**MULTIPLE CHOICE TEST WITH ONE CORRECT ANSWER**
(Answer by circling **just one** answer marked with A, B, C or D. Each correct answer is worth 2 points)

1. What of the following occurs at the melting temperature when solid sulfur passes into liquid?

   I. The motion of the particles accelerates.
   II. The distance between the particles increases.

   A. Only I
   B. Only II
   C. Both I and II
   D. Neither I nor II

2. What is the correct statement for the illustrations below?

   I   II   III
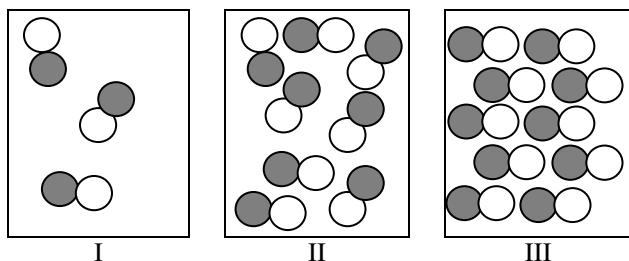
   A. The same substance is shown in I and II.
   B. The same substance is shown in II and III.
   C. All illustrations refer to the same substance.
   D. All illustrations refer to different substances.

3. The symbolic representation $3I_2$ denotes:
   A. Three atoms of iodine
   B. Three molecules of iodine
   C. Six atoms of iodine
   D. Six molecules of iodine

4. What electrodes are most commonly used for electrolysis of water in the Hoffmann apparatus?
   A. Graphite
   B. Platinum
   C. Copper
   D. Iron

5. What is the correct name of the compound represented by the chemical formula PbO_2?
   A. Lead oxide
   B. Lead tetroxide
   C. Lead(II) oxide
   D. Lead(IV) oxide

6. Which option (A-D) includes only chemical changes?
   I. The appearance of the rainbow
   II. Shooting the firecracker
   III. Darkening of silver
   IV. Magnesium in water
   V. Blue vitriol in water

   A. II and IV
   B. I, II, III and IV
   C. II, III and IV
   D. All

7. What is formed if aqueous solutions of aluminum nitrate and potassium hydroxide are mixed?
   A. Yellow precipitate of aluminum hydroxide
   B. White precipitate of aluminum hydroxide
   C. Yellow precipitate of potassium nitrate
   D. White precipitate of potassium nitrate

8. If the following substances: *baking soda, washing powder, milk* and *bleach* are sorted according to acidity, so that the most acidic substance is placed first, the second one will be:
   A. baking soda
   B. washing powder
   C. milk
   D. bleach

9. The figure represents the initial (a) and the final (b) volume read by the burette at some titration. How many milliliters of the solution were used during titration?
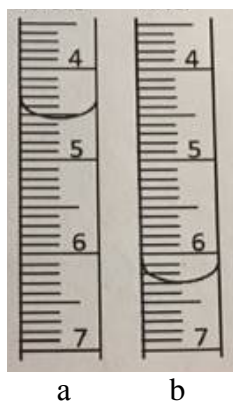
A. 0,75
B. 1,75
C. 2,00
D. 2,25

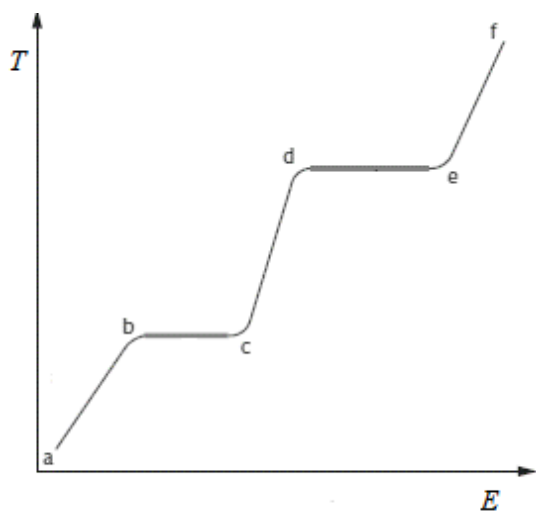10. How many isomers has the alkane with 14 hydrogen atoms in its molecule?
A. 5
B. 6
C. 7
D. 8

a   b

THEORETICAL PROBLEMS

(Answer each question following the instructions. Write down your answer at the designated place.)

Task 1.   (5)

Changing aggregate states may occur during heating of substances. A simple experiment can be performed by monitoring the temperature change while the substance is heated. The data obtained can be displayed using a heating curve. The figure below represents one such curve that shows the change of temperature depending on the energy added (in the form of heat). Connect the terms of both columns so that you only add one number (1-5) to each interval (a-b, b-c, etc.) that corresponds to the exact statement.

a-b		1	When the liquid substance is heated, the kinetic energy of the particles increases, and the temperature rises.	
b-c		2	This is the boiling temperature. Now there is enough energy to break the bonds between the particles and to form a gas. It takes more energy than melting because all the bonds between the particles should be broken. The temperature remains constant because there is no increase in kinetic energy. Bubbles of the vapor phase of the substance can be noticed through the liquid.	
c-d		3	This is the melting temperature. The particles are moving away from their almost fixed positions and liquid is formed. The added energy in this stage is used to break the particle bonds, not to increase kinetic energy. Therefore the temperature remains constant.	
d-e		4	When heating the gaseous substance, the kinetic energy of the particles increases, and the temperature rises.	
e-f		5	When heating a solid, the energy of the particles increases, and the temperature rises.	

Task 2. (6)

Statements a-f describe elements or elementary substances built from one element. In the table on the figure below (which is part of the Periodic Table), insert the **letters a-f** corresponding to the described element (or elementary substance). Do not write the symbols of the chemical elements.
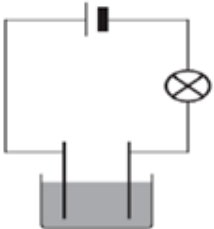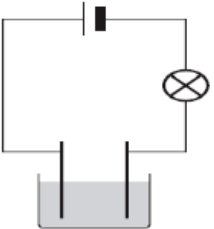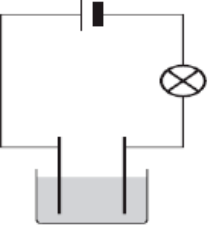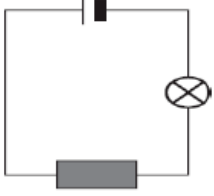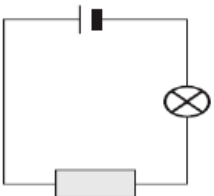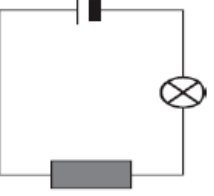

a - Colorless gas in which many substances can burn.
b - An element of metal that is part of marble.
c – Yellowish-green gas made up of diatomic molecules.
d - Non-reactive gas that is most abundant in the air.
e - An element that forms two elementary substances – diamond and graphite.
f - Liquid that does not conduct electricity.

Task 3. (6)

For each of the figures in the table below, circle YES if the bulb lights when an electric current is passing through or NO if it does not light up the bulb.

|		
Mercury YES NO	Aqueous solution of copper(II) sulfate YES NO	Aqueous solution of sodium chloride YES NO
Graphite YES NO	Diamond YES NO	Sulfur YES NO

Fill in the blank!

In electrolysis of a mixture of water and sulfuric acid, _____ and _____ in a ratio of _____ are obtained.

In electrolysis of water, _____ and _____ in a ratio of _____ are obtained.

Task 4. (3)

The following illustration corresponds to a simplified diamond structure.
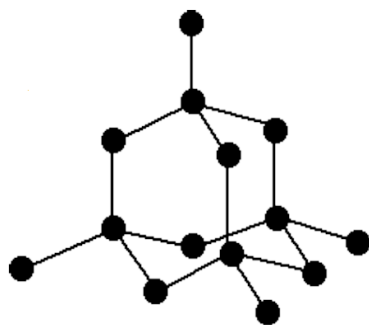
The diamond represents __X__. On the illustration above each circle represents __Y__ of __Z__.

The correct term to be written instead of X is:
A. Elementary substance
B. Compound
C. Homogeneous mixture
D. Heterogeneous mixture

The correct term to be written instead of Y is:
A. An atom
B. A monoatomic molecule
C. A diatomic molecule
D. An ion

The correct term to be written instead of Z is:
A. Gold
B. Silver
C. Carbon
D. Sulfur

Distillation   is a procedure for separating components from a mixture based on _____ _____. The figure shows the apparatus by which this procedure can be performed. **C** is located in front of vessel **B** and is called _____. In **C** _____ (*cold* or *hot*) water enters at a point marked with the letter _____.
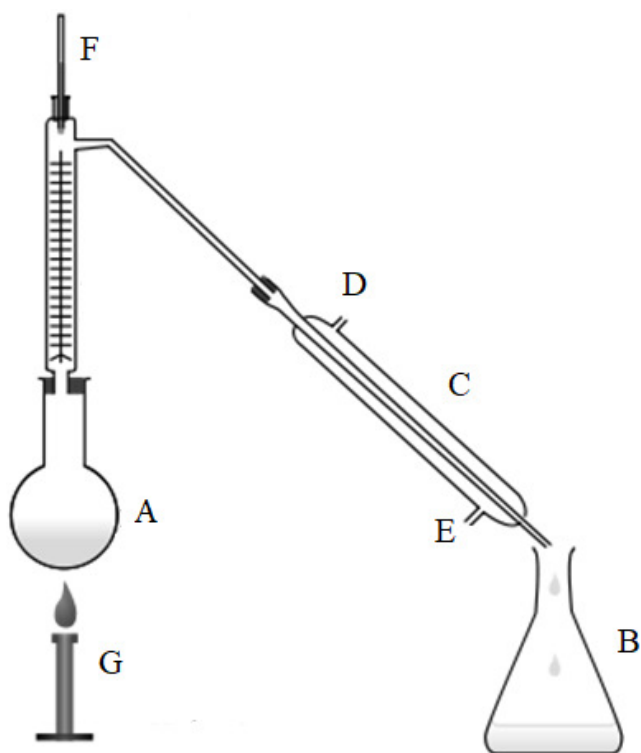

Alexandra was supposed to perform an experiment that would separate the seawater components. For this purpose she used simple distillation . If she put seawater in the round flask, she will get _____ in the conical flask.

Martin performed another experiment in which three liquids should be separated from their mixture by distillation (see figure above). If there are three liquids **X**, **Y** and **Z** in the flask, the properties of which are given in the table below, the liquid _____ (*X, Y or Z*) will leave the flask first. This procedure is known under the name _____.

	T_m / °C	T_b / °C	Density / kg/m^3	Color
X	−116,3	34,6	713,3	Colorless liquid
Y	0	100	997	Colorless liquid
Z	−114,1	78,37	789	Colorless liquid

Zuljeta had to make distillation to separate components from an unknown mixture. She heated the mixture in an appropriate distillation apparatus (see figure above). She measured the temperature as soon as the first drop of distillate appeared in the vessel, and then measured the temperature each time few drops of distillate appear. From the obtained data for the temperature and volume of the distillate, she plotted a distillation curve such as the one below.

Distillation curve
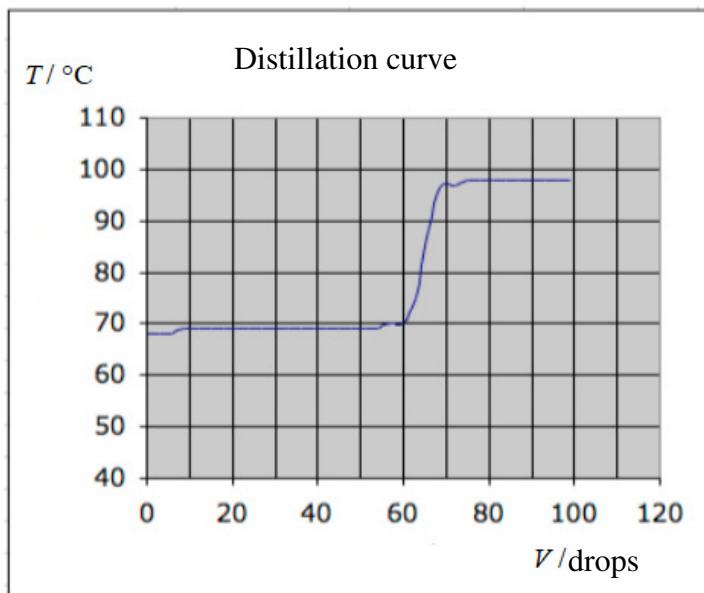
Based on the information about Zuljeta's experiment, answer the following questions:

1) How many components (pure substances) does the mixture consist of?

_____

2) What are their boiling temperatures?

_____

3) What is the ratio of the components (pure substances) in the mixture?

_____