

Concept Category	Key Concepts ^{1,2}	Activities
Process of Science	<ul style="list-style-type: none"> • Demonstrate safe laboratory procedures and behavior • Perform experiments using the scientific method • Demonstrate scientific literacy • Demonstrate ethical, responsible, co-operative behavior • Describe the relationship between scientific principles and technology 	<ol style="list-style-type: none"> 1. Graduate student instructors discuss their own research projects/interests 2. Orientation to building 3. Safety and rules 5. Students extract DNA from cheek cells 6. Students recognize a DNA precipitate 8. Michael Smith - Nobel laureate quiz 16. Students write questions about university life or careers in science that graduate student instructors answer
Nature of Genetic Material; Reproduction	<ul style="list-style-type: none"> • DNA is the genetic material for all living organisms. • Genes are segments of DNA that encode information critical for development. DNA is organized into structures called chromosomes. • Identify chromosomes, nucleotides, base pairs, sugar-phosphate backbone, double helix, centromere, nucleus, cell membrane, nuclear membrane. • The genome is all the genetic information within an organism. • The amount of genetic information within an organism is not a product of size or complexity. • Genome sequencing involves producing and organizing short overlapping DNA sequences. • Humans receive half their genetic information from each parent through the processes of replication, meiosis and fertilization. • Relate the processes of cell division and emerging reproductive technologies to embryonic development. 	<ol style="list-style-type: none"> 4. Presentation/ Discuss components of DNA and DNA extraction 5. Students extract DNA from cheek cells 6. Students recognize a DNA precipitate 7. Students label DNA drawing and list reagents used in DNA extraction 9. Students perform online searches to define genome, sequencing and the Human Genome Project (HGP) 10. Class discuss answers to HGP definitions 11. Students watch video about the HGP 12. As groups of 4-6, students race to put in order overlapping short DNA sequences 17. Watch video that introduces controversies within the field of human genomics 18. Students read thru personal genomics controversies worksheet 19. Answer personal genomics questions in groups 4-6. 20. Students watch video regarding human reproduction (pre-implantation diagnosis) 21. Read through hand out and discuss pre-implantation diagnosis questions in small groups
Gene Expression and Regulation	<ul style="list-style-type: none"> • Genes exist in different forms called alleles. • The expression of genetic information generally flows from DNA to RNA to protein. This occurs through transcription of DNA into RNA and translation of mRNA into protein. • Virtually all cells within a human body contain the same genetic information. • For traits primarily influenced by single genes, certain combinations of alleles lead to predictable patterns of inheritance. Other more complex traits involve the influence of multiple genes. • The functions of genes and their products can be affected by the environment and other genes at one or many steps involved in producing a trait. 	<ol style="list-style-type: none"> 9. Students perform online searches to define genome, sequencing and the HGP 10. Class discuss answers to HGP definitions 11. Students watch video about the HGP 12. As groups of 4-6, students race to put in order overlapping short DNA sequences 13. Class discuss and watch video about transcription and translation 14. Students transcribe and translate the short DNA sequence. 15. Presentation and questions regarding the role of environment and genotype of phenotype

Key Concepts adapted from:

¹ B.C. Ministry of Education. Grade 9 Curriculum Package, online. www.bced.gov.bc.ca/irp [April 11, 2012]

² Dougherty M, Pleasants C, Solow L, Wong A, et al. (2011) A Comprehensive analysis of High School Genetics Standards: Are States Keeping Pace with Modern Genetics? CBE- Life Sciences Education (10): 318-327.