



**NFS382H1 S**

**Vitamin & Mineral Metabolism  
Throughout the Life-Cycle**

**Dr. Alexander Schwartz**

**Winter 2023**



**Department of Nutritional Sciences  
University of Toronto**

### **1) Course Description:**

Vitamins and minerals are essential for health throughout the lifespan. This course examines the metabolism of vitamins and minerals in the context of human development from infancy, childhood, adolescence, adulthood, reproduction and through to aging. Some emphasis in the course is placed on understanding the role of vitamins and minerals in disease prevention and pathogenesis.

### **2) Prerequisites:**

NFS284 - Basic Human Nutrition

### **3) Learning objectives:**

- To gain knowledge of the metabolism of specific vitamins and minerals, and the role that they play in human health.
- To understand the dietary reference intakes (DRIs) for specific vitamins and minerals, and how these values were derived.
- To understand the current vitamin and mineral status of Canadians.
- To develop critical appraisal skills and attain a basic understanding of the principles of study design, so as to be able to assess research on vitamins, minerals, and nutrition in general.

### **4) Course Instructor:**

**Dr. Alexander Schwartz:**

e-mail: [a.schwartz@utoronto.ca](mailto:a.schwartz@utoronto.ca)

**Office Hours:** Virtual office hours will be possible by appointment only. TA office hours will also be made available online.

### **5) Course Delivery, Website, and Notifications:**

**Course Delivery:** Mondays (9-10am ET) and Wednesdays (9-11am ET)

**Location:** HS610

**Course website:** Available on Quercus

**Notifications:** Announcements are posted on the course website and it is the student's responsibility to read these regularly and to regularly check the course website for new information. It is strongly recommended that students leave their Quercus notifications on, to be automatically be advised of Quercus announcements, posting of new course content, upcoming due dates, the releasing of grades and other important course information.

### **6) Recommended Textbook:**

*Advanced nutrition and human metabolism. Seventh edition.* Boston, Massachusetts: Cengage Learning, 2018. Authors: Sareen S. Gropper, Jack L. Smith, and Timothy P. Carr. This textbook is available in hard copy and electronically through the UofT library system. For the electronic version, click the following link:

[https://librarysearch.library.utoronto.ca/permalink/01UTORONTO\\_INST/14bjeso/alma991106968119006196](https://librarysearch.library.utoronto.ca/permalink/01UTORONTO_INST/14bjeso/alma991106968119006196)

You will be prompted to log in with your UTOR ID. Only one person at a time can check out the electronic version. The textbook is also available for purchase through the

publisher, Amazon.ca and other retailers. While it is only recommended, this textbook is a great resource. If you plan to continue studies in nutrition, you may want to consider buying your own copy.

#### Required Readings:

Links to required readings will be posted on Quercus. You may be prompted to log in with your UTOR ID to access the full text versions of research articles through PubMed. In addition, links to optional readings are also provided.

### 7) Assessments

Assessment	Due Dates	Weight (%)
Weekly Paper Appraisal	End of day on Mondays	15
Critical Media Appraisal	February 1st	20
Nutrition Infographic	March 1st	20
Final Project	March 22 <sup>nd</sup>	27
Term Test*	April 5th	18
<b>TOTAL</b>		<b>100</b>

*\*This will be a multiple-choice test on Quercus. More details to follow in class announcements*

### 8) Course schedule

DATE	TOPICS	Readings
Jan 9-11 <b>Week 1</b>	<ul style="list-style-type: none"> <li>Course introduction</li> <li>Dietary reference intakes (DRIs)</li> <li>Prevalence of vitamin and mineral inadequacies in Canada</li> <li>Digestion</li> </ul>	R-1
Jan 16-19 <b>Week 2</b>	<ul style="list-style-type: none"> <li>How to assess scientific literature</li> </ul>	R-2
Jan 23-25 <b>Week 3</b>	<ul style="list-style-type: none"> <li>Folate</li> </ul>	R-3
Jan 30- Feb 1 <b>Week 4</b>	<ul style="list-style-type: none"> <li>Vitamin B<sub>12</sub></li> <li>Choline</li> <li><b>Critical Media Appraisal Due (February 1<sup>st</sup>)</b></li> </ul>	R-4
Feb 6-8 <b>Week 5</b>	<ul style="list-style-type: none"> <li>Iron</li> </ul>	R-5
Feb 13- 15 <b>Week 6</b>	<ul style="list-style-type: none"> <li>Zinc</li> <li>Iodine</li> </ul>	R-6
Feb 21- 23 <b>Week 7</b>	<b>Reading Week</b>	

Feb 27- Mar 1 <b>Week 8</b>	<ul style="list-style-type: none"> <li>• Fluoride</li> <li>• Vitamin D</li> <li>• <b>Nutrition Infographic Due (March 1<sup>st</sup>)</b></li> </ul>	R-7
Mar 6-8 <b>Week 9</b>	<ul style="list-style-type: none"> <li>• Calcium</li> <li>• Phosphorus</li> <li>• Magnesium</li> </ul>	R-8
Mar 13- 15 <b>Week 10</b>	<ul style="list-style-type: none"> <li>• Vitamin C</li> <li>• Vitamin A</li> <li>• Vitamin E</li> </ul>	R-9
Mar 20- 22 <b>Week 11</b>	<ul style="list-style-type: none"> <li>• Vitamin E (cont'd)</li> <li>• Selenium</li> <li>• Vitamin K</li> <li>• <b>Final Project Due (March 22<sup>nd</sup>)</b></li> </ul>	R-10
Mar 27- 29 <b>Week 12</b>	<ul style="list-style-type: none"> <li>• Sodium</li> <li>• Potassium</li> <li>• Chloride</li> </ul>	R-11
Apr 3-5 <b>Week 13</b>	<ul style="list-style-type: none"> <li>• Vitamin and mineral supplements – What's the evidence?</li> <li>• <b>Term Test (April 5<sup>th</sup>)</b></li> </ul>	R-12

## 9) Readings

Number	
R-1	<p><b>Required:</b></p> <p>Barr, S. I. Introduction to Dietary Reference Intakes. Applied Physiology, Nutrition, and Metabolism;31(1):61–65 (2006).</p> <p>Shakur, Y., et al. A comparison of micronutrient inadequacy and risk of high micronutrient intakes among vitamin and mineral supplement users and nonusers in Canada. Journal of Nutrition 2012;142(3):534-40.</p> <p><b>Optional:</b></p> <p>Barr, S.I. Is the 2019 Canada's Food Guide Snapshot nutritionally adequate? Applied Physiology, Nutrition, and Metabolism;44(12):1387-90 (2019).</p> <p>Murphy, S et al. History of Nutrition: The Long Road Leading to the Dietary Reference Intakes for the United States and Canada. Advances in Nutrition;7(1):157–168 (2016).</p> <p>Textbook Chapter 2: The Digestive System: Mechanism for Nourishing the Body.</p>

<p><b>R-2</b></p>	<p><b>Required</b></p> <p>Young YM and Solomon MJ. How to Critically Appraise an Article. Nature Clinical Practice Gastroenterology and Hepatology;6(2):82-91, 2009.</p> <p><b>Recommended</b></p> <p>Lappe, J et al. Effect of Vitamin D and Calcium Supplementation on Cancer Incidence in Older Women. Journal of the American Medical Association 317(12) 2017.</p>
<p><b>R-3</b></p>	<p><b>Required</b></p> <p>Colapinto C et al. Folate status of the population in the Canadian Health Measures. Canadian Medical Association Journal 183(2):E100-6, 2011.</p> <p><b>Optional</b></p> <p>Cornelia Ulrich. The relationship between micronutrients and nutrigenomics/epigenetics. American Society of Nutrition Meeting 2017</p> <p>Naderi N and House J. Recent developments in folate nutrition. Adv Food Nutr Res 2018;83:195-213. doi: 10.1016/bs.afnr.2017.12.006.</p> <p>Textbook Chapter 9: Water-Soluble Vitamins (ONLY Folate section and Chapter 9 Perspective).</p>
<p><b>R-4</b></p>	<p><b>Required</b></p> <p>MacFarlane AJ et al. Vitamin B12 and homocysteine status in a folate-replete population: results from the Canadian Health Measures Survey. American Journal of Clinical Nutrition 94(4):1079-1087, 2011.</p> <p>Leermakers ET et al. Effects of choline on health across the life course: a systematic review. Nutrition Reviews 73(8): 500-522.</p> <p><b>Optional</b></p> <p>Torsvik I et al. Cobalamin supplementation improves motor development and regurgitations in infants: results from a randomized intervention study. American Journal of Clinical Nutrition 98(5):1233-40, 2013.</p> <p>Masih S et al. Pregnant Canadian women achieve recommended intakes of one-carbon nutrients through prenatal supplementation but the supplement composition,</p>

	<p>including choline, requires reconsideration. Journal of Nutrition 145:1824-1834, 2015.</p> <p>Textbook Chapter 9: Water-Soluble Vitamins (ONLY Vitamin B<sub>12</sub> section).</p>
<b>R-5</b>	<p><b>Required:</b></p> <p>Cooper M et al. Iron sufficiency of Canadians. Health Reports 23(4): 3-10, 2012.</p> <p>Health Canada Prenatal Nutrition Guidelines for Health Professionals - Iron Contributes to a Healthy Pregnancy.</p> <p><b>Optional:</b></p> <p>Baker RD et al. Diagnosis and Prevention of Iron Deficiency and Iron-Deficiency Anemia in Infants and Young Children (0–3 Years of Age). Pediatrics 126(5): 1040 - 1050, 2010.</p> <p>Textbook Chapter 13: Essential Trace and Ultratrace Minerals (ONLY Iron section and Chapter 13 Perspective).</p>
<b>R-6</b>	<p><b>Required:</b></p> <p>Lowe, N. Assessing zinc in humans. Current Opinion in Clinical Nutrition and Metabolic Care, 19(5), 321–327. 2016.</p> <p>Iodine status of Canadians, 2009 to 2011</p> <p><b>Optional:</b></p> <p>Textbook Chapter 13: Essential Trace and Ultratrace Minerals (ONLY Zinc and Iodine sections).</p>
<b>R-7</b>	<p><b>Required:</b></p> <p>Health Canada: Fluoride in Drinking Water</p> <p>Whiting SJ et al The vitamin D status of Canadians relative to the 2011 Dietary Reference Intakes: an examination in children and adults with and without supplement use. American Journal of Clinical Nutrition 94: 128-135, 2011.</p> <p><b>Optional:</b></p> <p>Manson J et al. Vitamin D deficiency – Is there really a pandemic? New England Journal of Medicine. 2016;375(19):1817-1820.</p>

	<p>Hollis BW, Wagner CL, Howard CR, Ebeling M, Shary JR, Smith PG, et al. Maternal Versus Infant Vitamin D Supplementation During Lactation: A Randomized Controlled Trial. <i>Pediatrics</i>. 2015;136:625-34.</p> <p>Textbook Chapter 14: Nonessential Trace and Ultratrace Minerals (ONLY Fluoride section) and Chapter 10: Fat-Soluble Vitamins (ONLY Vitamin D section).</p>
<p><b>R-8</b></p>	<p><b>Required:</b> Weaver CM et al. Calcium, dairy products and energy balance in overweight adolescents: a controlled trial. <i>American Journal of Clinical Nutrition</i> 94 (5): 1163-1170, 2011.</p> <p><b>Optional:</b> Calvo M and Lamberg-Alardt C. Phosphorus. <i>Advances in Nutrition</i>. 6: 860-862, 2015.</p> <p>Magnesium – Fact Sheet for Health Professionals</p> <p>Textbook Chapter 11: Major Minerals (entire chapter, including Perspective section).</p>
<p><b>R-9</b></p>	<p><b>Required:</b></p> <p>Langlois K et al. Vitamin C status of Canadian adults: Findings from the 2012/2013 Canadian Health Measures Survey. <i>Health Reports</i> 2016 27(5):3-10.</p> <p><b>Optional:</b></p> <p>Bjelakovic G et al. Antioxidant supplements for prevention of mortality in health participants and patients with various diseases. <i>Cochrane Database of Systematic Reviews</i> 2012, Issue 3. Art. No.: CD007176.</p> <p>Lykkesfeldt J et al. Vitamin C. <i>Advances in Nutrition</i> 5:16-18, 2014.</p> <p>Debelo, H., Novotny, J. A., &amp; Ferruzzi, M. G. Vitamin A. <i>Advances in Nutrition</i>, 8(6), 992–994, 2017.</p> <p>Traber MG and Manor M. Vitamin E. <i>Advances in Nutrition</i>, 2012;3(3):330-1.</p> <p>Iddir M et al. Strengthening the Immune System and Reducing Inflammation and Oxidative Stress through Diet and Nutrition: Considerations during the COVID-19 Crisis. <i>Nutrients</i> 2020;12(6):1562. doi: 10.3390/nu12061562.</p> <p>Textbook Chapter 9: Water-Soluble Vitamins (ONLY Vitamin C section) and Chapter 10: Fat- Soluble Vitamins (Vitamin A and Vitamin E section and Chapter Perspective).</p>

<p><b>R-10</b></p>	<p><b>Required:</b></p> <p>Shearer MJ et al. Vitamin K nutrition, metabolism, and requirements: current concepts and future research.</p> <p><b>Optional:</b></p> <p>Akbari S, Rasouli-Ghahroudi AA. Vitamin K and Bone Metabolism: A Review of the Latest Evidence in Preclinical Studies. Biomed Res Int. 2018;2018:4629383.</p> <p>Textbook Chapter 10: Fat-Soluble Vitamins (ONLY Vitamin E and Vitamin K sections) and Chapter 13: Essential Trace and Ultratrace Minerals (ONLY Selenium section).</p>
<p><b>R-11</b></p>	<p><b>Required Reading &amp; Media:</b></p> <p>Hendriksen MAH et al. Potential effect of salt reduction in processed foods on health. American Journal of Clinical Nutrition 99:446-453, 2014.</p> <p>CBC Market Place (March 2013): The Great Salt Shakedown</p> <p><b>Optional:</b></p> <p>Overwyk KJ et al. Dietary Sodium Intake and Health Indicators: A Systematic Review of Published Literature between January 2015 and December 2019. Advances in Nutrition 2020;11(5):1174-1200.</p> <p>Textbook Chapter 12: Water and Electrolytes (ONLY Sodium, Potassium, and Chloride sections and Chapter Perspective).</p>
<p><b>R-12</b></p>	<p><b>Required Reading &amp; Media:</b></p> <p>Vitamins and Supplements: Magic Pills (Fifth Estate Broadcast Date: November 20, 2015).</p> <p>Sesso H. Evidence on positive and null outcomes from RCTs of multivitamin interventions. American Society of Nutrition Meeting 2017</p> <p>Marra and Bailey. Position of the Academy of Nutrition and Dietetics: Micronutrient Supplementation. Journal of the Academy of Nutrition and Dietetics 2018; 118: 2162-2173.</p>

**10) Weekly paper appraisal – via Quercus**



Every Monday, the focus of the lecture will be a summary of a peer-reviewed paper related to the course content (15% of final mark, top 8 marks counted). Students are expected to participate in a discussion about the paper and will then complete a short answer based on the discussion.

**11) Assignment 1(a): Critical Media Appraisal – via Quercus**

Students will be required to find an ‘influencer’ or supposed health and wellness guru online and in a written paper (20% of the final mark), debunk one of their claims related to vitamins or minerals using scientific evidence.

**12) Assignment 1(b): Nutrition Infographic Project – via Quercus**

Students will be required to create an infographic related to their written work debunking a vitamin or mineral claim in Part 1 (20% of the final mark).

**13) Term Test**

The term test (18% of the final mark) will take place on April 5<sup>th</sup> and it will be taken on Quercus. The test will include all the material covered throughout the entire semester, including lectures and required readings. *This will be an open-book test. You can use your own notes, lecture presentations and required readings to help you answer the questions. However, you must take the test individually, without help from anybody else.*

**14) Final Assignment: Nutrition Dissemination**

The final assignment (27% of the final mark) will have students get into groups and create a social-media-style informational video that will contain scientifically accurate information related to a vitamin or mineral.

**It is each student’s responsibility to ensure that they are available to take the test at the scheduled time.** If you foresee a scheduling conflict, you must contact the instructor **at least one week before the test** to discuss potential accommodations.

**14) Ouriginal plagiarism detection:**

*“Normally, students will be required to submit their course work to the University’s plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool’s reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University’s use of this tool are described on the Centre for Teaching Support & Innovation web site (<https://uoft.me/pdt-faq>)”*

All students are expected to either submit to Ouriginal, which is voluntary, or provide an alternative. On Quercus, online submissions will automatically be submitted to Ouriginal. If you have issues with Ouriginal, please contact Dr. Schwartz to arrange an alternate submission.

Dr. Schwartz reviews the Ouriginal submissions and will e-mail students if there are any concerns about their writing. Often this is no more than a discussion of how to properly

paraphrase and/or cite references, but the deduction of marks may also result. Failure to respond to such an e-mail **will** result in the deduction of assignment marks. If a serious case of plagiarism is suspected, the student's assignment will be forwarded to the Office of Academic Integrity for review and possible sanction.

### **15) Policy on Missed Tests and Late Submissions**

Missing the term test without a compelling reason will result in a grade of zero. Compelling reasons might include illness, personal distress, family emergency, or other unforeseen circumstances. Compelling reasons must be supported by documentation or verbal explanation (all discussions are confidential).

Late submission of the assignments will result in a 10% reduction of the assignment per overdue day unless there is a compelling reason for the lateness. If you anticipate that you will be unable to meet the deadline for any of the assignments, please contact the instructor **at least one week before the due date** to request an extension.

Re-read requests must be made in writing by emailing the instructor, detailing where the marks were wrongfully deducted and explaining why you should have received more marks. Be aware that your mark may go up, down, or stay the same.

### **16) Lecture material, audio recordings, and intellectual property:**

Students may not create audio recordings of classes with the exception of those students requiring accommodation for a disability, who should speak to the instructor prior to beginning to record lectures. Students creating an unauthorized audio recording of lectures violate an instructor's intellectual property rights and the Canadian Copyright Act. Students violating this agreement will be subject to disciplinary actions under the Code of Student Conduct. Course videos may not be reproduced or posted or shared anywhere other than the official course Quercus site and should only be used by students currently registered in the course.

Please note that the lecture presentations, videos, and other course documents are the intellectual property of Dr. Alexander Schwartz. The distribution, transmission, reproduction or re-posting of the NFS382 course materials, including audio and video recordings, in whole or part, is NOT permitted without the consent of the instructor. All students enrolled in NFS382 are permitted to use the material for personal use and study ONLY.

### **17) Academic Integrity:**

Students are expected to conduct themselves with academic integrity. The Code of Behaviour clearly describes activities that are considered academic misconduct:

<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>

For more information, also see <http://www.artsci.utoronto.ca/osai> and <http://academicintegrity.utoronto.ca>.

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of

academic honesty when writing assignments, collaborating with fellow students and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism— representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or program—is a serious offence that can result in sanctions. Speak to the instructor for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at <http://www.writing.utoronto.ca> . Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see <http://www.artsci.utoronto.ca/osai> and <http://academicintegrity.utoronto.ca> .

### **18) Accessibility Needs:**

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting <http://www.studentlife.utoronto.ca/as/new-registration> . Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructor will not reveal that you are registered with AS.

### **Specific Medical Circumstances**

#### **What should I do if I cannot attend class (in-person or remote) and it is affecting my academic work?**

Students who are absent from class for any reason (e.g., COVID, other illness or injury, family situation) and who require consideration for missed academic work should report their absence through the online absence declaration. The declaration is available on [ACORN](#) under the Profile and Settings menu. Students should also advise their instructor of their absence.

### **Resources & supports**

If you or someone you know is in distress and there is an immediate risk, call 911. The following includes supports available to students on all three campuses:

- [U of T St. George \(Downtown Toronto\)](#)
- [U of T Scarborough](#)
- [U of T Mississauga](#)

Additionally, students have access to [U of T My Student Support Program \(My SSP\)](#) | 1-844-451- 9700 24/7. Outside of North America, call 001-416-380-6578.

This program provides culturally- competent mental health and counseling services in 146 languages for all U of T students.

### **Accommodation for non-medical reasons**

There may be times when you are unable to complete course work on time due to non-medical reasons. If you have concerns, speak to the instructor or to an advisor in your College Registrar's office; they can help you to decide if you want to request an extension or accommodation. They may be able to provide you with a College Registrar's letter of support to give to your instructor, and importantly, connect you with other resources on campus for help with your situation.