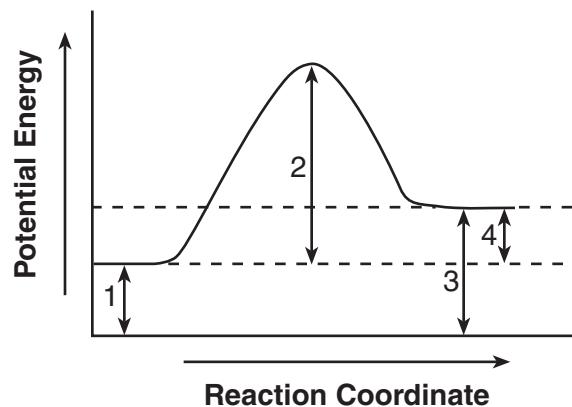
- 45 When a sample of gas is cooled in a sealed, rigid container, the pressure the gas exerts on the walls of the container will decrease because the gas particles hit the walls of the container

- (1) less often and with less force
  - (2) less often and with more force
  - (3) more often and with less force
  - (4) more often and with more force

- 46 A rigid cylinder with a movable piston contains 50.0 liters of a gas at 30.0°C with a pressure of 1.00 atmosphere. What is the volume of the gas in the cylinder at STP?



- 47 Given the potential energy diagram for a chemical reaction:



Which numbered interval represents the heat of reaction?