Universidade Federal de Minas Gerais
Instituto de Ciências Exatas
Graduate Program in Chemistry
Guidelines for selection 2018/1º Semester – PhD Program

The Coordinator of the Graduate Program in Chemistry at the Universidade Federal de Minas Gerais (UFMG) OFFICIALY STATES that the applications for the **PhD PROGRAM** are going to be available from **October 10th to November 10th, 2017**.

The application process is **entirely online** and consists in filling the application form (available in the website: http://www.ppg.qui.ufmg.br) and uploading the required documents listed in item II **(exclusively in PDF)**. The application period is from **06:00am of October 10th to 11:59pm of November 10th, 2017 (Brazil time zone BRST = GMT-2)**.

Contacts: Phone number +55 (31) 3409-5732; e-mail: pgquimic@qui.ufmg.br; program's website: http://www.ppg.qui.ufmg.br

I - Vacancies. It will be available **100 vacancies (a hundred vacancies)** for the first semester of 2018. Chemistry is the area of concentration, with four sub-areas: Analytical Chemistry, Inorganic Chemistry, Organic Chemistry and Physical Chemistry. As required by law, 20 (twenty) out of the 100 (a hundred) vacancies will be reserved to candidates that self-declare themselves blacks.

II - Application Requirements. The documents below must be uploaded to the program's website in order to complete the submission process. **All documents must be in PDF format, only the photo in JPEG format.**

a) Application form filled online (available in http://www.ppg.qui.ufmg.br);

b) Undergraduate diploma in chemistry or a related area (in case the candidate does not hold his diploma he/she must present a declaration proving his capability of concluding his undergraduation before the registration deadline) and the undergraduate transcript;

c) If applies, master's diploma (in case the candidate does not hold his diploma he/she must present a declaration proving his capability of concluding his master's before the registration deadline) and/or master's transcript;

d) *Curriculum vitae*, (Lattes Platform/CNPq – *site*: http://www.cnpq.br/), with mandatory proof of all the related activities, including the first page of published papers (if applies);

e) 01 (one) recent photo 3x4 cm (JPEG format);

f) Residential address proof;

g) Personal documents: Identity card, Passport, Certification of Birth or Marriage;

h) Foreign candidates must present all required documents according to their country legislation.

Special need candidates must inform, in the application form, the conditions necessary for their application.

After submission of the application if finalized, each candidate will receive an identification number by e-mail that will be used to keep his anonymity during the writing assessment corrections.

III – Selection Committee. The PhD selection committee will be composed by 8 (eight) professors from the Chemistry department, all nominated by the collegiate. The committee list and their declarations of impediments related to any candidate will be displayed in the secretary and the program's website 48 hours before the beginning of the process, according to the present legislation.

IV – Selection Process. The selection process will consist on a single eliminatory and classificatory step, with two evaluation, summing up to 100 points.

a) Writing assessment, summing up to 60 points. The candidate who does not obtain at least 30 points in the exam will be automatically eliminated. This assessment will be held on **November 20th, 2017, from 1:00pm to 5:00pm**, in CAD 1 - Auditorium 2A/Campus UFMG, Av. Presidente Antônio Carlos, 6627 - Bairro Pampulha/Belo Horizonte. There is the possibility to perform the assessment in other selected cities if requested in the application form. The bibliography is indicated in the **Attachment** of these guidelines and in the program's website. The results will be available on **November 27th, 2017** and the candidate has 10 days to request a revision of the writing assessment.

b) *Curriculum vitae* and transcript evaluation, summing up to 40 points. The titles, professional experience, intellectual production and academic development in the undergraduate and master's (if applies) transcripts will be evaluated. The *Curriculum vitae* weights 2 and the transcripts weight 1.

V – Final result. The final score will be the sum of the writing assessment score with the *Curriculum vitae* and transcript evaluation score. It will be considered approved the candidate who scores equal or higher than 50%, and scores at least 30 points in the writing assessment. The candidates will be ordered in a descending sequence according to the scores and divided in the categories: approved and classified, approved and not classified, or reproved. It will be admitted in the PhD program the approved and classified candidates respecting the limit of available vacancies. In the case of draw the following order will be used: i) Writing assessment, ii) *Curriculum vitae* and transcript evaluation. The final result of

the selection will be available **on December 12th, 2017 from 2:00pm** in the website http://www.ppg.qui.ufmg.br.

The candidate has 10 days to request a revision of the results for this selection as established by the General Rules of UFMG, counted from the date of the results announcement. During the revision period, candidates may request their writing assessment by the email: pgquimic@qui.ufmg.br.

VI – Register and Enrollment. The approved and classified candidate must fill a pre-registration form in the website http://sistemas.ufmg.br/cadastroprevio **from January 23rd to 25th, 2018.** The candidate must also deliver two (2) printed copies of the complete documentation (legible copies and without erasures) required for the application, in the program's secretary, **until January 29th, 2018**.

The DRCA will effectuate the enrollment after receiving the complete documentation and the online pre-registration form.

The candidate who applied with a declaration proving his capability in concluding his undergraduation or master's before the registration deadline must present an official document proving his undergraduate and master's conclusion **until January 29th, 2018.**

In case of undergraduation completed abroad, a copy of the course's diploma with a consular authentication and the certified translation to Portuguese must be presented (except those emitted in English, French or Spanish languages).

Foreign candidates must present to the program's secretary, **until January 29th, 2018**, the *Registro Nacional de Estrangeiro* – RNE, or the passport with a permanent or temporary student visa (valid), documents proving the filiation and other documents listed in the link: https://www2.ufmg.br/drca/drca/Home/Pos-Graduacao/Registro-Academico

In accordance with the provisions of art.39, § 2, of the General Rules of UFMG, *"each student has the right to a single academic register, corresponding to a single position on the course where he was admitted at UFMG"*.

The candidate who does not present the required documents and complete the pre-registration form before the deadlines will be considered as a dropout and lose his vacancy in the program. These vacancies will be filled by summoning other approved candidates strictly respecting the descending sequence of the scores, as described in item V. The summoned candidates must submit their required documents and pre-registration form until **February 4th, 2018**.

The enrollment will be performed with the program's secretary instructions in the academic system of the graduate program on a date to be disclosed, according to UFMG academic calendar.

There are no guaranteed scholarships for candidates in the selection. The rules for distribution of scholarships are in the website http://www.qui.ufmg.br/pg/.

The selected students must demonstrate knowledge of the English language within **24 month** counting from the date of first registration in the course. This requirement is in compliance with Resolution N^{o} 08/2008 of October 14th, 2008 and the graduate program in chemistry resolution N^{o} 01/2015 of March 27th, 2015, available at the website http://www.ppg.qui.ufmg.br. This proof of knowledge is required to continue the studies in the PhD program. **The non-compliance with this determination will imply in the exclusion of the student from the program.** It will be accepted one of the following proofs, with the respective minimum scores, obtained in the last 03 years:

EXAM	**MINIMUM SCORE**
CENEX-FALE-UFMG, performed for Area 2: Ciências Exatas e da Terra, Engenharias (Faculdade de Letras – UFMG)	60
TOEFL ITP (Institucional Testing Program TOEFL)	500
TOEFL iBT (Internet Based Test TOEFL)	60
IELTS (International English Language Testing System)	6.0
University of Cambridge – FCE (First Certificate in English) or CAE (Cambridge Advanced English)	A, B or C

The foreign selected students, except those born in a Portuguese speaking country, must prove **knowledge in the Portuguese language** in the maximum deadline of 24 month, starting from the first register in the program.

Only the applications complying with all demands in these guidelines will be granted.

Belo Horizonte, October, 2017.

Prof. Hélio Anderson Duarte
Coordinator of the Graduate Program in Chemistry at UFMG

ATTACHMENT
Writing Assessment Topics and Suggested Literature

I - PHYSICAL CHEMISTRY

1. The laws of thermodynamics
Fundamental concepts, reversible and irreversible processes, work and heat, thermochemistry, state functions and exact differentials; thermodynamic consequences; direction of spontaneous change; system functions; combination of the first and second laws, properties of Gibbs energy.

2. Phase diagrams of pure substances
Physical transformations of pure substances, phase diagrams; stability and phase transitions, the phase rule.

Literature

- P. W. Atkins & J. Paula (2010). "Physical Chemistry", Vol 1, 8th Edition, LTC, Rio de Janeiro.
- G. W. Castellan (1988). "Essentials of Physical Chemistry", 1st edition, LTC, Rio de Janeiro.

II - ANALYTICAL CHEMISTRY

1. Acid-Base titration
Acid-Base equilibria, titration curves, acid-base indicators

2. Precipitation titration
Solubility equilibria, titration curves, titrations of silver ions with chloride (Mohr and Volhard).

3. Complexometry
Complexation equilibria, EDTA Titration.

4. Electrochemistry
Galvanic electrochemical cells, Nernst equation, Potential electrodic

5. Oxidation-reduction titration
Titration curves, oxidation-reduction indicators.

Literature

- SKOOG-WEST: Fundamentals of Analytical Chemistry - Vol I
- HARRIS, DANIEL, C: Quantitative Chemical Analysis – seventh edition

III - INORGANIC CHEMISTRY

1. Coordination Chemistry and Organometallic Chemistry
Crystal Field Theory and Valence Bond Theory (octahedral and tetrahedral symmetry). Crystal Field Stabilization Energy. Factors affecting the magnitude of Δ. The spectrochemical series. Jahn-Teller theorem (distortions from perfect octahedral symmetry). Applications of Crystal Field Theory. Molecular Orbital Theory applied to coordination compounds and organometallic complexes. The electroneutrality principle and back bonding. Metal carbonyl complexes. Experimental evidence for

Pi bonding. Isomerism in coordination compounds (optical isomerism, geometric isomerism, other types of isomerism). Stability of coordination compounds (formation constants, chelate effect, eighteen-electron rule, factors affecting the stability of coordination compounds).

2. Acid-base chemistry
Acid-base concepts: Bronsted-Lowry, Lewis, hard and soft acids and bases.

Literature

- Huheey, J. E., Keiter, E. A., Keiter, R. L. *Inorganic Chemistry:* Principles of Structure and Reactivity. 4th ed. New York: HarperCollins College Publishers, 1993.
- Atkins, P. W., Shriver, D. F.; Overton, T. L., Rourke, J. P.; Weller, M. T.; Armstrong, F. A., Hagerman, M. *Inorganic Chemistry*, 5th ed. W. H. Freeman and Company, New York, 2010.
- Gispert, J. R. *Coordination Chemistry*, 1th ed, Wiley-VCH, Weinheim, 2008.
- Miessler, G. L.; Tarr, D. A. *Inorganic Chemistry*. 4th ed. Upper Saddle River, NJ: Pearson Prentice Hall, 2011.

IV - ORGANIC CHEMISTRY

1. Stereochemistry and conformational analysis
Stereochemistry: Diastereomers, enantiomers, *meso* compounds and their physical properties; Nomenclature of stereoisomers: *R*/*S* and *E*/*Z* systems. Conformational analysis of cyclic and alicyclic compounds.

2. Acidity and basicity
General theory and reactions, organic acids and bases.

3. Nucleophilic substitution at saturated carbon and elimination reactions
The S_N1, S_N2, E1, and E2 reactions (general aspects of their mechanisms, stereochemistry; effect of substituents and solvents).

4. Electrophilic addition to alkenes and alkynes
General aspects, mechanisms, stereo- and regioselectivity of the addition reactions to alkenes and alkynes.

5. Aromatic compounds
Aromaticity; Electrophilic aromatic substitution reactions of benzene and its derivatives; Electrophilic aromatic substitution reactions of substituted benzenes (directing effects of activating/deactivating substituents).

6. Carbonyl compounds
Nucleophilic carbonyl-addition reactions to aldehydes and ketones; Reactions of carboxylic acids and derivatives thereof.

Literature:

- Organic Chemistry - Wiley; 9th ed, 2007. T. W. Graham Solomons and Craig B. Fryhle.