

Lab Six: Cell Division and Cancer Research Project

Pre-Lab: none (usual 8 pts. will be rolled into In-Lab)

Procedures: *Work in pairs - NO LARGER GROUPS! Complete in order.*

Model Revisions For All Building Exercises

Two large chromosomes - use 10 red beads for one and 10 orange beads for the other

Two small chromosomes - use 6 blue beads for one and 6 blue beads for the other

Centromere - 1 white bead with 4 holes per chromosome

Centrioles - wooden spools will be provided to model these

Individual Genes - labels or small piece of tape for crossing over modeling (7.4)

Microtubules - yarn, which can be taped to centriole and centromere

Use chalk to draw other parts - e.g. cell membrane, nuclear membrane

Colored pencils will be provided so you can accurately represent your drawings

Complete 7.1A

Use supplies above to model the following cell cycle phases using your cell with 4 total chromosomes (2 homologous pairs): G1, S, G2; have your instructor check your G2 cell

Confer with instructor as needed; remember - model building is designed to help you master mitosis/meiosis for your exam. Take notes/draw pictures/make flashcards as needed to HELP YOURSELF!

Complete 7.2B

Use supplies above to model mitosis; have your instructor check your final product(s).

Complete 7.2

Remember - this is an onion root tip. How do you know this is mitosis, not meiosis?

Capturing images using your the digital microscope:

Turn on the microscope and camera - green AND red switches (back of scope)

Make sure metal pull-bar on right/upper part of scope is pulled all the way out

Double-click on "Motic Images Plus 2.0" program icon - desktop of computer

Activate camera by selecting File/Capture Still Image - image of live feed should come up

Adjust as suggested above, always using computer screen to assess focus

Once satisfied, click "capture" - a new image icon will appear to the right (a .sfc file)

To edit image, double click .sfc file and - when satisfied - File/Save As .jpg (to desktop)

Make sure you record the magnification at which you shoot each image

Photograph the following phases: interphase, prophase, metaphase, anaphase, and telophase. You may take more than 1 picture if necessary. HAND-LABEL final images!

Complete 7.4

Use supplies above to model meiosis I and II, including crossing over as indicated in manual; have your instructor check your final product(s) for both meiosis I and II.

Video and Cancer Research Homework Assignment

During the last 30-60 minutes, you will watch all or a portion of a video about the genetics of cancer (Suzuki's "Secret of Life" - Conquering Cancer section). Each person will then select a cancer gene of interest and be expected to complete a moderately involved research homework assignment about this topic, due in 2 weeks.

Lab Six: Cell Division In-Lab Problems - PAIR Worksheet (9 pts)

Please complete by hand. Due in lab next week as usual.

Pair Member Names:

(1) 3 pts. Summarize and draw the major events of the cell cycle using the lab model cell, including the correct chromosome colors (use provided colored pencils):

Cell Cycle Phase	Brief Description	Model Cell Drawing
G1		
S		
G2		

(2) 1.5 pt. Draw product(s) of MITOSIS using lab model cell, including chromosome colors.

(3) 1.5 pt. Draw all possible product(s) of MEIOSIS using lab model cell, including chromosome colors and showing gene letters in all cases.

(4) 3 pts. Attach your labeled print-outs of the onion root tip exercise.

Lab Six: Individual Cancer Research Homework Assignment

Scientists use many levels of publications to present and communicate their work. Review Manual section 1.5 about the importance of communication and peer-review evaluation in the scientific method. In this exercise, you will use both the internet and the WOU Library to research, locate, read, and summarize several levels of scientific publications - emphasizing cancer, which involves a loss of cell cycle control.

Focus on the GENETICS of Cancer

The best way to truly approach cancer is to understand its GENETIC basis. Thus, in your search for publications, you need to focus on 1 kind of cancer AND look for specific information about a contributing gene. Here is a list of the best-understood cancers (from a genetic standpoint) to get you started. It was obtained from the NIH (National Institutes of Health) website called "Genes and Disease." You should read the assignment/essay questions carefully before choosing your target cancer and gene.

Kind of Cancer	Some Understood Contributing Gene(s)
Breast and Ovarian	BRCA1, BRCA2
Burkitt Lymphoma	Myc* (associated with many other kinds of cancer)
Colon	MSH2, MSH6, MLH1
Chronic Myeloid Leukemia	BCR, ABL
Skin/Malignant Melanoma	CDKN2
Multiple Endocrine Neoplasia	MEN1
Neurofibromatosis	NF2
Pancreatic	DPC4
Polycystic Kidney Disease	PKD1
Prostate	HPC1 (some forms)
Retinoblastoma	Rb
Tuberous sclerosis	TSC1, TSC2
Von Hippel-Lindau Syndrome	VLH
MANY kinds of cancer	p53, Ras

You probably will find other examples of genes. Be wary about choosing a different kind of cancer unless you can demonstrate it is linked to a specific gene with a known cell function - although researching the genes like p53 or Ras may lead you to interesting cancers not on this list. Be adventurous and interested in whatever you choose! If in doubt, email or talk with your instructor - NOT at the last minute (i.e. within 48 hours of the due-date).

Heirarchy of Publications:

(1) Primary research article - a technical and detailed firsthand account of research experiments; should have obvious background/introduction, methods, results, and discussion. These are always evaluated by scientists in the field.

(2) Review article - a technical assimilation of many research findings; typically have big-picture/concept figures but are not divided into specific sections above (intro, methods, results...). These are always evaluated by scientists in the field.

(3) Textbook - well-supported/accepted concepts that have been supported by many primary and review articles; still fairly technical but moving into the area of "popular press." These are reviewed by other science professionals, although sometimes not in the exact same field, and sometimes not research scientists.

(4) Popular Press - relatively non-technical presentations of science, both in journals and on-line; although many represent well-supported concepts, sometimes they don't (which can create conflicts in the peer-review process). Many are not reviewed by other scientists.

Resources at WOU Library

Some Useful Technical Journals - Primary and Review Resources

Science, Nature, New England Journal of Medicine (NEJM), Journal of the American Medical Association (JAMA), Proceedings of the National Academy of Sciences (PNAS), Journal of Cell Biology

Some Useful Non-Technical - Popular Press Resources

Scientific American, Discovery, Natural History Magazine, National Geographic, New York Times, New Yorker, Time, Newsweek, NCBI Website, NCI Website

Your INDIVIDUAL Assignment - 15 pts. Due at Your Lab in TWO WEEKS!

(1) Read your text presentation of cancer (p. 228-9 and p. 368-372). Visit the NIH/Genes and Disease Website. Use this information to choose a target cancer and gene.

(2) Locate a POPULAR PRESS article (a reputable magazine or major newspaper - NOT an on-line website) about this cancer. Photocopy and read. Turn in just the cover page of this article with your essay.

(3) Locate a PRIMARY RESEARCH and REVIEW article about this cancer. The PRIMARY article, minimally, must describe a specific contributing gene. Photocopy both of these articles and read, beginning with the review. Do not expect to understand everything. Turn in just the cover pages of each of these articles with your essay.

(4) Complete the following essay questions, limiting your total answers to 3 total pages, double-spaced and word-processed. Make it clear which question you are answering - i.e. label parts (a), (b), and (c). REMEMBER to put things in your own words and be succinct; poorly used technical language does not impress your professors - neither does too much information. If you quote articles directly, use quotations and make it clear exactly where the statements are from.

(a) 4 pts. Briefly describe this kind of cancer: its pathology, mortality, incidence in the US (and worldwide, if known), and most widely-used treatment (if available).

(b) 4 pts. Compare and contrast the kinds of information you obtained from the popular press article vs. the review article vs. the primary research paper: provide 2 examples of similar things about both kinds of articles and 2 unique examples from each article.

(c) 4 pts. Carefully explain what is known about the specific gene you selected: Which chromosome is it located on? What is its normal function in the cell? How does screwing up this gene likely contribute to cancer? How, specifically, did the primary research paper provide new information about this gene?

(d) 3 pts. STAPLE just the cover pages of your popular press article, your review, and your primary article to your essay above.