

Please READ! Use the following questions to review the concepts you are expected to understand and measure your overall chemistry fitness. Score yourself and then do something about it! Schedule a consultation with your teacher and make a plan to improve your fitness. This should be the first step in your preparation to help focus your effort. Study hard, but study efficiently.

Unit 1

1. Which pair is classified as pure substances?

- (1) mixtures and solutions
- (2) compounds and solutions
- (3) elements and mixtures
- (4) compounds and elements

2. Which is a characteristic of all mixtures?

- (1) They are homogeneous.
- (2) They are heterogeneous.
- (3) Their composition is a definite ratio.
- (4) Their composition can be varied.

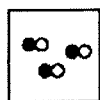
3. An example of a heterogeneous mixture is

- (1) soil
- (2) sugar
- (3) carbon monoxide
- (4) carbon dioxide

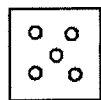
4. Which of these terms refers to matter that could be heterogeneous?

- | | |
|------------|-------------|
| 1. element | 3. compound |
| 2. mixture | 4. solution |

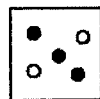
5. Which diagram represents a mixture?



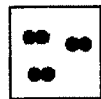
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(3)



(2)



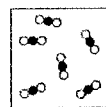
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● = particle X
○ = particle Y

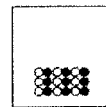
6. A compound differs from a mixture in that a compound always has a

- (1) homogeneous composition
- (2) maximum of two components
- (3) minimum of three components
- (4) heterogeneous composition

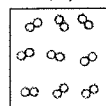
7. Which particle diagram could represent a sample containing the compound CO_2 (g)?



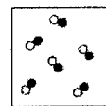
(1)



(3)



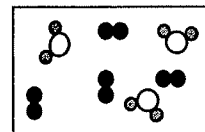
(2)



(4)

8. Which is a possible description of this sample of matter?

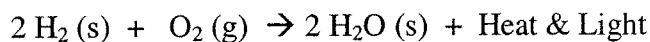
- (1) 4 N_2 and 3 H_2
- (2) 4 N_2 and 3 NO_2
- (3) 4 NO and 3 H_2O
- (4) 4 N_2 and 3 H_2O



9. How many atoms of oxygen are found in the compound $\text{Al}_2(\text{PO}_4)_3$?

- (1) 1
- (2) 12
- (3) 3
- (4) 4

Use the following change descriptions to answer questions 10 & 11.



10. How would the change best be described

- (1) chemical
- (2) physical

11. In terms of energy, which of the following would best describe the change?

- (1) endothermic

- (2) exothermic
12. Which of the following is an example of a physical change in matter?
- (1) magnesium metal burning with a bright white flame
 - (2) fizzing produced when magnesium metal is added to acid
 - (3) melting of sodium metal
 - (4) sodium metal exploding in water
13. Element *A* and element *B* become chemically bonded together to form substance *C*. Substance *C* must be
- (1) a compound
 - (2) a mixture
 - (3) a solution
 - (4) an element
14. Calculate the volume of a piece of copper that has a mass of 7.40 grams.
- (1) 0.826 cm^3
 - (2) 66.3 cm^3
 - (3) 1.21 cm^3
 - (4) not enough info
4. An atom contains 35 protons, 45 neutrons, and 35 electrons has an atomic number of
- (1) 35
 - (2) 45
 - (3) 80
 - (4) 115
5. What is the total number of protons in the nucleus of an F^- ion?
- (1) 8
 - (2) 9
 - (3) 10
 - (4) 11
6. All atoms in given sample of an element contain the same number of
- (1) protons and electrons
 - (2) protons and neutrons
 - (3) neutrons and electrons
 - (4) electrons and morons
7. What is the atomic number of an element whose atoms contain 47 protons, 60 neutrons, and 47 electrons?
- (1) 13
 - (2) 47
 - (3) 60
 - (4) 107

Unit 2

1. What is the mass number of an atom which contains 21 electrons, 21 protons, and 24 neutrons?
- (1) 21
 - (2) 42
 - (3) 45
 - (4) 66
2. The mass number of an atom always indicates the total number of
- (1) protons, only
 - (2) neutrons, only
 - (3) protons and electrons
 - (4) protons and neutrons
3. Which subatomic particles have the mass of approximately 1 atomic mass unit each?
- (1) protons and electrons
 - (2) protons and neutrons
 - (3) neutrons and electrons
 - (4) electrons and morons
8. All atoms of a given element must have the same
- (1) atomic mass
 - (2) atomic weight
 - (3) mass number
 - (4) atomic number
9. The atomic mass of an element is defined as the weighted average mass of that elements
- (1) most abundant isotope
 - (2) least abundant isotope
 - (3) naturally occurring isotopes
 - (4) radioactive isotopes
10. Which particle is electrically neutral?
- (1) proton
 - (2) moron
 - (3) neutron
 - (4) electron

11. The nucleus of which of the following atoms contains the greatest number of neutrons?
- (1) Cl-37
 - (2) K-39
 - (3) Ar-40
 - (4) Ca-41
12. The nucleus is the part of the atom that
- (1) consists of mostly empty space
 - (2) has a negative charge
 - (3) occupies most of the atom's total volume
 - (4) contains most of the atom's total mass
13. The nucleus of an atoms of $^{127}_{53}\text{I}$ contains
- (1) 53 neutrons and 127 protons
 - (2) 53 protons and 127 neutrons
 - (3) 53 protons and 74 neutrons
 - (4) 53 neutrons and 74 electrons
14. What is the symbol for an atom containing 20 protons and 22 neutrons?
- (1) $^{42}_{20}\text{Ca}$
 - (2) $^{40}_{20}\text{Ca}$
 - (3) $^{42}_{22}\text{Ti}$
 - (4) $^{40}_{22}\text{Ti}$
15. In which pair of elements do the nuclei of the atoms contain the same number of neutrons?
- (1) ^7_3Li and ^9_4Be
 - (2) $^{14}_7\text{N}$ and $^{16}_8\text{O}$
 - (3) $^{22}_{11}\text{Na}$ and $^{24}_{12}\text{Mg}$
 - (4) $^{32}_{16}\text{S}$ and $^{33}_{17}\text{Cl}$
16. The elements in the modern periodic table are arranged according to their
- (1) atomic number
 - (2) oxidation number
 - (3) atomic mass
 - (4) nuclear mass
17. More than two thirds of the elements of the modern periodic table are classified as
- (1) metalloids
 - (2) metals
 - (3) nonmetals
 - (4) noble gases
18. An atom of an element has 28 innermost electrons and 7 outermost electrons. In which period of the periodic table is this element located?
- (1) 5
 - (2) 2
 - (3) 3
 - (4) 4
19. Atoms with the most similar properties would have which of the following in common?
- (1) atomic numbers
 - (2) mass numbers
 - (3) valence electrons
 - (4) electron shells
20. At which location in the Periodic Table would the most active metallic element be found?
- (1) in Group 1 at the top
 - (2) in Group 1 at the bottom
 - (3) in Group 17 at the top
 - (4) in Group 17 at the bottom
21. Which elements have the most similar chemical properties?
- (1) K and Na
 - (2) K and Cl
 - (3) K and Ca
 - (4) K and S
22. Which group 15 element exists as a diatomic molecule at STP?
- (1) phosphorous
 - (2) nitrogen
 - (3) bismuth
 - (4) arsenic
23. Which electron-dot symbol correctly represents an atom of its given element?
- (1) $\overset{\cdot\cdot}{\underset{\cdot}{\text{S}}}$
 - (2) $\overset{\cdot\cdot}{\underset{\cdot}{\text{Al}}}$
 - (3) $\overset{\cdot\cdot}{\text{Li}}$
 - (4) $\overset{\cdot\cdot}{\underset{\cdot}{\text{B}}}$

24. An element with an electron configuration of 2-8-1 would most likely
- (1) lose one electron to obtain the same configuration as argon
 - (2) gain one electron to obtain the same configuration as neon
 - (3) gain one electron to obtain the same configuration as argon
 - (4) lose one electron to obtain the same configuration as neon
25. In Bohr's model of the atom, where are the electrons and protons located?
- (1) The electrons move around the protons, which are at the center of the atom.
 - (2) The electrons and protons move throughout the atom.
 - (3) The electrons occupy fixed positions around the protons, which are at the center of the atom.
 - (4) The electrons and protons are located throughout the atom, but they are not free to move.
4. The elements Li and F combine to form an ionic compound. The electron configurations in this compound are the same as the electron configurations of atoms in Group
- (1) 1
 - (2) 14
 - (3) 17
 - (4) 18
5. As sodium reacts with fluorine to form a compound NaF, each sodium atom will
- (1) gain 1 electron
 - (2) gain 2 electrons
 - (3) lose 1 electron
 - (4) lose 2 electrons
6. Which pair of atoms will share electrons when a bond is formed between them?
- (1) Ba and I
 - (2) Br and Cl
 - (3) K and Cl
 - (4) Li and I
7. What is the correct name of Fe_2O_3 ?
- (1) iron (I) oxide
 - (2) iron (II) oxide
 - (3) iron (III) oxide
 - (4) iron (IV) oxide
8. What is the correct name of the compound with the formula NH_4NO_2 ?
- (1) ammonia nitrite
 - (2) ammonium nitrate
 - (3) ammonia nitrate
 - (4) ammonium nitrite
9. What is the correct name for the compound with the formula CrPO_4 ?
- (1) chromium (II) phosphate
 - (2) chromium (III) phosphate
 - (3) chromium (II) phosphide
 - (4) chromium (II) phosphide
10. What is the correct name of the compound with the formula MgCl_2 ?
- (1) magnesium chloride
 - (2) magnesium dichloride
 - (3) magnesium (II) chloride
 - (4) magnesium chlorate

Unit 3

1. Which of the following represents a negative ion?
- (1) anion
 - (2) cation
2. Magnesium, Mg, is a metallic element that loses a electrons when it bonds to other elements. What electrical charge would a Magnesium ion have after losing a electrons?
- (1) negative
 - (2) positive
 - (3) neutral
3. If M represents an alkali metal, what is the formula for the compound formed by M and oxygen?
- (1) MO_2
 - (2) M_2O
 - (3) M_2O_3
 - (4) M_3O_2

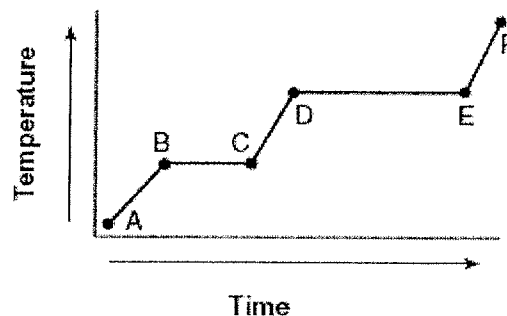
11. Which formula represents the compound aluminum iodide?
- AlI
 - AlI₃
 - Al₃I
 - Al₃I₃
12. What is the correct name of a compound with the formula Na₂S?
- sodium sulfide
 - sodium sulfate
 - sodium sulfite
 - sulfur dinitride
13. Which of the following elements will form a compound with Chlorine in which electrons are transferred from one atom to another?
- K
 - O
 - P
 - C
14. An atom represented by X forms a compound with the formula X₃N₂. The atom could be
- Na
 - Mg
 - Al
 - Cs
15. Element X is in Group 2 and element Y is in Group 17. What happens when a compound is formed between these two atoms?
- X loses electrons to Y to form an ionic bond.
 - X loses electrons to Y to form a covalent bond.
 - X gains electrons from Y to form an ionic bond.
 - X gains electrons from Y to form a covalent bond.
16. What is the gram formula mass of K₂CO₃?
- 138 g
 - 106 g
 - 99 g
 - 67 g
17. What is the gram formula mass of (NH₄)₂SO₄?
- 66.0 g
 - 94.0 g
 - 114 g
 - 132 g
18. What is the total mass of iron in 1.0 mole of Fe₂O₃?
- 160 g
 - 112 g
 - 72 g
 - 56 g
19. Which quantity is equivalent to 39 grams of LiF?
- 1.0 moles
 - 2.0 moles
 - 0.50 moles
 - 1.5 moles
20. The total number of moles represented by 20 grams of CaCO₃ is
- 1
 - 2
 - 0.1
 - 0.2
21. Given the reaction:
- $$2\text{Al} + 3\text{H}_2\text{SO}_4 \rightarrow 3\text{H}_2 + \text{Al}_2(\text{SO}_4)_3$$
- The total number of moles of H₂SO₄ needed to react completely with 5.0 moles of Al is
- 2.5 moles
 - 5.0 moles
 - 7.5 moles
 - 9.0 moles
22. Given the equation:
- $$\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$$
- How many moles of HCl would be required to produce a total of 2 moles of H₂?
- 0.5
 - 2
 - 3
 - 4
23. Given the equation:
- $$__ \text{CaCl}_2 + __ \text{Na}_2\text{CO}_3 \rightarrow __ \text{CaCO}_3 + __ \text{NaCl}$$
- When the equation is correctly balanced using the smallest whole numbers, the coefficient of NaCl is
- 1
 - 2
 - 3

(4) 4

Unit 4

- The particles of a substance are arranged in a definite geometric pattern and are constantly vibrating. This substance can be in
 - the solid phase, only
 - the liquid phase, only
 - either the solid or the liquid phase
 - neither the liquid nor the solid phase
- Standard temperature and pressure are
 - 0°C and 1 kilopascal
 - 0°C and 101.3 kilopascal
 - 273°C and 1 kilopascal
 - 273°C and 101.3 kilopascal
- As the temperature of a liquid increases, its vapor pressure
 - decreases
 - increases
 - does not change
 - remains the same
- The vapor pressure of a liquid is 0.92 atm at 60°C . The normal boiling point of the liquid could be
 - 35°C
 - 45°C
 - 55°C
 - 65°C
- How much heat energy must be absorbed to completely melt 35.0 grams of $\text{H}_2\text{O}(\text{s})$ at 0°C ?
 - 9.54 J
 - 146 J
 - 11 700 J
 - 79 100 J

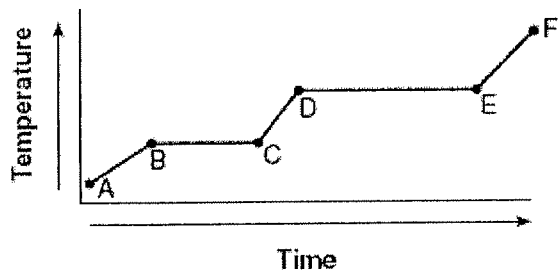
- The graph below represents the uniform heating of a substance, starting below its melting point, when the substance is solid.



- Which line segments represent an increase in average kinetic energy?

- AB and BC
 - AB and CD
 - BC and DE
 - DE and EF
- Which phase change happens as a result of the release of energy?
 - $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{l})$
 - $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{g})$
 - $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{O}(\text{g})$
 - $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
 - As the temperature of a substance *decreases*, the average kinetic energy of its particles
 - decreases
 - increases
 - remains the same
 - Using your knowledge of chemistry and the information in Reference Table H, which statement concerning propanone and water at 50°C is true?
 - Propanone has a higher vapor pressure and stronger particle attractions than water.
 - Propanone has a higher vapor pressure and weaker particle attractions than water.
 - Propanone has a lower vapor pressure and weaker particle attractions than water.
 - Propanone has a lower vapor pressure and stronger particle attractions than water.

The graph below represents the uniform heating of a substance, starting with the substance as a solid below its melting point.



10. Which line segment represents an increase in potential energy and no change in average kinetic energy?

- (1) \overline{AB} (3) \overline{CD}
 (2) \overline{BC} (4) \overline{EF}

11. Which change is exothermic?

- (1) freezing of water
 (2) melting of iron
 (3) vaporization of ethanol
 (4) sublimation of iodine

12. According to Reference Chart S, the freezing point of bromine is

- (1) 539°C
 (2) -539°C
 (3) 7°C
 (4) -7°C

13. As matter is heated, changes occur in the particle behavior. Which of these correctly describes those changes?

- (1) The particles move faster and attract each other less.
 (2) The particles move faster and collide with each other less often.
 (3) The particles move slower and attract each other less.
 (4) The particles move slower and collide with each other less often.

14. Which 5.0-milliliter sample of NH_3 will take the shape of and completely fill a closed 100.0-milliliter container?

- (1) $\text{NH}_3(\text{s})$
 (2) $\text{NH}_3(\text{l})$
 (3) $\text{NH}_3(\text{g})$

(4) $\text{NH}_3(\text{aq})$

15. A gas has a pressure of 300 torr, a temperature of 400 K, and a volume of 50.0 L. What volume will the gas have at a pressure of 150 torr and a temperature of 200 K?

- (1) 12.5 mL
 (2) 50.0 mL
 (3) 100 mL
 (4) 200 mL

16. Under which conditions will the volume of a given sample of gas decrease?

- (1) decreased pressure and decreased temperature
 (2) decreased pressure and increased temperature
 (3) increased pressure and decreased temperature
 (4) increased pressure and increased temperature

17. If the Kelvin temperature of a sample of gas is doubled, while the pressure is halved, the volume of the gas will

- (1) remain the same
 (2) increase 2 times
 (3) decrease by half
 (4) increase 4 times

18. The temperature of a substance is a measure of its particles

- (1) average potential energy
 (2) average kinetic energy
 (3) enthalpy
 (4) entropy

19. The compound whose molecules have the highest average kinetic energy is

- (1) $\text{NO}(\text{g})$ at 25°C
 (2) $\text{N}_2\text{O}(\text{g})$ at 15°C
 (3) $\text{NO}_2(\text{g})$ at 30°C
 (4) $\text{N}_2\text{O}_3(\text{g})$ at 20°C

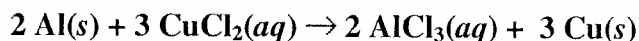
20. As ice cools from 273 K to 263 K, the average kinetic energy of its molecules will

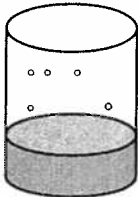
- (1) decrease
 (2) increase
 (3) remain the same

Staple on to back of "DIAGNOSTIC" midterm Review!

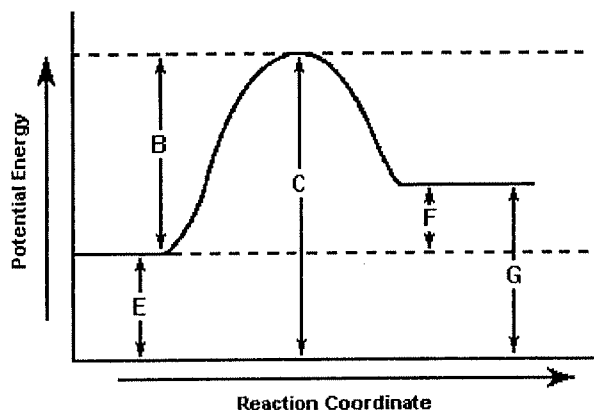
UNIT 5

Given the reaction:



- In order for a chemical reaction to occur, there must always
 - be an effective collision between reacting particles
 - a bond that breaks in a reactant particle
 - reacting particles have a high charge
 - reacting particles have a high kinetic energy
 - The energy needed to start a chemical reaction is called
 - potential energy
 - kinetic energy
 - activation energy
 - ionization energy
 - As the number of effective collisions between reacting particles increases, the rate of the reaction
 - decreases
 - increases
 - remains the same
 - An increase in the temperature increases the rate of a chemical reaction because the collisions in this reaction increase in
 - number, only
 - effectiveness, only
 - both number and effectiveness
 - neither number nor effectiveness
 - Which conditions will increase the rate of a chemical reaction?
 - decreased temperature and decreased concentration of the reactants
 - decreased temperature and increased concentration of the reactants
 - increased temperature and decreased concentration of the reactants
 - increased temperature and increased concentration of the reactants
 - In which substance is the oxidation number of N equal to +5?
 - N_2
 - N_2O_3
 - NO_2
 - HNO_3
 - The oxidation number (charge) of $\text{Al}(s)$ increases because it
 - loses electrons
 - gains electrons
 - loses protons
 - gains protons
 - As the reaction occurs, what happens to copper?
 - It undergoes reduction and its oxidation number (charge) decreases.
 - It undergoes reduction and its oxidation number (charge) increases.
 - It undergoes oxidation and its oxidation number (charge) decreases.
 - It undergoes oxidation and its oxidation number (charge) increases.
 - Which of these is a redox reaction?
 - $\text{MgCO}_3 \rightarrow \text{MgO} + \text{CO}_2$
 - $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
 - $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$
 - $\text{MgO} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2\text{O}$
- A closed system is shown in the diagram below*
- 
- The rate of vapor formation at equilibrium is
 - less than the rate of liquid formation
 - greater than the rate of liquid formation
 - equal to the rate of liquid formation
 - When equilibrium is reached in a reversible chemical reaction, the
 - forward reaction stops
 - the reverse reaction stops
 - concentrations of products and reactants become equal
 - the concentrations of products and reactants become constant.

The diagram below represents a hypothetical reaction shown as: $X(g) + Q(s) \rightarrow Z(g)$



Whoa! Not too bad, right? Use the answer key on the next page to assess yourself. If you score greater than 80% on a section, consider yourself in good shape, but some additional training will help!

If you score below 80% on a section, definitely schedule an appointment with your teacher to address the specific issues you are having.

Either way, *excellence* on this exam **REQUIRES** an active, efficient, plan for preparation. See me for further recommendations!

12. Which letter on the diagram represents the activation energy?
- (1) B
 - (2) C
 - (3) E
 - (4) F
13. *Based on the diagram*, which description is correct?
- (1) The reaction is endothermic as shown by $X(g) + Q(s) \rightarrow Z(g) + \text{Heat}$
 - (2) The reaction is endothermic as shown by $\text{Heat} + X(g) + Q(s) \rightarrow Z(g)$
 - (3) The reaction is exothermic as shown by $X(g) + Q(s) \rightarrow Z(g) + \text{heat}$
 - (4) The reaction is exothermic as shown by $\text{Heat} + X(g) + Q(s) \rightarrow Z(g)$
14. Which type of chemical reaction took place?
- (1) synthesis
 - (2) decomposition
 - (3) double replacement
 - (4) single replacement
15. Which of these changes would NOT decrease the entropy of a system formed by placing liquid water in a sealed container?
- (1) allowing the water to freeze
 - (2) cooling the container to a lower temperature
 - (3) removing water from the container
 - (4) evaporating some of the water

Answer Key

Unit 1

- 1. 4
- 2. 4
- 3. 1
- 4. 2
- 5. 2
- 6. 1
- 7. 1
- 8. 4
- 9. 2
- 10. 1
- 11. 2
- 12. 3
- 13. 1
- 14. 1

Unit 2

- 1. 3
- 2. 4
- 3. 2
- 4. 1
- 5. 2
- 6. 1
- 7. 2
- 8. 4
- 9. 3
- 10. 3
- 11. 3
- 12. 4
- 13. 3
- 14. 1
- 15. 4
- 16. 1
- 17. 2
- 18. 4
- 19. 3
- 20. 2
- 21. 1
- 22. 2
- 23. 2
- 24. 4
- 25. 1

Unit 3

- 1. 1
- 2. 2
- 3. 2
- 4. 4
- 5. 3
- 6. 2
- 7. 3
- 8. 1
- 9. 2
- 10. 1
- 11. 2
- 12. 1
- 13. 1
- 14. 2
- 15. 1
- 16. 1
- 17. 4
- 18. 2
- 19. 4
- 20. 4
- 21. 3
- 22. 4
- 23. 2

Unit 4

- 1. 1
- 2. 2
- 3. 2
- 4. 4
- 5. 3
- 6. 2
- 7. 4
- 8. 1
- 9. 2
- 10. 2
- 11. 1
- 12. 4
- 13. 1
- 14. 3
- 15. 2
- 16. 3
- 17. 1

18. 2

19. 3

20. 1

Unit 5

1. 1

2. 3

3. 2

4. 3

5. 4

6. 4

7. 1

8. 1

9. 3

10. 3

11. 4

12. 1

13. 2

14. 1

15. 4