

Tribhuvan University
Institute of Science and Technology

Course Title: Basic Chemistry Practical I
Course No.: CHE 102 (major/minor)
Nature of the Course: Practical

Full Mark: 50
Pass Mark: 20
Year: I

Course Objectives:

- To make students aware of the importance of scientific methods of accurate experimental works about chemistry.
- To develop in students' abilities to perform experiments having due regard for safety.
- To develop in students skill of observation and their ability to record and interpret those observations.

Experiments on Inorganic Chemistry

Volumetric analysis: Volumetric analysis involving acidimetry and alkalimetry (combination of strong and weak acids and bases); Determination of total alkalinity and phenolphthalein alkalinity in a given sample of water, Permanganate titration (estimation of iron in Mohr's salt), Determination of calcium in calcium carbonate, Silver nitrate titration (determination of chloride content in a given sample of water), Iodometric titration (potassium dichromate and copper sulphate, determination of residual chlorine in a given sample of water). **27 hrs**

Inorganic Preparation: Sodium thiosulphate, Potassium dichromate, Ammonium ferric sulphate, Potash alum, Tetrammine copper sulphate, Prussian blue **33 hrs**

Experiments on Organic Chemistry

1. Thermometer calibration.
2. Purification of crude organic compounds.
3. Re-crystallization (acids, acetanilide, amides, benzoates, etc.).
4. Determination of melting point and mixed melting point.
5. Purification of liquid compounds by distillation.
6. Determination of boiling points (aniline, nitrobenzene, nitroaniline, etc.).
7. Isolation of steam volatile compounds.
8. Classification of organic compounds by solubility (water, ether, 5% HCl, 5% sodium hydroxide, 5% sodium bicarbonate, conc. H₂SO₄).
9. Identification of functional groups.

60 hrs

Experiments on Physical Chemistry

1. Determination of surface tension of liquid using Stalagmometer.
2. Determination of viscosity using Ostwald viscometer.
3. Preparation of standard buffer solution using sodium acetate and acetic acid and determine the pH of unknown solution using universal indicator.
4. Preparation of standard buffer solution using ammonium hydroxide and ammonium chloride and determine the pH of unknown solution using universal indicators.
5. Determination of heat of solution of potassium acetate.
6. To study the kinetics of acid catalysed hydrolysis of methyl acetate
7. To study the kinetics of reaction between potassium persulphate and iodine by iodine clock method.
8. Determination of molecular weight of organic compound by Rast method.

60 hrs

Text Books: for theoretical course CHEM 101

1. J. D. Lee, *Concise Inorganic Chemistry*, 5th Edition, John Wiley and sons, Inc., 2007.
2. F. A. Cotton, G. Wilkinson & C. Gaus, *Basic Inorganic Chemistry*, 3rd Edition, John Wiley & Sons (Asia), Pvt., Ltd., 2007.
3. D. F. Shriver & P. W. Atkins, *Inorganic Chemistry*, Oxford University Press.
4. R. T. Morrison & R. N. Boyd, *Organic Chemistry*, 6th and 7th Edition, Prentice- Hall of India Pvt., Ltd., 2008.
5. I. L. Finar, *Organic Chemistry*, Vol. I and Vol. II, Prentice Hall, London, 1955, (available recent edition).
6. Streitweiser & Heathcock, *Introductory Organic Chemistry*, Wiley and Sons, New York, 1981
7. J. March, *Advanced Organic Chemistry*, 4th Edition, Wiley Eastern Ltd., India, 2005.
8. N. D. Cheronis and J.B. Entrikin, *Identification of Organic Compounds*, A Student's Text using Semi-micro Techniques, John Wiley & Sons, Inc (Latest edition).
9. L. Shriner, R.C Fusion and D.Y Cartin, *The Systematic Identification of Organic Compounds*, A Hand Manual, John Wiley and Sons, Inc. New York (Latest).
10. S. H. Maron & C. Prutton, *Principles of Physical Chemistry*, 4th Edition, Oxford & IBH Pub.Co., 1992
11. P. Atkins & J. de Paula, *Elements of Physical Chemistry*, 5th Edition, Oxford University Press Inc., Printed in India by Saurabh Printers Pvt. Ltd., New Delhi, 2009.

Reference Books: for theoretical course CHEM 101

1. A. Sharpe, *Inorganic Chemistry*, 2nd Edition, ELBS & Longman, Singapore, 1986, (recent edition)
2. R. D. Madan & Satya Prakash, *Modern Inorganic Chemistry*, S. Chand & Company Ltd., 1994.
3. K. N. Upadhyaya, *A Text Book of Inorganic Chemistry*, 2nd Edition, Vikash Publishing House Pvt., Ltd., 1995
4. G. Marc Loudon, *Organic Chemistry*, Oxford University, 4th Edition
5. Lawry & Richardson, *Mechanism and Theory in Organic Chemistry*, Haper and Row, New York, 1981
6. C. Norman, *Principles of Organic Synthesis*, 2nd Edition, Chapman and Hill. London, 1978, (recent edition)
7. Warren, *Organic Synthesis; The Disconnection Approach*, Wiley, New York, 1982. (available recent edition)
8. House, *Modern Synthesis Reactions*, 2nd Edition, W. A. Benjamin. New York, 1972
9. R. M. Silverstein, G. L. Bassler & T. C. Morrill, *Spectrometric Identification of Organic Compounds*, Wiley, New York, 1981, (Preferably available recent edition)
10. C. Agrawal, *Modern Inorganic Chemistry*, Wiley Eastern, New Delhi, 1981 (available recent edition)
11. T.W. Graham Solomons, *Organic Chemistry*, (latest edition), John Wiley and Sons, New York.
12. R. A. Bansal, *A Textbook of Organic Chemistry*, 2nd Edition, Wiley Eastern Ltd., New Delhi, 1993 (available recent edition)
13. K. L. Kapoor, *Textbook of Physical Chemistry*, Macmillan India Ltd., Vol. I to Vol.V, 3rd edition, 2001
14. D. Alberty, *Physical Chemistry*, 6th Edition, Wiley Eastern Ltd., New Delhi, 1992
15. S. Glasstone & D. Lewis, *Elements of Physical Chemistry*, Mcmillan & Co., Ltd.
16. S. Negi & S. C. Anand, *A Text Book of Physical Chemistry*, Wiley Eastern Ltd., 1991
17. S. Bahl, G. D. Tuli & A. Bhal, *Essential of Physical Chemistry*, 24th Edition, S. Chand & Co. 2000.
18. M. K. Sthapit & R. R. Pradhananga, *A Textbook of Physical Chemistry*, Taleju Prakashan, Nepal, 2007.
19. S. D. Gautam, M. K. Prasad & D. P. Bhattarai, *Fundamental Chemistry*, 1st Edition, Heritage Publishers and Distributors Pvt. Ltd., Nepal, 2013
20. M. L. Sharma & P. N. Chaudhary, *A Textbook of B. Sc. Chemistry (Vol. I & II)*, 2nd Edition, Ekta Books Nepal, 2007.
21. A. K. Bhagi & G. R. Chatwal, *Bioinorganic and Supramolecular Chemistry*, Himalaya Publishing House, Mumbai.
22. A. K. Bhagi & G. R. Chatwal, *Environmental Chemistry*, Himalaya Publishing House, Mumbai.

23. M. R. Pokhrel & B. R. Poudel, *A Textbook of Inorganic Chemistry*, National Book Centre, Bhotahity, Kathmandu, 2011.
24. James E. Huheey, Ellen A. Keiter & Richard L. Keiter, *Inorganic Chemistry: Principles of Structure and Reactivity*, Addison Wesley Publishing House.

Text Books: for practical courses CHEM 102

1. A. I. Vogel, *A Text Book of Quantitative Inorganic Analysis*, Including Elementary Instrumental Analysis, ELBS & Longman, 1969, (Preferably available recent edition).
2. A. I. Vogel, *A Text Book of Qualitative Inorganic Analysis*, ELBS & Longman, 1969, (recent edition).
3. K. N. Ghimire, M. R. Pokhrel & K. P. Bohara, *University Experimental Inorganic Chemistry*, Quest Publication, Kirtipur, Kathmandu, 2008.
4. R. L. Shriner, R. C. Fuson & D. Y. Curtin, *The Systematic Identification of Organic Compounds, A Laboratory Manual*, John Wiley and Sons, Inc. New York, 1986. (Preferably available recent edition).
5. Moti Kaji Sthapit & R. R. Pradhananga, *Experimental Physical Chemistry*, Taleju Prakasan, Kathmandu, 1998.
6. N. M. Khadka, S. D. Gautam & P. N. Yadav, *A Core Experimental Chemistry for B.Sc.*, Heritage Publication, Kathmandu, 2016.

Reference Books: for practical course CHEM 102

1. Gurdeep Raj, *Advanced Practical Inorganic*, 10th Edition, Goel Publishing House, Meerut, 1994.
2. A. I. Vogel, *A Text Book of Practical Organic Chemistry*, Including Qualitative Organic Analysis, Longmans, 1958, (Preferably available recent edition)
3. F. G. Mann & B. C. Saunders, *Practical Organic Chemistry*, Orient Longman, 1986, (recent edition).
4. B. D. Khosla, A. Guali & V. C. Garg, *Senior Practical Physical Chemistry*, 5th Edition, R. Chand & Co., New Delhi, 1987.
5. J. N. Gurtu & A. Gurtu, *Advanced Physical Chemistry Experiments*, 4th Edition, Pragati Prakashan, 2008.
6. S. K. L. Karna, *Chemistry Practical for B. Sc.*, Subharambha Publication, Kathmandu, 2013.
7. S. C. Rastogi & S. K. Agrawal, *Advanced Inorganic Analysis*.
8. S. K. Agrawal and Keemti Lal, *Advanced Inorganic Chemistry*, Pragati Prakasan, Meerut.
9. A. K. De, *Environmental Chemistry*, New age International Ltd. Publishers, New Delhi.