Universidade Federal de Minas Gerais

Instituto de Ciências Exatas

Graduate Program in Chemistry

Guidelines for selection 2016/1º Semester – Master's Program

The Coordinator of the Graduate Program in Chemistry at the Universidade Federal de Minas Gerais (UFMG) OFFICIALY STATES that the applications for the **MASTER'S PROGRAM** are going to be available from **9th November to 04th December 2015.**

The application process is **entirely online** and consists in filling the application form (available in the website: http://www.ppg.qui.ufmg.br) and attaching the required documents listed in item II **(exclusively in PDF)**. The application period is from **06:00h 9th November 2015 to 23:59h 04th December 2015 (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 **50 vacancies (fifty vacancies)** for the first semester of 2016. The areas of concentration are: Analytical Chemistry, Inorganic Chemistry, Organic Chemistry and Physical Chemistry.

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

c) Undergraduate 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.

If the candidate is approved in the selection process, printed copies (legible and without erasures) of all the required documents must be delivered to the program's secretary until **27th January 2016** for his/her enrollment in the course.

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

At the moment of the application, each candidate will receive an identification number that will be used to keep his anonymity during the writing assessment corrections.

III – Selection Committee. The master's selection committee will be composed by 10 (ten) 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 one evaluation, summing up to 100 points.

a) Writing assessment, summing up to 100 points. The candidate who does not obtain at least 50 points in the exam will be automatically eliminated. This assessment will be held on **14th December 2015, from 13:00 to 17:00**, in room 124 and 126 in the Chemistry Department at UFMG. There is the possibility to perform the assessment in other cities, states or countries, if requested in the application form. The bibliography is indicated in the **Attachments** of these guidelines and in the program's website.

V – Final result. The final score will be granted according to the writing assessment. It will be considered approved the candidate who scores higher than 50% of the examination. 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 master program the approved and classified candidates respecting the limit of available vacancies. In the case of draw the following order will be used: undergraduated longer and, if the draw persists, the oldest.

The final result of the selection will be available on **11th January 2016 at 14:00** 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 writring 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 18th to 22nd January of 2016**. The candidate must also deliver the complete printed documentation (legible copies and without erasures) required for the application, in the program's secretary, **until the 27th January 2016.**

The DRCA will effectuate the enrollment after receiving the complete documentation and the online pre-registration form. The documentation must be sent to the DRCA by the program's secretary **until the 29th January 2016.**

The candidate who applied with a declaration proving his capability in concluding his undergraduation before the registration deadline must present an official document proving his undergraduate conclusion **until the 27th January 2016.**

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 Spanish language).

Foreign candidates must present to the program's secretary, **until the 27th January 2016,** 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 hisvacancy in the program. These vacancies will be filled by summoning other approved candidates strictly respecting the descending seguence of the scores, as described in item V. The summoned candidates must submit their required documents and pre-registration form until the 29th January 2016.

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.gui.ufmg.br/pg/.

The selected students must demonstrate knowledge of the English language within **12 months** counting from the date of first registration in the course. This requirement is in compliance with Resolution Nº 08/2008 of 14th October 2008 and the graduate program in chemistry resolution Nº 01/2015 of 27th March 2015, available at the website http://www.ppg.qui.ufmg.br. This proof of knowledge is required to continue the studies in the master's 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	MINUMUM 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) ou CAE (Cambridge Advanced English)	A, B ou 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 12 months, starting from the first register in the program.

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

Belo Horizonte, 26th October of 2015. Prof. Ângelo de Fátima - Coordinator of the Graduate Program in Chemistry at UFMG

ATTACHMENT

Writing Assessment Bibliography

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.

Bibliography
- 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.