

**Guidelines for preparation and evaluation of assignments for
PHGY 550 course
Molecular Physiology of Bone
2017**

Summaries:

Each student will prepare a one page summary for each discussion session. The summary should answer the question “In your opinion, which set of experimental data is most critical to support the conclusion of the study”. The following format should be adhered to:

Maximum length: 1 page,

Minimum font size: 12 point

Margins of ¾" (2 cm) around entire document

Spacing: 1.5-spaced.

Header must contain student’s name, ID number, and the date of the discussion session.

The summary should contain the following information:

1. Authors, Title, publication details for the scientific article
2. Objective of the study
3. Description of, in your estimation, the critical experiment or data set that supports the main study conclusion
4. Justification of the critical nature of this experiment or data set in supporting the conclusion of the study

Summaries are to be given to the instructor in the end of the corresponding discussion session – no extensions will be granted unless a doctor’s note is provided. Summaries will be evaluated on a 0-100% scale using the criteria described below. In each category partial mark can be given, so that the summary that is better than satisfactory but does not reach excellence can be given a mark between 5 and 8, for example 6.5. If all the formatting instructions are respected, the final mark would be (6.5+2)/10 or 85%. The average of all summary marks will determine 30% of student’s final grade.

Criteria	excellent	satisfactory	unacceptable
Content/analysis	Student demonstrates clear understanding of the paper’s objective, correctly describes the experimental setup and rationally justifies the critical role of the experiment in supporting the conclusions of the study 80	Student demonstrates general understanding of the paper’s objective, describes the relevant experiment, and provides some justification for its importance for the study. 50	Student does not understand the objective of the paper, describes the experiment incorrectly chooses the experiment not critical for the study, or fails to justify it’s importance 0
Organization/formatting	All formatting and organization requirements are respected 20	All formatting requirements are respected, some organization elements are not identified 10	The summary is less than ½ page or more than 1 page, the font is too small or too big, Structural elements are missing 0

Presentations:

Each student will participate in the presentation of 2 papers during the discussion sessions. In general, one paper will be divided between 2-4 students. Each of the presenters is expected to carefully read the paper, understand the relevant background and methodology, and participate in critical discussion of any part of the paper. The presentations are expected

1. To provide a specific introduction that covers salient features relevant to the study,
2. To use simple, clear slides that highlight major points,
3. To provide brief descriptions of each method used for each of the shown figures. The description could be verbal for common methods, or more detailed for newer methodologies
4. To summarize the significance of each figure for reaching the conclusion of the paper,
5. To summarize and discuss the conclusions drawn from the study

In preparation for the critical discussion of the paper the presenting students should think about the limitations of the study, additional or different experiment that may improve the certainty of the conclusions, or alternative explanations for the results. Even if the presenter finds the question which he/she is unable to answer, it is important to bring it to the discussion.

Presentations will be evaluated on a 0-100% scale using the criteria described below. The average of all presentation marks will determine 25% of student's final grade.

Criteria	excellent	good	satisfactory	unacceptable
Content	Student understands paper objective, provides extended background that significantly improves article understanding by the group, provides clear, logical description of the study 60	Student understands paper objective, provides sufficient background for article understanding by the group, provides logical description of the study 53	Student shows general understanding of paper objective, provides some background for article understanding by the group, provides description of the study 45	Student does not understand the objective of the paper, and/or the logic of the study 0
Critical analysis	Student identifies important discussion question or finds the answer for a question that required serious creative thought 30	Student raises important discussion question and contributes to the discussion aimed at finding the answer 20	Students contributes to discussion moderated by the instructor 10	Students is unable to contribute to discussion moderated by the instructor 0
Organization/ Style	Presentation is well-organized, slides are clear, readable, logical 10	The presentation is well-organized, slides are clear, readable 7	The presentation is organized, slides are clear, some problems are noted but were considered minor 5	Slides are badly-organized, unclear, barely readable, illogical 0

Essays:

Students will write 3 essays on selected topics. The objective of these papers is to synthesize the knowledge gained from lectures, readings and discussion and to use it to formulate an original hypothesis and suggest an experimental approach to test it. Originality of the hypothesis and suitability of the methods to answer the proposed questions are the main criteria in evaluation of your essays. The following format should be adhered to:

Maximum length: 5 pages

Minimum font size: 12 point

Margins of ¾" (2 cm) around entire document

Spacing: 2-spaced.

The essay should contain the following information:

1. Student name, student ID number, evaluator name, date and title of the essay. Do not use a separate title page.

2. Each essay should contain five sub-sections clearly separated by the subheadings:

1) Introduction (review existing knowledge essential for formulation of hypothesis) - generally ¾ of a page.

2) Hypothesis (clearly formulate in 1-2 sentences).

3) Suggested experimental approach (explain the strategy to test the hypothesis, anticipate potential pitfalls/problems and suggest different complementary experimental approaches, consider appropriate controls and discuss alternative outcomes), 2 – 3 pages.

4) Significance (describe anticipated results and consider the importance of knowledge gained from your study).

5) References (no more than 10).

Essays are to be given to Ms. Rosetta Vasile, Department of Physiology, Room 1021, McIntyre Bldg, by 3.00 PM on the corresponding deadline date – no extensions will be granted unless a doctor's note is provided.

Essays will be evaluated on a 0-100% scale using the criteria described below. The average of all essay marks will determine 40% of final grade.

Criteria	Excellent	Good	Satisfactory	Unacceptable
Hypothesis	Original, unambiguous hypothesis 15	Original hypothesis, somewhat broad 11	Interesting hypothesis, but has been tested before in limited number of studies 7	Hypothesis is obscure, or the answer represents general knowledge 0
Content	Logical experiments are suggested, alternative outcomes are considered/ discussed and appropriate controls are suggested	Logical experiments are suggested; however, some controls are missing, or some alternative outcomes are not discussed	Suggested experiments may provide relevant information, some controls are missing, alternative outcomes are not discussed	Suggested experiments will not address the question, controls are not included - as a result, the suggested methodology will not provide

	60	50	40	evidence for the hypothesis 0
Support	Introduction demonstrates excellent knowledge of the field, the student is able to place his study within broader content, referencing is accurate 15	Introduction demonstrates good knowledge of the field, the student is able to place his study within broader content, referencing is accurate 12	Introduction demonstrates some knowledge of the field, the student attempts to place his study within broader content, referencing is accurate 8	Introduction demonstrates limited knowledge of the field, the student is not able to place his study within broader content, referencing is inaccurate 0
Style	All structural elements are present; text within the sections is logically divided into paragraphs, Good flow of ideas. All formatting requirements are respected 10	All structural elements are present but not all are identified; Text is logical, good flow of ideas, occasional repetitions. All formatting requirements are respected 7	Structural elements are present but poorly identified, the text is hard to follow. All formatting requirements are respected 5	Main structural element is missing (such as Introduction), the text is hard to follow. The length is less than 2.5 or more than 5 pages. Formatting requirements are not respected 0

PHGY 550
2017
Molecular Physiology of Bone (3 credit course)
SCHEDULE - LECTURES AND DISCUSSIONS
Location: Room 1101 McIntyre Medical Bldg.

LECTURE 1 Dr. Monzur Murshed	September 5 Tuesday 8:35-9:25 AM	Introduction to bone cells, their differentiation and function
	Review article:	Biology of bone and how it orchestrates the form and function of the skeleton. Sommerfeldt DW, Rubin CT. Eur Spine J. 2001 Oct;10 Suppl 2:S86-95. Transcriptional control of skeletogenesis. Karsenty G. Annu Rev Genomics Hum Genet. 2008;9:183-96.
DISCUSSION 1	September 11 Monday 9:00-10:25 AM	Smpd3 Expression in both Chondrocytes and Osteoblasts Is Required for Normal Endochondral Bone Development. Li J, Manickam G, Ray S, Oh CD, Yasuda H, Moffatt P, Murshed M. Mol Cell Biol. 2016 Aug 12;36(17):2282-99.

INFO SESSION	September 11 Monday 8:35-9:00 AM	Course essays – requirements, evaluation criteria etc.
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LECTURE 2 Dr. Kerstin Tiedemann	September 12 Tuesday 8:35-9:25 AM	Osteoclast differentiation, function and signaling
	Review article:	Osteoclast differentiation and activation. Boyle WJ, Simonet WS, Lacey DL. Nature. 2003 May 15;423(6937):337-42. A Comprehensive Review of Immunoreceptor Regulation of Osteoclasts. Humphrey MB, Nakamura MC. Clin Rev Allergy Immunol. 2016 Aug;51(1):48-58. doi: 10.1007/s12016-015-8521-8.
DISCUSSION 2	September 18 Monday 8:35-10:25 AM	Differential effects of alendronate and losartan therapy on osteopenia and aortic aneurysm in mice with severe Marfan syndrome. Nistala H, Lee-Arteaga S, Carta L, Cook JR, Smaldone S, Siciliano G, Rifkin AN, Dietz HC, Rifkin DB, Ramirez F. Hum Mol Genet. 2010 Dec 15;19(24):4790-8

LECTURE 3 Dr. Bettina Willie	September 19 Tuesday 8:35-9:25 AM	Osteocytes and skeletal tissue mechanobiology
	Review article:	Bone Structural Adaptation and Wolff's Law; BETTINA WILLIE, GEORG N. DUDA AND RICHARD WEINKAMER (please see the attachment)
DISCUSSION 3	September 25 Monday 8:35-10:25 AM	Targeted ablation of osteocytes induces osteoporosis with defective mechanotransduction. Tatsumi S, Ishii K, Amizuka N, Li M, Kobayashi T, Kohno K, Ito M, Takeshita S, Ikeda K. Cell Metab. 2007 Jun;5(6):464-75.

LECTURE 4 Dr. Svetlana Komarova	September 26 Tuesday 8:35-9:25 AM	Mathematical modeling as a tool to understand complex questions in bone biology
	Review article:	Mathematical modeling in bone biology: from intracellular signaling to tissue mechanics. Pivonka P, Komarova SV. Bone. 2010 Aug;47(2):181-9
DISCUSSION 4	October 02 Monday 8:35-10:25 AM	A minimal mathematical model of calcium homeostasis. Raposo JF, Sobrinho LG, Ferreira HG. J Clin Endocrinol Metab. 2002 Sep;87(9):4330-40

Tuesday, October 3, the first essay is due (Murshed, Tiedemann, Willie and Komarova)

LECTURE 5 Dr. Pierre Moffat	October 03 Tuesday 8:35-9:25 AM	New signaling molecules and their potential therapeutic use in bone disease
	Review article:	Regulatory pathways revealing new approaches to the development of anabolic drugs for osteoporosis. Martin TJ, Sims NA, Ng KW. Osteoporos Int. 2008 Aug;19(8):1125-38.
DISCUSSION 5	October 16 Monday 8:35-10:25 AM	Phosphorylation of GSK-3beta by cGMP-dependent protein kinase II promotes hypertrophic differentiation of murine chondrocytes. Kawasaki Y, Kugimiya F, Chikuda H, Kamekura S, Ikeda T, Kawamura N, Saito T, Shinoda Y, Higashikawa A, Yano F, Ogasawara T, Ogata N, Hoshi K, Hofmann F, Woodgett JR, Nakamura K, Chung UI, Kawaguchi H. J Clin Invest. 2008 Jul;118(7):2506-15.

LECTURE 6 Dr. Monzur Murhsed	October 10 Tuesday 8:35-9:25 AM	General discussion and techniques to analyze bone.
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LECTURE 7 Dr. Geoffrey Hendy	October 17 Tuesday 8:35-9:25 AM	Calcium –sensing receptor and disorders of calcium metabolism
	Review article:	Diseases associated with the extracellular calcium-sensing receptor. Thakker RV. Cell Calcium. 2004 Mar;35(3):275-82.
DISCUSSION 7	October 23 Monday 8:35-10:25 AM	Acquired hypocalciuric hypercalcemia due to autoantibodies against the calcium-sensing receptor. Pallais JC, Kifor O, Chen YB, Slovik D, Brown EM. N Engl J Med. 2004 Jul 22;351(4):362-9.

LECTURE 8 Dr. Geoffrey Hendy	October 24 Tuesday 8:35-9:25 AM	Calcium sensing receptor as a drug target
	Review article:	Calcimimetic and calcilytic drugs: just for parathyroid cells? Nemeth EF. Cell Calcium. 2004 Mar;35(3):283-9.

DISCUSSION 8	October 30 Monday 8:35-10:25 AM	Cinacalcet HCl reduces hypercalcemia in primary hyperparathyroidism across a wide spectrum of disease severity. Peacock M, Bilezikian JP, Bolognese MA, Borofsky M, Scumpia S, Sterling LR, Cheng S, Shoback D. J Clin Endocrinol Metab. 2011 Jan;96(1):E9-18.
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LECTURE 9 Dr. Frank Rauch	October 31 Tuesday 8:35-9:25 AM	Osteogenesis Imperfecta
	Review article:	<u>Osteogenesis imperfecta.</u> Forlino A, Marini JC. Lancet. 2016 Apr 16;387(10028):1657-71.
DISCUSSION 9	November 6 Monday 8:35-10:25 AM	Attenuated BMP1 function compromises osteogenesis, leading to bone fragility in humans and zebrafish. Asharani PV, Keupp K, Semler O, Wang W, Li Y, Thiele H, Yigit G, Pohl E, Becker J, Frommolt P, Sonntag C, Altmüller J, Zimmermann K, Greenspan DS, Akarsu NA, Netzer C, Schönau E, Wirth R, Hammerschmidt M, Nürnberg P, Wollnik B, Carney TJ. Am J Hum Genet. 2012 Apr 6;90(4):661-74.

Tuesday, November 7, the second essay is due (Hendy, Moffatt and Rauch)

LECTURE 10 Dr. Juliana Marulanda/ Dr. Monzur Murshed	November 7 Tuesday 8:35-9:25 AM	Diseases associated with abnormal skeletal tissue mineralization
	Review article:	<u>Molecular determinants of extracellular matrix mineralization in bone and blood vessels.</u> Murshed M , McKee MD. Curr Opin Nephrol Hypertens. 2010 Jul;19(4):359-65.
DISCUSSION 10	November 13 Monday 8:35-10:25 AM	Matrix Gla protein deficiency impairs nasal septum growth, causing midface hypoplasia. Marulanda J , Eimar H, McKee MD, Berkvens M, Nelea V, Roman H, Borrás T, Tamimi F, Ferron M, Murshed M . J Biol Chem. 2017 Jul 7;292(27):11400-11412.

LECTURE 11 Dr. Mathieu Ferron	November 14 Tuesday 8:35-9:25 AM	Reciprocal regulation of bone and energy metabolism
	Review article:	<u>Regulation of energy metabolism by the skeleton: osteocalcin and beyond.</u> Ferron M, Lacombe J. Arch Biochem Biophys. 2014 Nov 1;561:137-46.
DISCUSSION 11	November 20 Monday 8:35-10:25 AM	Glucose Uptake and <u>Runx2</u> Synergize to Orchestrate Osteoblast Differentiation and Bone Formation. Wei J, Shimazu J, Makinistoglu MP, Maurizi A, Kajimura D, Zong H, Takarada T, Iezaki T, Pessin JE, Hinoi E, Karsenty G . Cell. 2015 Jun 18;161(7):1576-91.

LECTURE 12 Dr. Laura Stone	November 21 Tuesday 8:35-9:25 AM	Bone pain
	Review article:	The neurobiology of skeletal pain. Mantyh PW. Eur J Neurosci. 2014 Feb;39(3):508-19
DISCUSSION 13	November 27 Monday 8:35-10:25 AM	Morphine treatment accelerates sarcoma-induced bone pain, bone loss, and spontaneous fracture in a murine model of bone cancer. King T, Vardanyan A, Majuta L, Melemedjian O, Nagle R, Cress AE, Vanderah TW, Lai J, Porreca F. Pain. 2007 Nov;132(1-2):154-68.

LECTURE 13 Dr. Peter Siegel	November 28 Tuesday 8:35-9:25 AM	Cancer and Bone
	Review article:	Cancer to bone: a fatal attraction. Weilbaecher KN, Guise TA, McCauley LK. Nat Rev Cancer. 2011 Jun;11(6):411-25
DISCUSSION 12	December 4 Monday 8:35-10:25 AM	The osteogenic niche promotes early-stage bone colonization of disseminated breast cancer cells. Wang H, Yu C, Gao X, Welte T, Muscarella AM, Tian L, Zhao H, Zhao Z, Du S, Tao J, Lee B, Westbrook TF, Wong ST, Jin X, Rosen JM, Osborne CK, Zhang XH. Cancer Cell. 2015 Feb 9;27(2):193-210

Monday, December 4, the third essay is due (Siegel, Stone, Marulanda/Murshed and Ferron)