

Name: _____

Date: _____

Chemistry Terms 3 and 4 Review

1) The Law of Conservation of Mass states that when two or more reactants combine to produce a product, the total mass of the product is the same as the sum of masses of the individual reactants. Which of the following best restates this law?

- A. Mass is neither gained nor lost in a chemical change as long as nothing is added or lost.
- B. Mass cannot change form or shape in a chemical reaction as long as it is conserved.
- C. Mass on Earth as measured on a balance will change if the mass is taken to another planet.
- D. Mass in a chemical change will not vary if the products are the same as the reactants.

11) How did the Law of Conservation of Mass come to be widely accepted?

- A. scientists have proved it over and over again
- B. it has always been known by people with common sense
- C. it was voted on in the early 1900s by the scientific community
- D. it was written down in ancient times and still believed today

15) Using a container that will seal so that no gas can escape, a student places 5.00 grams of calcium metal and 150 ml of hydrochloric acid. The metal dissolves and bubbles rise to the surface. What do you predict has happened to the mass of the material in the container?

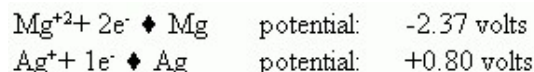
- A. The mass is 155 grams
- B. The mass is 145 grams
- C. The mass has not changed
- D. The mass has increased
- E. The mass has decreased

3) Given the equation: $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$ What is the total number of moles of $\text{HCl}(\text{g})$ produced when 3 moles of $\text{H}_2(\text{g})$ is completely consumed?

- A. 5 moles
- B. 2 moles
- C. 3 moles
- D. 6 moles

5) John knew that magnesium (Mg) is a more reactive metal than silver (Ag) after performing a series of chemical reactions. After doing some Internet research, he found the half-cell reduction potentials for the two metals to be as the diagram shows. What is the source of electrons in this cell?

- A. The magnesium metal piece
- B. The magnesium nitrate solution
- C. The potassium nitrate solution
- D. The silver nitrate solution
- E. The silver metal piece

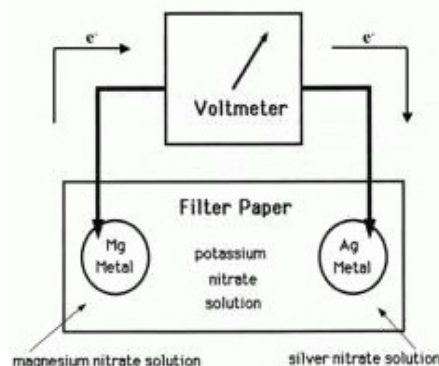


25) What is the expected voltage output of the cell?

- A. 2.37 volts
- B. 1.57 volts
- C. 0.80 volts
- D. 0.00 volts
- E. 3.17 volts

17) What would be the expected voltage output from the cell if the water in the potassium nitrate solution were allowed to evaporate?

- A. 3.17 volts
- B. 2.37 volts
- C. 1.57 volts
- D. 0.80 volts
- E. 0.00 volts



7) A student makes the following measurements in the process of reacting 20 mL of solution A and 20 mL of solution B.

Initial temp of solution A	Initial temp of solution B	Temp of mixture at time = 0	Temp of mixture at time = 1 min	Temp of mixture at time = 2 min	Temp of mixture at time = 3 min	Temp of mixture at time = 4 min
22 °C	22 °C	26 °C	25 °C	24 °C	23 °C	22 °C

How would you classify this reaction in terms of the energy change?

- A. The reaction is endothermic because the temperature drops
- B. The reaction is neither endothermic nor exothermic because the temperature returns to 22°C
- C. The reaction is endothermic because the temperature rises
- D. The reaction is exothermic because the temperature rises
- E. The reaction is exothermic because the temperature drops

13) Students reacted zinc with hydrochloric acid in a flask. They weighed the reactants, the flask, and the balloon that captured the hydrogen gas. The zinc was added to the acid and the balloon attached across the mouth of the flask. A student noticed that the flask heated up during the reaction. How should the reaction be classified?

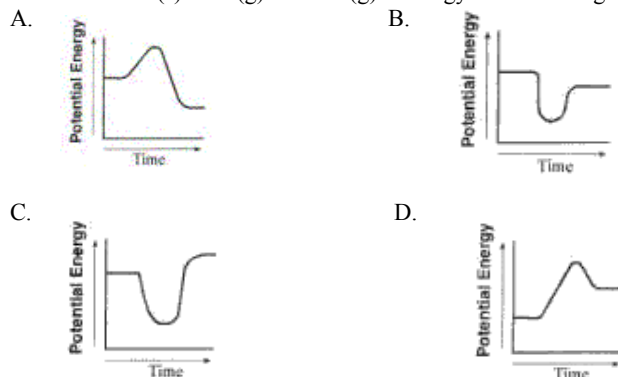
- A. as exothermic
- B. as endothermic
- C. as a single-displacement
- D. as a double-displacement

10) Which term describes a reaction in which heat is part of the product?

- A. endothermic
- B. exothermic
- C. isothermic
- D. nonthermic

9) Given the reaction: $S(s) + O_2(g) \rightarrow SO_2(g) + \text{energy}$

Which diagram best represents the potential energy changes for this reaction?

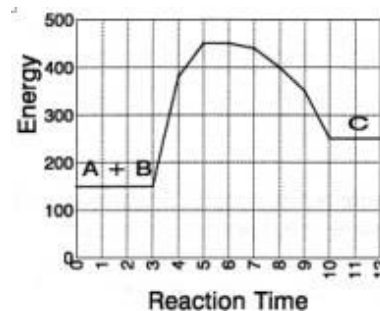


12) Which phase change is accompanied by the release of heat?

- A. $H_2O(s) \rightarrow H_2O(g)$
- B. $H_2O(s) \rightarrow H_2O(l)$
- C. $H_2O(l) \rightarrow H_2O(g)$
- D. $H_2O(l) \rightarrow H_2O(s)$

16) Graph: determine the potential energy difference between product and the reactants.

- A. The product has 10 joules more energy
- B. The product has 100 joules more energy
- C. The product has 150 joules more energy
- D. The reactants have 100 joules more energy
- E. The reactants have 150 joules more energy



29) Given the reaction: $H_2O(l) + 68.3 \text{ kcal} \leftrightarrow H_2(g) + 1/2 O_2(g)$

Which statement describes the reaction?

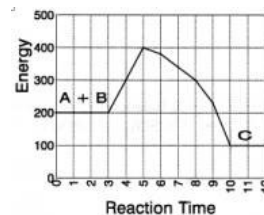
- A. It is endothermic and releases energy
- B. It is endothermic and absorbs energy
- C. It is exothermic and releases energy
- D. It is exothermic and absorbs energy

20) The burning of magnesium involves a conversion of

- A. chemical energy to mechanical energy
- B. chemical energy to heat energy
- C. heat energy to chemical energy
- D. heat energy to mechanical energy

21) Looking at the graph determine the potential energy difference between the product and the reactants.

- A. The product has 100 kilo joules more energy
- B. The product has 150 kilo joules more energy
- C. The reactants have 100 kilo joules more energy
- D. The reactants have 150 kilo joules more energy



28) Which statement correctly describes this reaction?

- A. It is endothermic and energy is absorbed
- B. It is endothermic and energy is released
- C. It is exothermic and energy is absorbed
- D. It is exothermic and energy is released

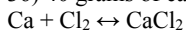
38) Which phase change is exothermic?

- A. solid to liquid
- B. solid to gas
- C. liquid to solid
- D. liquid to gas

22) Students reacted zinc with hydrochloric acid in a flask. They weighed the reactants, the flask, and the balloon that captured the hydrogen gas. The zinc was added and the balloon attached across the mouth of the flask. Which equation best describes this reaction?

- A. $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2 + H_2$
- B. $2Zn(s) + HCl(aq) \rightarrow ZnCl_2 + H_2$
- C. $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2 + 2H_2$
- D. $Zn(s) + HCl(aq) \rightarrow ZnCl_2 + H_2$

36) 40 grams of calcium are reacted with 71 grams of chlorine to produce 111 grams of calcium chloride following this reaction:



According to the law of conservation of mass, how many grams of calcium would be produced by

decomposing 111 grams of calcium chloride?

- A. 111 grams
- B. 71 grams
- C. 40 grams
- D. There's insufficient data to determine how much

23) An oxidation-reduction reaction is set up so that both half-reactions take place in separate beakers that are connected by a salt bridge and an external conductor. A path for the transfer of ions is provided by the _____.

- A. salt bridge
- B. external conductor
- C. cathode
- D. anode

31) An oxidation half-reaction always involves the

- A. gain of electrons
- B. gain of protons
- C. loss of electrons
- D. loss of protons

40) Given the electrochemical cell reaction: $\text{Zn(s)} + \text{Ni}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Ni(s)}$ Which chemical is oxidized?

- A. Zn
- B. Ni^{2+}
- C. Zn^{2+}
- D. Ni

42) Suppose 20 grams of a water-soluble solid is dissolved in one liter of water. The molar mass of the solid is 100 g/mol. Which of the following methods will probably produce a 0.2 M solution the fastest?

- A. placing 20 grams of powder in hot water and then stirring
- B. placing 100 grams of small crystals in warm water and then stirring
- C. placing 100 grams of powder in ice water and then stirring
- D. placing 20 grams of large crystals in hot water and then stirring
- E. placing 120 grams of very small crystals in cool water without stirring

43) As baking soda is heated, it decomposes as follows: $2 \text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$

Which statement below explains this occurrence?

- A. Increasing the number of collisions of atoms and the amount of energy in each collision results in a higher rate of reaction.
- B. Increasing the number of collisions of atoms and the amount of energy in each collision gives a greater mass of products.
- C. Decreasing the number of collisions and the amount of energy in each collision results reduces the mass of the products.
- D. Neither increasing nor decreasing the heat in the reaction changes the rate of the reaction.

44) How does adding a catalyst to a chemical reaction change the rate of reaction? By causing

- A. a decrease in the activation energy
- B. an increase in the activation energy
- C. a decrease in the heat of reaction
- D. an increase in the heat of reaction

46) Which event must always occur for a chemical reaction to take place?

- A. formation of a precipitate
- B. formation of a gas
- C. effective collisions between reacting particles
- D. addition of a catalyst to the reaction system

47) 1.0 gram of powdered Zn reacts faster with HCl than a 1.0-gram piece of Zn because the surface atoms in powdered Zn have

- A. higher average kinetic energy
- B. lower average kinetic energy
- C. more contact with the H^+ ions in the acid
- D. less contact with the H^+ ions in the acid

50) Suppose 10 grams of a water-soluble solid is dissolved in one liter of water. The molar mass of the solid is 100 g/mol.

Which of the following methods will probably produce a 0.1 M solution the fastest?

- A. placing 10 grams of large crystals in hot water and then stirring
- B. placing 100 grams of small crystals in warm water and then stirring
- C. placing 110 grams of very small crystals in cool water without stirring
- D. placing 10 grams of powder in hot water and then stirring
- E. placing 100 grams of powder in ice water and then stirring

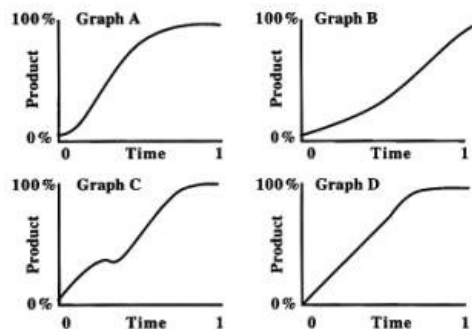
49) A reaction that can proceed in either direction is considered to be which type of chemical reaction?

- A. complete
- B. neutralization
- C. reversible
- D. spontaneous
- E. exothermic

- 51) Increasing the temperature increases the rate of a reaction by:
- lowering the activation energy
 - increasing the activation energy
 - lowering the frequency of effective collisions between reacting molecules
 - increasing the frequency of effective collisions between reacting molecules

53) From the graphs, which reaction occurs at the slowest rate?

- Graph A
- Graph B
- Graph C
- Graph D



55) From the graphs, how does increasing temperature affect the reaction?

- The reaction rate increases
- The reaction rate decreases
- The reaction rate remains the same

56) A catalyst will affect the rate of the forward reaction by changing the

- activation energy
- heat of reaction
- heat of formation
- potential energy of the products

57) Given the solution at equilibrium: $\text{PbI}_2(\text{s}) \leftrightarrow \text{Pb}^{2+}(\text{aq}) + 2\text{I}^{-}(\text{aq})$

Which ion, when added, will cause a decrease in the concentration of $\text{I}^{-}(\text{aq})$ when equilibrium is established?

- Pb^{2+}
- Ca^{2+}
- Li^{+}
- K^{+}

59) Given the reaction: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \leftrightarrow 2\text{NH}_3(\text{g}) + 22.0 \text{ kcal}$ When equilibrium is reached, the rate of the forward reaction is

- less than the rate of the reverse reaction
- greater than the rate of the reverse reaction
- equal to the rate of the reverse reaction
- unrelated to the rate of the reverse reaction

63) Given the following reaction of equilibrium: $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) + \text{heat} \leftrightarrow 2\text{HI}(\text{g})$ What will be the result of an increase in temperature?

- The equilibrium will shift to the left and $[\text{H}_2]$ will increase
- The equilibrium will shift to the left and $[\text{H}_2]$ will decrease
- The equilibrium will shift to the right and $[\text{H}_2]$ will increase
- The equilibrium will shift to the right and $[\text{H}_2]$ will decrease

64) Nitrogen dioxide can be made with the reaction of nitrogen monoxide and oxygen: $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) + \text{heat} \leftrightarrow 2\text{NO}_2(\text{g})$

What effect would a decrease in the concentration of NO_2 have on the equilibrium position once the equilibrium is reestablished?

- No change in the amount of O_2
- An increase in the amount of O_2
- An increase in the amount of NO
- A decrease in the amount of NO_2

67) In a reversible reaction, dynamic equilibrium is attained when the

- rate of the forward reaction is greater than the rate of the reverse reaction
- rate of the reverse reaction is greater than the rate of the forward reaction
- concentration of the reactants reaches zero
- concentration of the products remains constant

74) A blood level of 0.1 ppm of lead is known to affect intelligence levels in human beings. How many grams of lead would need to accumulate in 100 grams of blood to affect human intelligence?

- 100 grams of lead per 100 grams of blood
- 10 grams of lead per 100 grams of blood
- 0.1 grams of lead per 100 grams of blood
- 0.0001 grams of lead per 100 grams of blood

70) Given the reaction: $\text{A}_2(\text{g}) + \text{B}_2(\text{g}) \leftrightarrow 2\text{AB}(\text{g}) + \text{heat}$

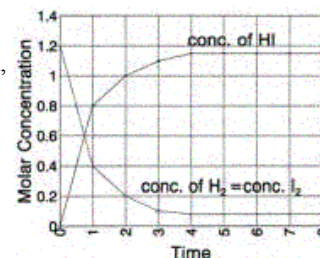
An increase in the concentration of $\text{A}_2(\text{g})$ will

- decrease the production of $\text{AB}(\text{g})$
- decrease the frequency of collisions between $\text{A}_2(\text{g})$ and $\text{B}_2(\text{g})$
- increase the production of $\text{B}_2(\text{g})$
- increase the frequency of collisions between $\text{A}_2(\text{g})$ and $\text{B}_2(\text{g})$



71) Use the following reaction equation and graph to answer the next question. According to the graph, after four minutes, which of the following statements is true concerning the above reaction?

- the rate of disappearance of the reactants is equal to the rate of the appearance of the products
- the rate of disappearance of the reactants is twice that of the rate of appearance of the products
- the rate of disappearance of the reactants is half that of the rate of appearance of the products
- the rate of disappearance of H_2 is equal to the rate of appearance of I_2
- the rates cannot be measured or graphed

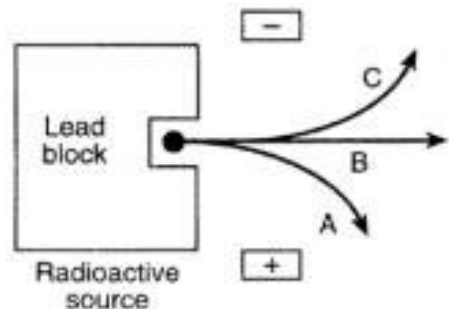


- 76) What is the molarity of a solution made with 128 grams of magnesium chloride dissolved in one liter of water?
- A. 1.34
 - B. 2.1
 - C. 3.6
 - D. 5.0
 - E. 8.1
- 78) What is the molarity of a solution of NaOH if 2 liters of the solution contains 4 moles of NaOH?
- A. 0.5 M
 - B. 2 M
 - C. 8 M
 - D. 80 M
- 92) What is the concentration of a solution with a volume of 0.50 L that contains 40.0 grams of sodium hydroxide (NaOH)?
- A. 0.10 M
 - B. 0.50 M
 - C. 1.0 M
 - D. 2.0 M
 - E. 8.0 M
- 82) What is the total number of moles of solute in 250 milliliters of a 1.0 M solution of NaCl?
- A. 1.0 mole
 - B. 0.25 mole
 - C. 0.50 mole
 - D. 42 moles
- 79) Which of the following solute/solvent combinations would represent the most concentrated solution?
- A. low amounts of solute to high amounts of solvent
 - B. moderate amounts of solute to moderate amounts of solvent
 - C. high amounts of solute to low amounts of solvent
 - D. low amounts of solute to moderate amounts of solvent
 - E. moderate amount of solute to high amounts of solvent
- 80) Which of the following statements makes correct use of the terms solute, solvent, and solution?
- A. The solute dissolved in the solvent to produce the solution
 - B. The solvent dissolved in the solution to produce the solute
 - C. The solvent dissolved in the solute to produce the solution
 - D. The solute dissolved in the solvent to produce the solution
- 83) Some chemicals are critical at very low concentrations. Which of the following units would be most appropriate for recording these low concentrations?
- A. molarity (moles/liter)
 - B. molality (moles/kilogram)
 - C. mole fraction (moles/total moles)
 - D. ppm (parts per million)
- 96) Which of the following concentrations has units of moles of solute per of kilogram of solvent?
- A. molarity
 - B. molality
 - C. parts per million
 - D. mole fraction
- 84) A solute is added to water and some remains un-dissolved. When equilibrium is reached, the solution must be
- A. dilute
 - B. saturated
 - C. unsaturated
 - D. un-reactive
- 99) The $[H_3O^+]$ of a solution is 1×10^{-8} . This solution has a pH of
- A. 6, which is acidic
 - B. 8, which is basic
 - C. 6, which is basic
 - D. 8, which is acidic
- 100) A hydrogen ion $[H_3O^+]$ concentration of 1.0×10^{-3} is best represented by which pH?
- A. pH 1.00
 - B. pH 2.00
 - C. pH 3.00
 - D. pH 4.00
 - E. pH 5.00
- 102) How many liters of 2.5 M HCl are required to exactly neutralize 1.5 liters of 5.0 M NaOH?
- A. 1.0 L
 - B. 2.0 L
 - C. 3.0 L
 - D. 4.0 L

- 105) When 50 milliliters of an HNO_3 solution is exactly neutralized by 150 milliliters of a 0.50 M solution of KOH , what is the concentration of HNO_3 ?
- 1.0 M
 - 1.5 M
 - 3.0 M
 - 0.5 M
- 110) Finish this sentence to show the mathematic relationship between the numbers on the pH scale. As pH increases by one unit, the concentration of H^+
- decreases by a power of 1
 - increases by a power of 1
 - decreases by a power of 10
 - increases by a power of 10
- 113) What is the pH of a solution that results from the complete neutralization of an HCl solution with KOH solution?
- 1
 - 7
 - 10
 - 4
- 115) Students prepared solutions of the following household items by dissolving them in distilled water. Four of the solutions were tested with universal pH paper. The other four solutions were tested with neutral litmus paper, which turns red in the presence of an acid ($\text{pH} < 7$) and blue in the presence of a base ($\text{pH} > 7$). Which group of household items below all have an acidic pH?
- tomato, soda pop, and Drano
 - Drano, baking soda, and ammonia
 - soda pop, tomato, and milk
 - Drano, lemon extract, and tomato
 - lemon extract, milk, and tap water
- 121) If 5.0 mL of a 0.20 M HCl solution is required to neutralize exactly 10 milliliters of NaOH , what is the concentration of the base?
- 0.10 M
 - 0.20 M
 - 0.30 M
 - 0.40 M
- 116) High mountain lakes in Utah are sometimes treated with a basic lime solution. Why would this be done?
- the lakes are acidic and the base neutralizes them, creating a more livable environment for fish
 - the lakes are acidic and the base decreases the pH, creating a more livable environment for plant life
 - the lakes are too cold for living things and the lime raises the temperature and the evaporative rate
 - the lakes have too many living things and the lime solution reduces the numbers of living things
- 117) Equal volumes of 0.1 M NaOH and 0.1 M HCl are thoroughly mixed. The resulting solution has a pH closest to
- 5
 - 7
 - 3
 - 9
- 128) A hydrogen ion [H_3O^+] concentration of 7.84×10^{-8} is best represented by which pH?
- pH 4.77
 - pH 5.45
 - pH 6.37
 - pH 7.10
 - pH 7.55
- 132) If 50.0 mL of hydrochloric acid is neutralized using 10.0 mL of 2.0 M sodium hydroxide, what is the concentration of the acid?
- 40 M
 - 10 M
 - 2.5 M
 - 1.0 M
 - 0.4 M
- 133) What is the pH of a 0.0001 M aqueous solution of HCl ?
- 1
 - 2
 - 3
 - 4
- 11) During a flame test, ions of a specific metal are heated in the flame of a gas burner. A characteristic color of light is emitted by these ions in the flame when the electrons
- absorb energy as they return to lower energy levels
 - absorb energy as they move to higher energy levels
 - emit energy as they return to lower energy levels
 - emit energy as they move to higher energy levels

- 2) What type of radiation has is not assigned a mass nor charge?
 A. gamma
 B. neutron
 C. alpha
 D. beta
- 3) The relationship of wavelength λ to light energy (E) is:
 A. increased wavelength correlates to increased energy
 B. increased wavelength correlates to decreased energy
 C. wavelength is independent of energy
 D. wavelength is independent of frequency
- 8) Which color of visible light has the highest frequency?
 A. green
 B. red
 C. blue
 D. violet
- 10) The color of light emitted by an atom is most closely related to
 A. energy release by the electron
 B. mass of the electron
 C. potential energy of the electron in the ground state
 D. size of the electron
 E. strength of charge on the electron
- 4) When an electron in an atom moves from a lower energy state to a higher energy state, the electron
 A. absorbs energy
 B. releases energy
 C. both absorbs and releases energy
 D. neither absorbs nor releases energy
- 20) The isotope Np-238 has a half-life of 2.0 days. If 84 grams are produced on Monday, how much will be remaining 4.0 days later?
 A. 18 grams
 B. 21 grams
 C. 35 grams
 D. 42 grams
- 21) Over a period of time Bismuth decays to Polonium. What would account for this change?
 A. Bismuth is a metal
 B. Polonium has an atomic mass of 84
 C. Bismuth decays through beta emission
 D. Bismuth ionizes and loses 2 protons
 E. One element cannot change to another
- 22) Which type of emission has the highest penetrating power?
 A. alpha
 B. beta
 C. positron
 D. gamma
- 23) Which type of radiation is assigned a value of zero mass and zero charge?
 A. alpha
 B. beta
 C. neutron
 D. gamma

30) The diagram below represents radiation passing through an electric field
 The arrow labeled A most likely represents



- A. a positron
 B. an electron
 C. alpha radiation
 D. gamma radiation

- 33) Which of the following reactions would you expect to produce the most energy?
 A. (combination of a strong acid and a strong base)
 B. (combustion of hydrogen gas)
 C. (combustion of a large hydrocarbon)
 D. (nuclear fusion of two hydrogen isotopes)

45) Given the equation: $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$ What is the total number of moles of $\text{HCl}(\text{g})$ produced when 3 moles of $\text{H}_2(\text{g})$ is completely consumed?

- A. 5 moles
 B. 2 moles
 C. 3 moles
 D. 6 moles