Mechanisms of Cyclin Action
- cyclins are a family of regulatory proteins that control the progression of the cell cycle
- cyclins activate cyclin dependent kinases (CDKs), which control cell cycle processes through phosphorylation
- the phosphorylated target protein will trigger some specific event within the cell cell cycle
    - e.g. centrosome duplication
- after the event has occurred, the cyclin is degraded and the CDK is rendered inactive again

Cyclin Expression Patterns
- cyclin concentrations need to be tightly regulated in order to ensure the cell cycle progresses in a proper sequence
    - different cyclins specifically bind to, and activate, different classes of cyclin dependent kinases
    - cyclin levels will peak when their target protein is required for function and remain at lower levels at all other times

Cancer Development
- tumors are abnormal cell growths resulting from uncontrolled cell division and can occur in any tissue or organ
    - disease caused by the growth of tumors are collectively known as cancers

Mutagens
- mutagen is an agent that changes the genetic material of an organism (either acts on the DNA or the replicative machinery)
- mutagens may be physical, chemical or biological in origin:
    - physical: sources of radiation, including x-rays (ionizing), ultraviolet (UV) light and radioactive decay
    - chemical: DNA interacting substance including reactive oxygen species (ROS) and metals
        - e.g. arsenic
    - biological: viruses, certain bacteria and mobile genetic elements
        - transposons
- mutagens that lead to the formation of cancer are further classified as carcinogens

Oncogenes
- an oncogene is a gene that has the potential to cause cancer
- most cancers are caused by mutations to two basic classes of genes - photo-oncogenes and tumor suppressor genes
    - proto-oncogenes code for proteins that stimulate the cell cycle and promote cell growth and proliferation
    - tumor suppressor genes code for proteins that repress cell cycle profession and promote apoptosis
- when a porto-oncogene is mutated or subjected to increased expression it becomes a cancer-causing oncogene
- tumor suppressor genes are sometimes referred to as anti-oncogenes, as their normal function prevents cancer

Relationship between Proto-Oncogenes and Tumor Suppressor Genes