

Note: There are special instructions in this exam. Please answer the questions according to these instructions.

שים לב: בבחינה זו יש הנחיות מיוחדות. יש לענות על השאלות על פי הנחיות אלה.

Chemistry

כימיה

Instructions for examinees

הוראות לנבחן

א. Duration of the exam: Three hours

א. משך הבחינה: שלוש שעות.

ב. Exam structure and breakdown of points:

ב. מבנה השאלון ומפתח ההערכה:

This exam has two parts.

בשאלון זה שני פרקים.

Part One — 40 points

פרק ראשון — 40 נקודות

Part Two — 60 points

פרק שני — 60 נקודות

Total — 100 points

סך הכל — 100 נקודות

ג. Material that may be used during the exam:

ג. חומר עזר מותר בשימוש:

(1) A calculator (graphing calculators are permitted).

(1) מחשבון (כולל מחשבון גרפי).

(2) Formula and data sheets (attached)

(2) דפי נוסחאות ונתונים (מצורפים)

(3) A Hebrew-foreign language/
foreign language-Hebrew dictionary.

(3) מילון עברי-לועזי / לועזי-עברי.

ד. Special instructions:

ד. הוראות מיוחדות:

(1) In Part One, there are nine questions.

(1) בפרק הראשון יש תשע שאלות.

For each of Questions 1-8, four possible answers are given and you must choose the correct answer.

בכל אחת מן השאלות 1-8 מוצגות ארבע

תשובות, ומהן עליך לבחור בתשובה הנכונה.

את התשובות הנכונות עליך לסמן בתשובון שבסוף

מחברת הבחינה (עמוד 19).

Mark the correct answers on the answer sheet found at the end of the answer booklet (page 19).

בשאלה 9 יש לענות על הסעיפים לפי ההנחיות.

(2) בפרק השני יש חמש שאלות. עליך לענות על שלוש

מהן לפי ההנחיות בכל שאלה.

Answer the items in Question 9 according to the instructions.

(2) In Part Two, there are five questions. You must answer three of them according to the instructions in each question.

Write in the answer booklet only. Write the word "טייטה" at the top of each page you use as a draft page. If you write any draft material outside the answer booklet, your exam may be disqualified.

כתוב במחברת הבחינה בלבד. רשום "טייטה" בראש כל עמוד המשמש טייטה. כתיבת טייטה בדפים שאינם במחברת הבחינה עלולה לגרום לפסילת הבחינה.

Good Luck!

בהצלחה!

Questions

Part One (40 points)

Answer **all** eight questions 1-8.

If you answer at least six questions correctly you will receive the full 20 points
(each question— $3\frac{1}{3}$ points).

Before you answer a question, read all the possible answers.

Each question is given four possible answers. Choose the correct one.

- * Mark the answer you chose on the answer sheet on the inside cover at the end of the answer booklet (page 19).
- * For each question, use a pen to mark an $\times$ in the box below the letter (ט-א) that represents the answer you chose.
- * Mark an $\times$ in only one box for each question.
- * If you want to erase your answer, fill in the whole box like this: ■ .
- * Do **not** use White-Out to erase answers.
- * **Note: In order to limit the need to erase answers on the answer sheet, we recommend that you first mark the correct answers inside the exam booklet itself and only later mark them on the answer sheet.**

1. What is the electron configuration of the ion $_{12}\text{Mg}^{2+}$?

- א. 2 , 8
- ב. 2 , 6
- ג. 2 , 8 , 2
- ד. 2 , 8 , 4

2. Let us arbitrarily label an element A .

The mass number of one of the atoms of the element A is 87 .

The number of neutrons in this atom is 49 .

Which of the following is the correct ion for an atom of the element A ?

- א. A^{2+}
- ב. A^{2-}
- ג. A^{+}
- ד. A^{3+}

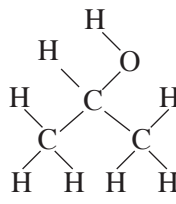
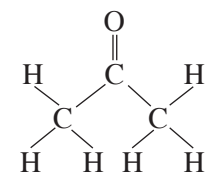
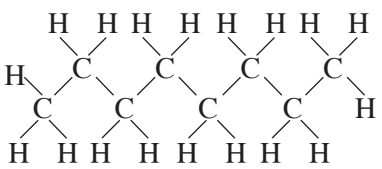
3. The following table shows information about the spatial structure of four molecules.

Molecule	CF_4	CH_2Cl_2	C_2F_2	HCN
Spatial structure of the molecule	tetrahedron	tetrahedron	linear	linear

Consider the following four pairs of molecules. In which pair are both molecules polar [קוטביות]?

- א. HCN and C_2F_2
 - ב. HCN and CH_2Cl_2
 - ג. CF_4 and C_2F_2
 - ד. CF_4 and CH_2Cl_2
4. X and Y are the arbitrary symbols of two elements in the second or third row of the periodic table.
Element X is located in Column 1 of the periodic table.
Element Y is located in Column 6 of the periodic table.
A reaction between the elements X and Y produced a water-soluble compound.
Which of the four statements א-ד about the compound is correct?
- א. At room temperature, this compound is a gas.
 - ב. The formula of this compound is $\text{XY}_{2(s)}$.
 - ג. The aqueous solution of this compound conducts electricity.
 - ד. At room temperature, this compound is composed of molecules whose molecular formula is X_2Y .

5. The following table shows data about three substances.

Substance	State of matter at room temperature	Full structural formula of the molecule
2-propanol	liquid	
acetone	liquid	
octane	liquid	

The following four statements, I-IV, describe certain phenomena. All statements are correct.

- I The boiling point of 2-propanol is higher than the boiling point of acetone.
- II The boiling point of octane is higher than the boiling point of 2-propanol.
- III 2-propanol dissolves in octane.
- IV Acetone dissolves in water.

Which statements describe phenomena that can be explained by Van der Waals forces alone?

- א. statements I and III
- ב. statements II and III
- ג. statements I and IV
- ד. statements II and IV

6. Statements א-ד below describe samples of different substances.

Which of the samples described contains the largest total number of atoms?

- א. 2.56 gram sulfur, $S_{8(s)}$.
- ב. 0.2 moles of carbon dioxide, $CO_{2(g)}$, molecules.
- ג. 1.6 gram methane, $CH_{4(g)}$.
- ד. 0.1 moles of hexane, $C_6H_{14(l)}$, molecules.

7. In four separate experiments a solution of $NaOH_{(aq)}$ with a concentration of 0.1M was added to four solutions of different acids.

Which of the acid solutions א-ד requires the largest volume of $NaOH_{(aq)}$ to reach complete titration [סתירה] of the acid solution?

- א. 10 ml of $HCl_{(aq)}$ solution at a concentration of 0.1M
- ב. 10 ml of $HNO_{3(aq)}$ solution at a concentration of 0.2M
- ג. 10 ml of $H_2SO_{4(aq)}$ solution at a concentration of 0.2M
- ד. 10 ml of $HBr_{(aq)}$ solution at a concentration of 0.3M

8. Compounds א-ד contain chlorine atoms.

In which of these compounds can the chlorine atoms undergo only reduction [חיזור]?

- א. $HCl_{(g)}$
- ב. $HClO_{(g)}$
- ג. $HClO_{4(g)}$
- ד. $ClF_{(g)}$

Analysis of a passage from a scientific article – Required

9. Read the passage below and answer all the items א-ה that follow (required question – 20 points).

Domestic detergents: Great for cleaning, don't start mixing!

The spread of the COVID-19 virus across the world triggered an increase in the use of cleaning and disinfectant agents, which were used to prevent the virus from surviving on surfaces.

There are several types of cleaning agents and disinfectants on the market for domestic use:

Bleach [אקונומיקה]: the common name for an aqueous solution of **sodium hypochlorite**,

$\text{NaOCl}_{(\text{aq})}$. This solution also contains $\text{HOCl}_{(\text{aq})}$ formed during dissolution in water of solid sodium hypochlorite.

Ammonia solution: obtained by dissolving **ammonia** gas, $\text{NH}_{3(\text{g})}$, in water. The solution is usually used to clean glass, glazed ceramics, and stainless steel, and to remove grease from ovens.

Caustic soda: the common name for solid **sodium hydroxide**, $\text{NaOH}_{(\text{s})}$. The aqueous solution of sodium hydroxide is used, for example, to remove grease from ovens.

Hydrochloric acid solution: obtained by dissolving the gas **hydrogen chloride**, $\text{HCl}_{(\text{g})}$, in water. This solution is used in bathroom cleaner sprays.

Solutions of the alcohol ethanol, $\text{C}_2\text{H}_5\text{OH}_{(\text{aq})}$, of various concentrations, are used to clean surfaces, usually glass. After cleaning, the alcohol evaporates quickly and evenly without leaving any streaks.

If these substances are used separately and strictly according to instructions they can be effective (even though they may be toxic). But mixing cleaning materials creates substances that are not only ineffective but can also emit hazardous toxins.

For example:

- Mixing bleach and bathroom cleaner spray can produce the toxic gas chlorine, according to Reaction (1):
$$(1) \text{HOCl}_{(\text{aq})} + \text{H}_3\text{O}_{(\text{aq})}^+ + \text{Cl}_{(\text{aq})}^- \longrightarrow \text{Cl}_{2(\text{g})} + 2\text{H}_2\text{O}_{(\text{l})}$$
- Mixing bleach and ammonia solution can result in the formation of monochloramine, $\text{NH}_2\text{Cl}_{(\text{g})}$, which can harm the eyes and respiratory system.
- Mixing bleach and ethanol can result in the formation of the toxic substance chloroform, $\text{CHCl}_{3(\text{l})}$.
- Mixing bathroom cleaner spray with caustic soda does not produce any hazardous materials, but the reaction produces energy. If there are toxic substances in the mixture where this reaction takes place (because other cleaning materials were added in), the emitted energy causes increased motion of molecules of the toxic substances and dispersion of these substances into the air as gas.

What should you do if you accidentally mix cleaning products?

Immediately dilute the mixture by adding a lot of room-temperature water, then ventilate the room and leave it. **Do not try to neutralize the solution by adding other substances.**

Adapted from: Bradley, David, Why is mixing cleaning chemicals such a bad idea? *Chemistry World*, 23 April 2020.

Answer Items א, ב, ג, ד, ז, ח, and one of the Items ה or ו.

- א. One type of bleach manufactured in Israel contains 30 grams of sodium hypochlorite, $\text{NaOCl}_{(s)}$, in 1 liter of solution.

What is the molar concentration of sodium hypochlorite in this bleach solution?

Provide detailed calculations.

All the disinfectants mentioned in the passage are water-soluble [מתמוססים במים].

- ב. Formulate the dissolution in water of each of the following substances:
ammonia, $\text{NH}_{3(g)}$, sodium hydroxide, $\text{NaOH}_{(s)}$, and hydrogen chloride, $\text{HCl}_{(g)}$.
- ג. Specify whether the pH of each of the solutions obtained in Item ב is lower than, higher than, or equal to 7.
- ד. Reaction (1), the reaction that takes place between bleach solution and bathroom cleaner spray is an oxidation-reduction [חמצון-חיזור] reaction.



Determine which is the oxidizer and which is the reducer in Reaction (1).

Item ה is an elective question; if you choose to answer it, do not answer Item ו.

- ה. i The boiling point of ethanol, $\text{C}_2\text{H}_5\text{OH}_{(l)}$, is 78° , but the boiling point of ammonia, $\text{NH}_{3(l)}$ is -33°C .
Why is the boiling point of ethanol higher than the boiling point of ammonia? In your answer, discuss all the types of forces acting between the molecules in each of the two compounds.
- ii Chlorophorm, $\text{CHCl}_{3(l)}$, dissolves well in ethanol.
Formulate the process in which chloroform dissolves in ethanol.

Item ו is an elective question; if you choose to answer it, do not answer Item ה.

- ו. Answer Sub-Items i-ii based on the passage:
- i Write the net equation for the reaction that takes place when **mixing** bathroom cleaner spray with caustic soda solution.
- ii Determine the sign of ΔH^0 for the reaction you formulated in Sub-Item i.
Use the information in the passage to explain your answer.
- ז. Consider the following quote from the passage: "Solutions that contain various concentrations of the alcohol ethanol, $\text{C}_2\text{H}_5\text{OH}_{(aq)}$, are used to clean surfaces, usually glass. After cleaning, the alcohol evaporates quickly and evenly without leaving any streaks."
Formulate the process described in this quote from the passage.
- ח. Explain why, if you accidentally mix cleaning materials, you must dilute the solution with room-temperature water and not with hot water.

Part 2 (60 points)

Answer three of the questions 10-14 according to the instructions in each question (each question—20 points).

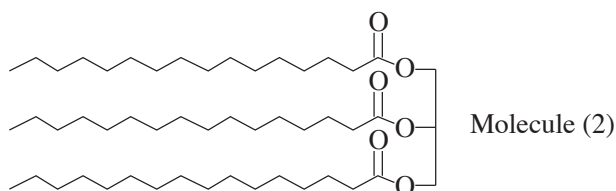
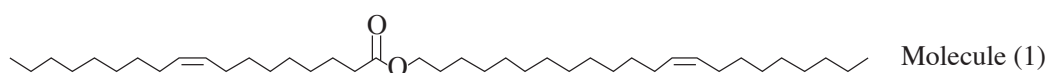
Food chemistry

10. Answer Items א, ב, ג, ד, ו, ז, and one of the Items ה **or** ח.

Jojoba oil is extracted from the seeds of the jojoba plant and is used mainly in cosmetic products. Jojoba oil does not contain triglycerides.

The fatty acids in jojoba oil have a special structure, as seen in the abbreviated structural formula [ייצוג מקוצר לנוסחת המבנה] of Molecule (1).

Shown below are the abbreviated structural formulas of two molecules that are found in different oils:



א. List the functional groups in each of the molecules, Molecule (1) and Molecule (2).

The composition of the oil in the jojoba seed depends on where it grows. The following table shows the main fatty acids in jojoba oil that is extracted from seeds grown in a certain region in Mexico.

Fatty acid	Abbreviated notation of fatty acid	Percent of total fatty acids
Palmitic acid	C16:0	8.1%
Oleic acid	C18:1 ω 9cis	19.7%
Gondoic acid	C20:1 ω 9cis	60.6%
Erucic acid	C22:1 ω 9cis	10.1%
Other fatty acids		1.5%

ב. Provide an abbreviated structural formula of the gondoic acid molecule and an abbreviated structural formula of the palmitic acid molecule.

- ג. How many moles of gondoic acid, $C_{19}H_{37}COOH_{(l)}$, can be produced from 100 grams of the fatty acids in jojoba oil? Use the data in the table.

Another variety of jojoba oil contains elaidic acid. Elaidic acid is an omega-9 fatty acid and an isomer of oleic acid.

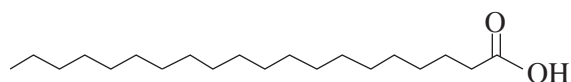
- ד. Provide an abbreviated structural formula for a molecule of elaidic acid.

Item ה is an elective question; if you choose to answer it, do not answer Item ו.

- ה. The melting point of elaidic acid is higher than the melting point of oleic acid. Explain why.

The oil extracted from the seeds of jojoba grown in the Negev contains a higher percentage of saturated fatty acids. One of these fatty acids is arachidic acid.

The abbreviated structural formula of arachidic acid is given below:



- ו. Provide the abbreviated notation [רישום מקוצר] of arachidic acid.
- ז. Arachidic acid can be obtained from one of the acids shown in the table by hydrogenation. Which fatty acid can be used to obtain arachidic acid? Explain your answer.

Item ח is an elective question; if you choose to answer it, do not answer Item ט.

- ח. One of the ways to produce jojoba oil is to add hexane, $C_6H_{14(l)}$, to crushed seeds and then shake them.
- Jojoba oil dissolves well in hexane, $C_6H_{14(l)}$. Explain why.

Acids and bases, Structure and Bonding

11. Answer Items א, ג, ה, and one of the Items ב **or** ד.

Vinegar [חומץ] is a liquid commonly found in the kitchen.

This liquid has a distinctive odor, and it can be used not only in salad dressings but also for cleaning.

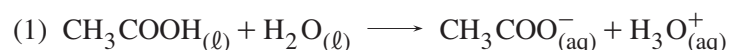
Vinegar is a solution of acetic acid, $\text{CH}_3\text{COOH}_{(\ell)}$, in water.

- א. The label on a bottle of ordinary vinegar says "Vinegar 5%", which means there are 5 grams of acetic acid in 100 ml of solution.

i Calculate the molar concentration of acetic acid in this bottle of vinegar.

Provide detailed calculations.

Acetic acid reacts with water according to Reaction (1):



ii Is the pH of the vinegar solution lower than 7, higher than 7, or equal to 7?

Explain your answer.

Item ב is an elective question; if you choose to answer it, do not answer Item ד.

- ב. To safely use ordinary vinegar as a cleaning liquid, it is best to dilute it in water, by adding 400 ml of water (about two cups) to 100 ml of vinegar (about half a cup).

i Calculate the molar concentration of **acetic acid** in the vinegar solution obtained **after this dilution**. Provide detailed calculations.

ii Will the pH of the vinegar solution **after this dilution** be higher than, lower than, or equal to the pH of the vinegar solution before this dilution? Explain your answer.



When acetic acid is in a gaseous state, some of the molecules of acetic acid form pairs (dimers).
 The individual molecules in each pair are connected by hydrogen bonds [קשרי מימן].

- א. Which of the following figures (1)-(3) correctly describes the hydrogen bonds formed between two molecules of acetic acid? Explain your answer.

Figure (1)

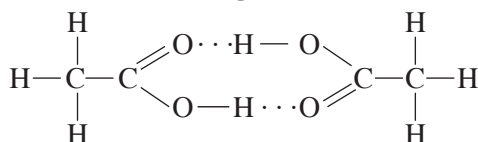


Figure (2)

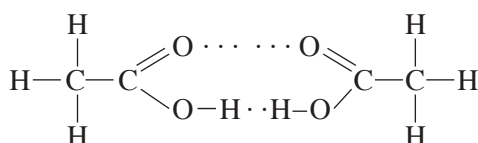
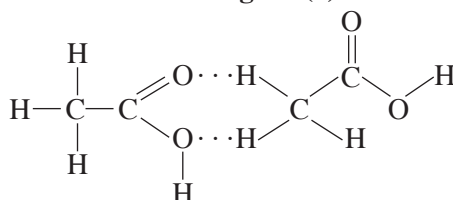
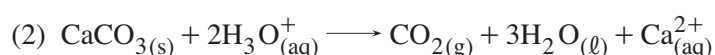


Figure (3)



Item 7 is an elective question; if you choose to answer it, do not answer Item 2.

7. Ordinary vinegar is commonly used to remove limescale that builds up in kettles.
 Reaction (2), below, is the reaction that occurs between an acid and calcium carbonate, $\text{CaCO}_{3(s)}$, which is the main component of limescale:



The same reaction takes place when a solution of $\text{HCl}_{(aq)}$ is applied to rocks that contain limestone $\text{CaCO}_{3(aq)}$.

This is how we detect limestone in rocks.

- i. $\text{CaCO}_{3(s)}$ was added to 10 ml of a 0.5M solution of $\text{HCl}_{(aq)}$. All reactants reacted completely according to Reaction (2).
 Calculate the mass of calcium carbonate that reacted in this reaction.
Provide detailed calculations.
- ii. Did the pH of the $\text{HCl}_{(aq)}$ solution decrease, increase, or remain unchanged?
Explain your answer.
- ה. 0.25 grams of $\text{CaCO}_{3(s)}$ were added to 12 ml of a 0.5M solution of $\text{HCl}_{(aq)}$ and the $\text{CaCO}_{3(s)}$ reacted completely.
 Is the pH of the solution at the end of the reaction higher than, lower than, or equal to 7?
Provide detailed calculations or explain in words.

Oxidation-reduction, stoichiometry, energy

12. Answer Items א, ב, ג, ד, ה, and one of the Items ז or ח.

This question discusses the ionic compound ammonium nitrate, $\text{NH}_4\text{NO}_3(\text{s})$.

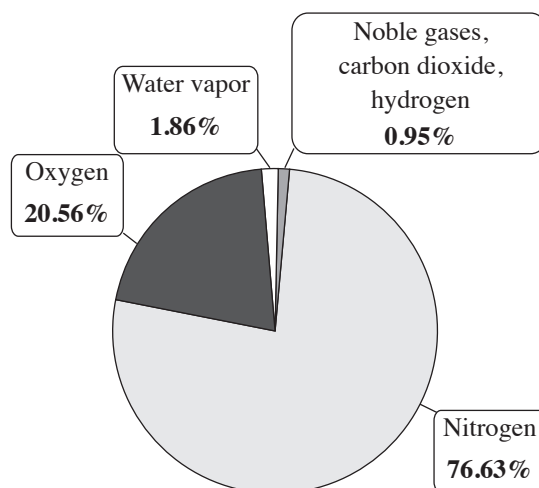
When soaked in a liquid mixture of hydrocarbons, solid ammonium nitrate, $\text{NH}_4\text{NO}_3(\text{s})$, is an explosive used to blast rocks in mountain road construction. The ammonium nitrate decomposes during the explosion.

The reaction of the complete decomposition of ammonium nitrate, $\text{NH}_4\text{NO}_3(\text{s})$, is given below:



א. Is Reaction (1) an oxidation-reduction reaction? Explain your answer.

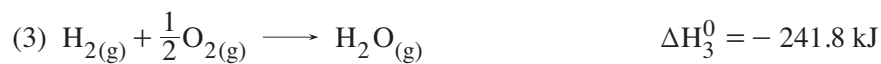
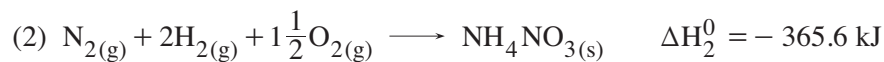
The following chart describes the composition of air at a temperature of 25°C , 60% humidity, and pressure of 1 atmosphere.



ב. The products of complete decomposition of ammonium nitrate do not cause air pollution. Explain this fact.

Item ז is an elective question; if you choose to answer it, do not answer Item ח.

ג. Consider the following ΔH^0 data for the reactions (2) and (3).



Calculate ΔH_1^0 for Reaction (1), which is the reaction of the complete decomposition of ammonium nitrate.

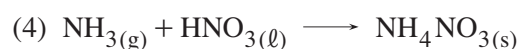
7. In the partial breakdown of ammonium nitrate, $\text{NH}_4\text{NO}_{3(s)}$, several nitrogen compounds such as $\text{N}_2\text{O}_{(g)}$ and $\text{NO}_{2(g)}$ are obtained.

Calculate the oxidation states of the nitrogen atoms in each of the types of ions of which $\text{NH}_4\text{NO}_{3(s)}$ is composed and in both the given nitrogen compounds.

Item 7 is an elective question; if you choose to answer it, do not answer Item 8.

8. The compound ammonium nitrate, $\text{NH}_4\text{NO}_{3(s)}$, is mainly used as a fertilizer in agriculture. Ammonium nitrate, $\text{NH}_4\text{NO}_{3(s)}$, is formed in a reaction of nitric acid, $\text{HNO}_{3(l)}$, with gaseous ammonia, $\text{NH}_{3(g)}$.

The equation for this reaction is:



Calculate the mass of ammonia, $\text{NH}_{3(g)}$, required to prepare 1.0 kg of ammonium nitrate, $\text{NH}_4\text{NO}_{3(s)}$, according to Reaction (4).

Given: 1 kg = 1000 gram.

The fertilizer ammonium nitrate, $\text{NH}_4\text{NO}_{3(s)}$, is sold in a 9.5M aqueous solution for fertilization in the summer.

9. Formulate the dissolution reaction of ammonium nitrate, $\text{NH}_4\text{NO}_{3(s)}$, in water.
10. In the winter, a different concentration of this solution is used—7.9M . Which one of treatments a-c, below, must be applied to the summer fertilizer solution to adapt it for winter fertilization? Explain your answer.
- Reduce the volume of the solution by evaporating water.
 - Increase the volume of the solution by adding water.
 - Add solid ammonium nitrate, $\text{NH}_4\text{NO}_{3(s)}$, to the solution.

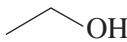
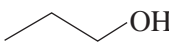
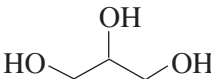
Structure and bonding, energy

13. Answer Items א, ב, ג, ד, and one of the Items ה or ו.

Alcogel is used to disinfect and clean hands when soap and water are not available.

Alcogel is a liquid mixture of several types of alcohol dissolved in water.

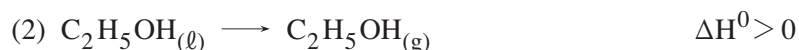
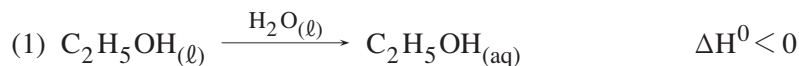
The table below lists data about alcohols that can be found in alcogel.

	Alcohol	Boiling point (°C)	Abbreviated structural formula of the alcohol molecule
1	Ethanol	78	
2	1-propanol	97	
3	2-propanol	82	
4	glycerol		

- א. i Provide the Lewis electron dot structure [נוסחת ייצוג אלקטרונית] for each of the alcohol molecules shown in the table.
ii Which two alcohols in the table are isomers? Explain.
- ב. Explain why the boiling point of 1-propanol is higher than the boiling point of ethanol.
- ג. Which of the following statements, (1)-(3), explains the difference in boiling point between 1-propanol and 2-propanol? Explain.
 - (1) The surface area of a 1-propanol molecule is greater than the surface area of a 2-propanol molecule.
 - (2) A 1-propanol molecule is polar [קוטבית], but a 2-propanol molecule is nonpolar.
 - (3) The size of the electron cloud of a 1-propanol molecule is different from the size of the electron cloud of a 2-propanol molecule.
- ד. Determine whether the boiling point of glycerol is higher or lower than the boiling point of 2-propanol. Explain your answer.
In your answer, discuss all the types of forces of interaction between the molecules in each of the two compounds.

Item ה is an elective question; if you choose to answer it, do not answer Item ו.

- ה. If we wet our hands with water, pour some alcogel containing 70% ethanol, $C_2H_5OH_{(l)}$, on them and then rub our hands together, we will feel them warming up.
- In the process described above, do our hands absorb or emit energy? Explain.
 - Which reaction, Reaction (1) or Reaction (2), is responsible for the sensation of warmth in our hands? Explain your choice.



- What change does the ethanol undergo according to the reaction you chose in Sub-Item ii: evaporation, dissolution in water, condensation, or decomposition?

Item ו is an elective question; if you choose to answer it, do not answer Item ה.

- ו. Use of alcogel near a source of fire should be avoided because it is a flammable substance and can start a fire.

Consider the following four enthalpy diagrams.

Which diagram correctly describes the change in enthalpy that occurs in the combustion [שרפה] of ethanol?

Explain your choice, and explain why you rejected the other diagrams.

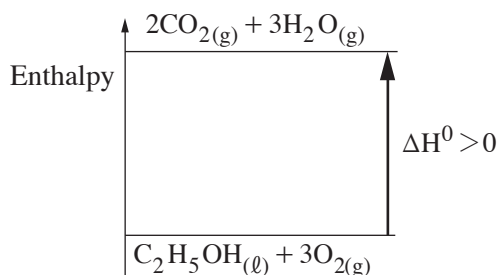


Diagram 2

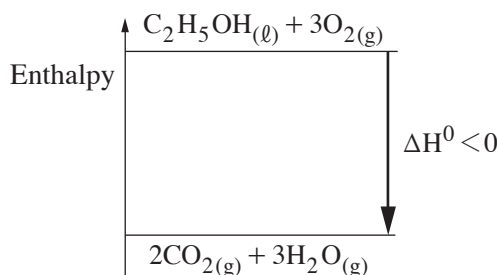


Diagram 1

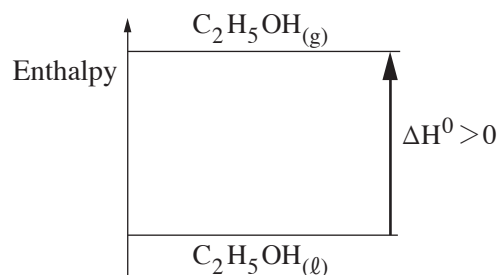


Diagram 4

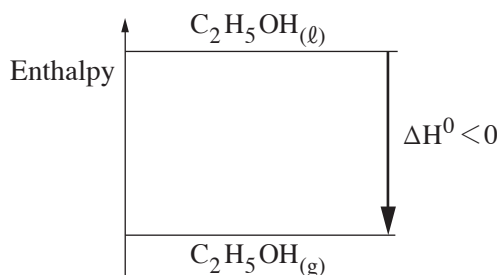


Diagram 3

Ionic substances. calculations

14. Answer Items ג, ד, ה, ו, and one of the Items א or ב.

This question discusses ionic substances and their properties.

Item א is an elective question; if you choose to answer it, do not answer Item ב.

- א. All ionic substances are solid at room temperature.

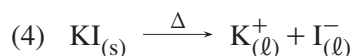
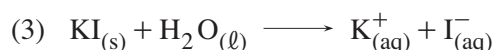
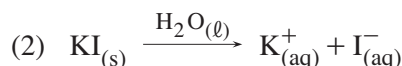
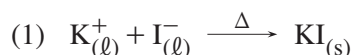
Explain this statement on the microscopic level.

Item ב is an elective question; if you choose to answer it, do not answer Item א.

- ב. Ionic substances are not conductive at room temperature.

Explain this statement on the microscopic level.

- ג. Consider the following four equations (1)-(4).



i Which of the equations (1)-(4) represents the process of melting potassium iodide, $\text{KI}_{(\text{s})}$?

ii Which of the equations (1)-(4) represents the process of dissolving potassium iodide, $\text{KI}_{(\text{s})}$, in water?

- ד. 16.6 grams of $\text{KI}_{(\text{s})}$ were dissolved in water. A solution of 1 liter was prepared.

How many moles of ions are there in total in the solution?

Provide detailed calculations.

- ה. Aluminum sulfide is a solid used in the chemical industry to produce hydrogen sulfide, $\text{H}_2\text{S}_{(\text{g})}$.
- Provide the empirical formula of aluminum sulfide.
 - Aluminum sulfide reacts with water to produce aluminum hydroxide, $\text{Al}(\text{OH})_{3(\text{s})}$, and hydrogen sulfide, $\text{H}_2\text{S}_{(\text{g})}$.
Formulate and balance the reaction.
 - What is the mass of aluminum hydroxide, $\text{Al}(\text{OH})_{3(\text{s})}$, that is produced when 30 kg of aluminum sulfide react with water? Provide detailed calculations.
Given: 1 kg = 1000 g.

- ו. One of the uses of magnesium sulfate, $\text{MgSO}_{4(\text{s})}$, also known as Epsom salt [מלח אנגלי], is as a relaxing bath salt.

A bath was filled with water, and magnesium sulfate was dissolved in it. There were 220 liters of water in the bath, and the concentration of magnesium ions, $\text{Mg}_{(\text{aq})}^{2+}$, was 0.022M.

What mass of magnesium sulfate, $\text{MgSO}_{4(\text{s})}$, was dissolved in the bath water? Provide detailed calculations.

Good Luck!

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בהצלחה!

זכות היוצרים שמורה למדינת ישראל
אין להעתיק או לפרסם אלא ברשות משרד החינוך