

Due to change in subject been taught there is slight change in schedule of courses. ~~for~~ for P.G. (e-notes uploading)

Monday

M.Sc. (Sem I)

CC-II

Physical Chemistry

Tuesday

M.Sc. (Sem II)

CC-III

Physical Chemistry

Wednesday

M.Sc. (Sem III)

CC-IV

Advances in Chemistry

Thursday

M.Sc. (Sem IV)

EC-1b Physical Chemistry

Friday

M.Sc. (Sem III)

CCX Application of Spectroscopy

Saturday

M.Sc. (Sem III)

CC-XIII Bio-organic Chemistry

AECC-2 will be uploaded in between.

Radiochemical Principles in the use of tracers:-

The use of stable or radio-isotope as tracers to follow the course of reaction such as physical, chemical or biological is based on the assumption that isotopes behave as an element in an identical manner i.e. isotope effects are absent.

However, these assumptions are not correct kinetically as well as thermodynamically as there is difference in the rate of reaction as well as equilibrium constants due to difference in masses, even though very slight. This effect is very small upto oxygen but certainly noticeable for many heavier elements.

The following points must be taken care of for using radioisotopes as tracers:-

- 1) The tracer isotopic molecule and the stable one should be in the same chemical form, as sometimes isotopes in molecules of different chemicals may not exchange rapidly.
- 2) If more than one radioisotope is available, the one to be chosen for labelling should have a convenient half-life and the energy of the radiations emitted should be such that it permits easy measurements ∴ eg. ^{24}Na ($T = 15\text{h}$) is recommended for biological experiments, as it would be completely eliminated by decay in about four days while ^{22}Na ($T = 2.6\text{y}$).

Applications of Radioactivity

- If in a reaction, the radioisotope of a substance taking part in reaction is added in very small amount for the same element, the two isotopes function identically participating in every stage of reaction in exact same way and proportion. The only difference will be seen in the emission of signal of labelled reactant.
- One can monitor the movements of the reactant atom along with the different intermediates stages to the end products.
- A deeper insight into the complex reactions which otherwise would have been missed, has become possible by use of radioisotopes as tracers.
- There are large number of applications of these techniques such as research, industry, medicine and agriculture.
- Some of the use of these techniques can be done as follows.

More widely used radioisotopes:-

There are around 50 or more widely used isotopes which can be labelled as ^3H , ^{14}C , ^{22}Na , ^{31}Si , ^{32}P , ^{35}S , ^{36}Cl , ^{40}K , ^{45}Ca etc.

3) The total amount of the radioisotopes should be just enough to provide measurable signals. Large excess should be avoided as otherwise the systems under study may get chemically damaged by self-irradiation, as in the case of sensitive biochemicals besides increasing the health hazards to the worker.

Typical Applications of Radioisotopes as tracers:-

Common radioisotopes used for tracers are:-
 ^2H , ^{13}C , ^{15}N , ^{18}O .

→ monitoring is done by mass spectrometry.

These are following applications:-

- 1) chemical-investigations
- 2) Physico-chemical investigations.
- 3) Analytical
- 4) Determination of age.
- 5) Medical applications
- 6) Agricultural applications
- 7) Prospecting of natural resources
- 8) Industrial applications.