

Course 2: Refresher Courses on IKS based Chemistry and Metallurgy

1 Theoretical framework for the practice of science in ancient India (12 lectures):

- *Sāṅkhya-Pātañjala* system: (*Prakṛti* – The original constituents and their interactions; conservation of energy and transformation of energy; the doctrine of causation; principle of collocation, storing and liberation of energy; dissipation of energy and mass and their dissolution into formless *prakṛti*, the evolution of matter; the evolution of infra atomic unit; chemical analysis and synthesis; elements and compounds).
 - Evolution of different forms of matter (*Pañcīkaraṇa*) from the *Vedāntic* view.
 - The atomic theory of the Buddhists and Jains.
 - *Nyāya-Vaiśeṣika* chemical theory: theory of atomic combinations; chemical combinations, mono and hetero *bhautika* compounds, theory of dynamic contact (*Viśṭambha*), chemical action and heat, three axes of *Vācaspati* (graphical representation of the constitution of a bi-*bhautika* compound), conception of molecular motion (*parispanda*)
- 2 Chemistry in practice as gleaned from the medical schools of ancient India (4 lectures):
- Physical characteristics of the *Bhūtas*, The *Mahābhūtās*, mechanical mixtures.
- 3 Qualities of compounds; formation of molecular properties in chemical compounds. (5 lectures)
- 4 Chemistry of colors, measures of weight and capacity, size of the minimum visible. (2 lectures)
- 5 Ideas of chemistry as in *bṛhatsamhitā*: making of *vajrālepa/vajrasamghāta; gamdhayukti*. (2 lectures)
- 6 Metallurgical heritage (12 lectures):
- *Arthaśāstra* as the earliest text describing gold, silver and other metals;
 - Processing of gold, silver, copper, iron, tin, mercury and lead as mentioned in the Indian texts in the ancient and Medieval period
 - *Bhasma*; A nano-medicine of ancient India
- 7 Zinc distillation as mentioned in *Rasārṇava* and *Rasaratnasamukāyā*. (4 lectures)
- 8 Concepts of acid and bases in Indian chemistry from organic fruit, vegetable based. Acids, plant-ash based bases to mineral acids of the medieval period. (4 lectures)

Reference Materials:

- 1 The Positive Sciences of the Ancient Hindus; Brijendra Nath Seal; 4th Edition; 2016
- 2 Fine Arts & Technical Sciences in Ancient India with special reference to Someśvara's *Mānasollāsa*; Dr. Shiv Shekhar Mishra, Krishnadas Academy, Varanasi 1982
- 3 Mints and Minting in India; Upendra Thakur; Chowkhanba Publication; 1972
- 4 A Concise History of Science in India, ed. D M Bose, S N Sen and B V Subbarayappa; INSA; 2009
- 5 Science and Technology in Medieval India - A Bibliography of Source Materials in Sanskrit, Arabic and Persian by A Rahman, M A Alvi, S A Khan Ghorī and K V Samba Murthy; 1982.
- 6 Science and Technological Exchanges between India and Soviet Central Asia (Medieval

- Period), ed B V Subbarayappa;1985
- 7 Scientific and Technical Education in India, 1781-1900 by S N Sen; 1991
 - 8 History of Technology in India , Vol. I, ed. A K Bag (1997); Vol III, ed. K V Mital (2001); Vol-II by Harbans Mukhia (2012).