

Last (= family) Name: **Answers**  
**Highlighted**

ID #  
# on the signature list: N1 =  
(N1 to be entered by the invigilator)

CHEMISTRY 205/2 Section Lec 51 (N2 to be entered by the teacher) N2 =

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**MID TERM EXAMINATION**

Number of pages: 8

October 21, 2015 18:00 - 19:00

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Instructor: G. DÉNÈS

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**Materials allowed:** Calculators with no storage capacity  
Printed translation dictionaries

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**Materials NOT allowed:** No books or notes  
No periodic tables (one is provided at the end of this questionnaire)  
No sharing of calculators  
No technical/scientific dictionary  
No electronic dictionary  
Not your own scrap paper.  
No electronic equipment, except calculator

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**INSTRUCTIONS TO BE READ BEFORE STARTING THE EXAM:**

1. Write your name and ID number in the appropriate places at the top of the front page.
2. Write your ID number at the top of all the other pages.
3. This is a multiple choice examination. All the questions are worth the same mark.
4. Circle only one answer number for each question. There is only one correct answer for each question.
5. If you circle more than one answer number for a question, you will get a "zero" for that question.
6. If you have already circled an answer and you change your mind, erase the other answers, or clearly cross them out. Ambiguous answers will be counted as being wrong.
7. Only the circle around the question number will count. I will not read any calculation or anything else you may write on the questionnaire.
8. Do not write anything else on the front of the pages. Use the back of the questionnaire for your calculations.
9. Answer every question.
10. All group numbers used throughout this questionnaire are in the current official numbering system defined by the IUPAC.
11. When you are finished writing your exam, raise your hand and remain seated. The teacher or an invigilator will come to pick up your questionnaire and have you sign the attendance sheet, after checking your ID card. Do NOT leave your seat until the teacher allows you to.
12. Do NOT mutilate this questionnaire. The periodic table and the table of constants attached at the end of

this questionnaire maybe removed, however, they must be returned with your questionnaire.

13. There are three blank pages for your calculations and rough work at the end of the questionnaire. They will not be graded. They can also be removed. They must be returned with the questionnaire at the end of the exam.

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\*\*\*\*\* QUESTIONS START HERE \*\*\*\*\*

1. Tell which of the following represent a *kinetic energy*.

- (a) Thermal energy
- (b) Gravitational energy
- (c) Nuclear energy
- (d) Chemical energy
- (e) Electrostatic energy

- 1. (a), (c) and (d)
- 2. (a), (c) and (e)
- 3. (a), (d) and (e)
- 4. (a)
- 5. (d)

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2. Tell which of the following equation is correct.

- 1.  $1 \text{ km}^3 = 1 \times 10^6 \text{ cm}^3$
- 2.  $1 \text{ km}^3 = 1 \times 10^9 \text{ cm}^3$
- 3.  $1 \text{ km}^3 = 1 \times 10^{-9} \text{ cm}^3$
- 4.  $1 \text{ km}^3 = 1 \times 10^{-15} \text{ cm}^3$
- 5.  $1 \text{ km}^3 = 1 \times 10^{15} \text{ cm}^3$

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3. Tell which of the following statements is correct.

- 1. At the molecular level, atoms, ions or molecules in solids vibrate in fixed positions and orientation with respect to each other.
- 2. Liquefaction takes places when the state of matter changes from solid to liquid.
- 3. The chemical energy is a kinetic energy.

4. When heat is released to the environment in a chemical reaction, the reaction is said to be endothermic.
5. The color of a compound is a chemical property.

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4. The melting point of sodium chloride is 801 °C. Determine it in the Kelvin scale and in the Fahrenheit scale.

1. 528 K and 1442 °F
2. 1074 K and 1474 °F
3. 528 K and 477 °F
4. 1074 K and 477 °F
5. 1074 K and 1442 °F

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5. Who proposed that “at the same temperature and pressure, equal volumes of different gases contain the same number of particles”?

1. Gay-Lussac
2. Avogadro
3. Lavoisier
4. Dalton
5. Proust

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6. A chemist in a galaxy far, far away, performed the Millikan oil drop experiment and obtained the following results for the charges of various drops:

$2.56 \times 10^{-12}$ zirkombs	$7.68 \times 10^{-12}$ zirkombs
$3.84 \times 10^{-12}$ zirkombs	$6.40 \times 10^{-12}$ zirkombs

Use these data to calculate the charge of the electron in zirkombs

1.  $2.56 \times 10^{-12}$  zirkombs
2.  $3.84 \times 10^{-12}$  zirkombs
3.  $0.32 \times 10^{-12}$  zirkombs
4.  $0.64 \times 10^{-12}$  zirkombs
5.  $1.28 \times 10^{-12}$  zirkombs

Hint: The charge of each oil drop must be equal to an integer number of electrons, and the charge of the

electron must be the highest that satisfies this condition, i.e. the number of electrons on the droplets should not have a common divisor. Start by assuming that the drop with the lowest charge has acquired one electron.

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7. Tell who ran an experimental to show that the “plum pudding model” of the atom was incorrect

1. Dalton
2. Millikan
3. Rutherford
4. Thomson
5. Chadwick

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8. Taking into account that the diameter of a  $^1\text{H}$  nucleus is  $1.0 \times 10^{-3}$  pm, the mass of a proton is  $1.672622 \times 10^{-24}$  g and the mass of a neutron is  $1.674927 \times 10^{-24}$  g, determine the density of a  $^1\text{H}$  nucleus.

1.  $1.1 \times 10^{15} \text{ g/cm}^3$
2.  $1.1 \times 10^{-15} \text{ g/cm}^3$
3.  $3.2 \times 10^{15} \text{ g/cm}^3$
4.  $2.2 \times 10^{-15} \text{ g/cm}^3$
5.  $4.4 \times 10^{15} \text{ g/cm}^3$

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9. Give the number of electrons, protons and neutrons contained in  $^{31}\text{P}^{3-}$

1. 15 electrons, 18 protons, 13 neutrons
2. 15 electrons, 18 protons, 31 neutrons
3. 18 electrons, 15 protons, 31 neutrons
4. 18 electrons, 15 protons, 16 neutrons
5. 15 electrons, 15 protons, 18 neutrons

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10. Give the name of the element, the symbol of which is K.

1. Krypton

2. Potassium

3. Calcium

4. Kopper

5. Kobalt

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**11.** An element reacts with water at room temperature to give an ion in the +2 oxidation state and hydrogen. Tell what is this element.

6. Beryllium

7. Potassium

8. Calcium

9. Aluminum

10. Silver

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**12.** Tell which of the following sulfur compound is found as a pollutant in natural gas

1. SO<sub>2</sub>

2. H<sub>2</sub>S

3. H<sub>2</sub>SO<sub>4</sub>

4. SO<sub>3</sub>

5. CaS

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**13.** Tell which of the following pair of elements should have similar electronegativities.

1. Carbon and silicon

2. Silicon and arsenic

3. Silicon and aluminum

4. Aluminum and boron

5. Aluminum and calcium

14. Give the unit formula of aluminum chlorite.

1.  $\text{Al}(\text{ClO}_2)_3$
2.  $\text{Al}(\text{ClO}_3)_3$
3.  $\text{AlCl}_3$
4.  $\text{Al}_3\text{ClO}_3$
5.  $\text{Al}_3\text{ClO}_2$

15. Give the unit formula of strontium phosphide. Strontium: Sr

1. SrP
2.  $\text{SrP}_2$
3.  $\text{Sr}_3(\text{PO}_3)_2$
4.  $\text{Sr}_2\text{P}_3$
5.  $\text{Sr}_3\text{P}_2$

16. Give the name of  $\text{SF}_4$ .

1. Sulfur tetrafluoride
2. Monosulfur tetrafluoride
3. Sulfur(IV) fluoride
4. Sulfur(IV) tetrafluoride
5. Sulfur fluoride

17. Tell what is the change of oxidation number of sulfur when aluminum sulfide reacts with oxygen to give sulfur dioxide.

1. +3 to +4
2. -2 to +2
3. -3 to +2

4. +2 to -4
5. -2 to +4

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**18.** Determine the molar mass of isopentyl acetate,  $C_7H_{14}O_2$ , the compound responsible for the scent of bananas.

1. 65.09 g/mol
2. 130.18 g/mol
3. 260.36 g/mol
4. 112.05 g/mol
5. 139.23 g/mol

Hint: Add up the molar masses of all atoms

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**19.** Determine the percentage mass composition of carbon in carvone,  $C_{10}H_{14}O$ .

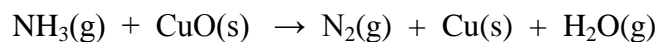
1. 65.32 %
2. 87.19 %
3. 71.65 %
4. 79.96 %
5. 48.80 %

Hint: Add up the molar masses of all atoms to get the molar mass. The % mass is the mass contained in 100 g of compound.

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**20.** Balance the following equation and give the stoichiometric coefficient of copper metal.



1. 1
2. 2
3. 3
4. 4
5. 6

Hint: Stoichiometric coefficients must all be integer, and the smallest set of integer.

