UNIVERSITAS NEGERI YOGYAKARTA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF CHEMISTRY
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Bachelor of Science in Chemistry **MODULE HANDBOOK**

Module name:	Nuclear Chemistry
Module level, if applicable:	Undergraduate
Code:	KIM6214
Sub-heading, if applicable:	-
Classes, if applicable:	-
Semester:	6th
Module coordinator:	Prof. Dr. Endang Widjajanti, L. F. X.
Lecturer(s):	Sulistyani, M.Si.
Language:	Indonesia and English
Classification within the curriculum:	Compulsory Course
Teaching format / class hours per week during the semester:	100 minutes lectures, 120 structured activities and 120 individual study per week
Workload:	Total workload of the activity is 90,67 hours per semester which consists of 100 minutes lectures, 120 structured activities and 120 individual study per week for 16 weeks
Credit points:	2 SKS (3.28 ECTS)
Prerequisites course(s):	-
Course Outcomes	After taking this course, the students have ability to: After taking this course, the students are expected: CO1. Being able to show independent attitude and responsibility in carrying out structured and independent tasks. CO2. Able to explain the process of discovering radioactivity and the nature of radioactive rays. CO3. Able to describe experiments on the discovery of atomic nuclei and their natural properties. CO4. Able to explain the alpha, beta, and gamma decay processes, and calculate the rate of decay. CO5. Able to explain the working system of nuclear radiation detectors. CO6. Able to explain nuclear reactions and nuclear reactors. CO7. Able to analyze and predict the stability of an atomic nucleus. CO8. Able to rationalize the interaction of radiation beams when it comes to matter CO9. Able to do a search and describe the results of their study using their own language regarding the effects of nuclear radiation on the body. CO10. Able to trace and describe the results of their study using their own language regarding the use of radionuclides and safety of nuclear radiation.

<table>
<tr><td>Content:</td><td>This course discusses changes in nuclear structure due to the reaction in the nucleus (nuclear reaction). Nuclear reaction consists of 2 (two) types, namely nuclear decay (radioactivity) and reaction of nuclear bombardment. Lecture emphasizes the mastery of lecture material logically and scientifically and the ability to use scientific methods to solve problems faced by students.

The course consists of:
The Discovery of Radioactivity
Nuclear Structure and Its Characteristics
Stability of Nuclear
Qualitatively and Quantitatively Radioactivity
The Interaction of Radiation with Matter
Detection of Nuclear Radiation
Nuclear Reaction
Occupational safety against radiation</td></tr>
<tr><td>Study / exam achievements:</td><td>The final mark will be weight as follow:<table>
<tr><th>No</th><th>CO</th><th>Assessment Object</th><th>Assessment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>CO1, CO2, CO3, CO4, CO5, CO6, CO7, CO8, CO9, CO10.</td><td>Assignment
Quiz
Midterm Exam
Final Exam</td><td>Presentation / written test</td><td>20%
20%
30%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Handout, Board, LCD Projector, PPT slides, Laptop/Computer, Module.</td></tr>
<tr><td>Reference:</td><td>Handbooks
Walter DL, David JM and Glenn TS. (2017). Modern nuclear chemistry. 2^{nd} edition. USA: John Wiley & Sons Inc.
Jens Volker Kratz and Karl Heinrich Lieser. (2013). Nuclear and radiochemistry. 3^{nd} edition. Germany: Wiley VCH.
Gregory Choppin, Jan-Olov Liljenzin, Jan Rydberg and Christian Ekberg. (2013). Radiochemistry and nuclear chemistry. Elsevier: Academic Press.
Atilla Vértes et al., (2011). Handbook of nuclear chemistry. 2^{nd} edition. New York: Springer Science.
I Made Sukarna. (2005). Kimia inti. Yogyakarta: Jurusan Pendidikan Kimia FMIPA Universitas Negeri Yogyakarta.
Friedlander G, Kennedy JW, Macias ES, Miller JM. (1981). Nuclear and Radiochemistry. New York: John Wiley & Sons.</td></tr>
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	Journals • Eva Juranová et al., (2020). Sorption of anthropogenic radionuclides onto river sediments and suspended solids: Dependence on sediment composition. *J. Radioanal. Nucl. Chem.* **324**. 983-991. • Judith Salupeto-Dembo, Zsuzsanna Szabó-Krausz, Péter Völgyesi and Csaba Szabó. (2020). Radon and thoron radiation exposure of the angolan population living in adobe houses. *J. Radioanal. Nucl. Chem.* **325**. 271-282. • Masashi Kusakabe and Hyoe Takata. (2020). Temporal trends of ^{137}Cs concentration in seawaters and bottom sediments in coastal waters around Japan: implications for the *K*d concept in the dynamic marine environment. *J. Radioanal. Nucl. Chem.***323**. 567–580. • Tárkányi et al., (2020). Investigation of the deuteron induced nuclear reaction cross sections on lutetium up to 50 MeV: Review of production routes for ^{177}Lu, ^{175}Hf, and ^{172}Hf via charged particle activation. *J. Radioanal. Nucl. Chem.* **324**. 1405-1421. • Yuhi Satoh et al. (2019). Concentrations of iodine-129 in coastal surface sediments around spent nuclear fuel reprocessing plant at Rokkasho, Japan, during and after its test operation. *J. Radioanal. Nucl. Chem.* **322**. 2019-2024. • Zsolt Varga et al., (2019). Measurement of production date (age) of nanogram amount of uranium. *J. Radioanal. Nucl. Chem.* **322**. 1585-1591.

PLO and CO mapping

CO	PLO									
	Attitude	Generic Skills		Knowledge				Specific Skills		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
CO1		✓								
CO2					✓					
CO3					✓					
CO4					✓					
CO5					✓					
CO6					✓					
CO7								✓		
CO8								✓		
CO9								✓		
CO10								✓		