



SCOPE & SEQUENCE
GR. 12 – BIOLOGY 30

Student Task
GRADE 12: Biology 30**UNIT 4: Change in Populations and Communities****TASK: Study of Hardy-Weinberg Equilibrium**

PRODUCTIVITY TOOL: Internet Research, Simulations, Word Processor and Spreadsheet

TIMELINE: 1-2 Classes

LEVEL OF DIFFICULTY: ☺☺

Communities are made up of populations that consist of pools of genes from the individuals of a species. Students will use the resources listed to meet the knowledge, skills and STS connections requirements related to the concept.

RECOMMENDED RESOURCES:

- ☞ Ritter, Bob et al. *Nelson Biology*. Scarborough, ON: Nelson Canada, 199?, pages 560 to 563.
- ☞ Galbraith, Don et al. *Biology Directions Manual: Investigations & Issues*. Toronto, ON: John Wiley & Sons Canada Limited, 1993, Activity 8-1.
- ☞ The Science Teacher
- ☞ Hardy-Weinberg Equilibrium Model
http://daphne.palomar.edu/synthetic/synth_2.htm
- ☞ Population Genetics
<http://infolanka.com/org/genetics/guide-bmg/bmg-ch1309.htm> (general notes)
- ☞ VCCS Courseware Project Page
<http://164.106.153.50/vccs-biology-courseware/objectives/objevolution.htm> (notes, quizzes)
- ☞ Notes for Lecture #4 – Population Genetics, HW
<http://nitro.biosci.arizona.edu/courses/EEB182/Lecture04/lect4.html> (notes)
- ☞ Lecture 4 – Population Genetics and Microevolution
http://fig.cox.miami.edu/Faculty/Tom/bil160/04_notes.html
- ☞ Population and Evolutionary Genetics
<http://www.cc.ndsu.nodak.edu/instruct/mcclean/plsc431/popgen/popgen4.htm> (lots of good notes and examples, starting at popgen1)
- ☞ Exercise for Hardy-Weinberg Simulator
<http://jsd.claremont.edu/bio/bio44/HARDY-W.html>


ICT Outcomes
The learner will:

- C1** 4.2 select information from appropriate sources, including primary and secondary sources
- C2** 4.1 consult a variety of sources that reflect varied viewpoints on particular topics
- C6** 4.1 investigate and solve problems of prediction, calculation and inference
4.2 investigate and solve problems of organization and manipulation of information
- F1** 4.1 assess the strengths and weaknesses of computer simulations in relation to real-world problems
4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments
- P2** 4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets









Curriculum Outcomes

GRADE 12: Biology 30



TASK: Study of Hardy-Weinberg Equilibrium

Knowledge Objectives, Concept 1, Bullets 2-5


Students should be able to:

-  describe the Hardy-Weinberg principle and explain its importance to population gene pool stability and the significance of non-equilibrium values; e.g. evolution of a population
-  describe the conditions that cause the gene pool diversity to change e.g. random genetic drift, gene migration, differential reproduction
-  apply, quantitatively, the Hardy-Weinberg principle to observed and published data
-  describe the molecular basis and significance of gene pool change over time; i.e. mutations

Skills Objectives, Concept 1, Bullets 1-2

-  calculate and interpret problem-solving exercises involving the Hardy-Weinberg principle expressed as $p^2 + 2pq + q^2 = 1$
-  perform experiments and/or computer simulations to demonstrate population growth and gene pool change

Science, Technology and Society (STS), Concept 1, Bullet 4

-  assess the role and importance of models in science to explain observable phenomena; e.g. the Hardy-Weinberg principle



Hardy-Weinberg Equilibrium Model

Student Task:

1. Define the Hardy-Weinberg principle.
2. Define evolution.
(Use *Hardy-Weinberg Equilibrium Model*. http://daphne.palomar.edu/synthetic/synth_2.htm.)
3. Identify the following variables and their relationships. (Use the Biology 30 data sheet and *Hardy-Weinberg Equilibrium Model*. http://daphne.palomar.edu/synthetic/synth_2.htm.)
 - a) p
 - b) q
 - c) p^2
 - d) $2pq$
 - e) q^2
4. List SEVEN conditions under which no change will occur in a gene pool.
(Use *Hardy-Weinberg Equilibrium Model*. http://daphne.palomar.edu/synthetic/synth_2.htm.)
5. Describe FOUR factors that bring about evolutionary change. (Use *Nelson Biology and Population and Evolutionary Genetics*
<http://www.cc.ndsu.nodak.edu/instruct/mcclean/plsc431/popgen/popgen4.htm>.)
6. Use a spreadsheet program to do Investigation C of Activity 8-1, The Hardy-Weinberg Equilibrium.
7. Work through the Hardy-Weinberg Simulator using the guidelines in the *Exercise for Hardy-Weinberg Simulator* <http://jsd.claremont.edu/bio/bio44/HARDY-W.html>.

