

PULSE EXPERIENTIAL TEAM ASSIGNMENT

1. Title of your PULSE experiential assignment. <i>Provide a creative and informative title.</i>
PATH POWER: The Vitamin Vault
2. Please summarize your PULSE experiential assignment (max 300 words). <i>Provide a non-technical (lay) summary of your PULSE assignment. Prompts to think about: What is the topic? What is the format? Why did you choose this topic and format? The summary for lay audience is a brief and accessible summary of the assignment that is used to explain complex ideas, technical writing and scientific terms to people who do not have prior knowledge of the subject (e.g., high school science level). This summary should include the importance, impact, and content of your assignment to a broader audience.</i> <i>[Team 23 is an example of an informative lay summary.]</i>
Vitamins are critical micronutrients that our bodies need to survive. We need to get vitamins from our diet since we our bodies cannot create them. Vitamin Deficiencies are a subset of Nutritional diseases that occur when someone does not get enough of a particular vitamin. In my PULSE project, it investigates the function and sources of fat-soluble (A and D) vitamins and water-soluble (B and C) vitamins and their associated diseases and symptoms when we have deficiencies in them. I decided to choose Vitamin deficiencies for my project because of how difficult it is to memorize 5 different vitamins each with their own sources, functions in the bodies, and diseases that occur when we don't get enough of them. The magazine I created attempts to make this content easily digestible for current and future students. The magazine features memorization friendly 'chunking' of content, and many cartoon-style diagrams and images that clearly show concepts. Readers can explore the magazine at their own pace, connecting ideas visually and textually. The "Practice Activities" section provides the readers with Multiple choice questions, a case study, and plenty of mnemonics to help reinforce learning and make it more interactive. Besides university students, our magazine is easy to understand and accessible to those who have a high school science level. This is important as it can provide individuals every day with useful information that can motivate them to maintain a balanced diet. This is crucial especially, with the increasing amount of misinformation in nutrition in North America.
3. Provide up to 6 keywords relevant to your PULSE experiential assignment. <i>3-6 keywords are ideal.</i>
Nutritional Diseases, Deficiencies, Fat-soluble vitamins, Water-soluble vitamins, Micronutrients, Magazine
4. Identify the course topic with which your PULSE assignment most aligns. <i>Refer to the various topics outlined under 'Course content and Schedule' in the syllabus (e.g. Inflammation).</i>
Section B: Metabolic and Nutritional Diseases

5. What are the learning outcomes?

There should be a minimum of 2 learning outcomes for your assignments. For further information on learning outcomes, the Centre for Teaching and Learning offers information:

<https://teaching.uwo.ca/curriculum/coursedesign/learning-outcomes.html>

1. By the end of this magazine, successful students will be able to list the major vitamins, their dietary sources, and their primary functions in the body
2. By the end of this magazine, successful students will be able to recall the common diseases and health conditions caused by deficiencies of specific vitamins
3. By the end of this magazine, students will be able to interpret symptoms in a hypothetical patient to identify potential vitamin deficiencies

6. Why did the team select the chosen topic and the medium? How will the topic and medium of choice help learners?

I selected this topic because topic in the course covers 5 vitamins, each of which with their own normal functions in body and their own disease states which is a lot to memorize and handle. I struggled with this myself, and I imagine others will as well. By organizing the information in a more fun and easily digestible manner (instead of a plain white slideshow) and providing helpful activities to aid with memorization, I hope that this will be a benefit to the learner. A medium that can do both tasks is a magazine which is why I decided to use it.

7. Did the team use an artificial intelligence (AI) technology tool? If so, which AI technology tool(s) did the team use? What other technology tools did the team use? Is the technology tool novel? Is the team using this technology tool in a novel fashion? If the team did not use technology tool, why did the team decide against using the technology tool(s)?

Please include details (e.g., for what purpose was the tool used for? Why was the tool the best tool to use for your assignment? Are there alternative tools that were considered?)

- ChatGPT
 - **Purpose:** Used for the creation of Practice activities. These activities included a 20-question multiple choice practice quiz, a short case study, and 5 mnemonics to help with memory. Additionally, it was used to create a general introduction about vitamins for an editor's note in my magazine.
 - **Reason for use:** ChatGPT was the best tool for this assignment because it allowed for rapid generation of accurate educational content based the Research I provided it with. It was particularly useful in creating questions in a 2nd year university level difficulty.
 - **Alternative Tools Considered:** Other AI tools like Claude and Gemini were considered but it created less coherent content. Trying to make the questions myself would have taken a significant amount of time.
 - **Novelty:** ChatGPT is constantly updated.
- Google Gemini
 - **Purpose:** Used for image creation, 4 diagrammatic images created describing specific diseases

- **Reason for Use:** This is the best tool to use for this assignment because I tried generating the same images using ChatGPT, but they were not detailed enough and produced inaccurate diagrams (i.e arrows pointing to nothing). Also, the style of images generated by ChatGPT did not match the desired clarity or format that I was going for. Gemini provided consistent, high-quality results that effectively conveyed the key points.
- **Alternative tools considered:** Other AI tools, such as Claude, were not suitable since they do not support image generation. Traditional graphic design software was an option, but that would have taken a significant amount of time and expertise in graphic design.
- **Novelty:** Gemini is constantly updated.

I did not use AI tools for research due to the possibility of false information and trying to fetch the correct information from false information, would have taken longer than just doing it myself.

8. How is your PULSE experiential assignment innovative and/or novel?

Describe what about the PULSE assignment is innovative/novel. Is there a particular component or content that is innovative/novel? How is it different from other content that already exists?

My PULSE assignment is innovative because I used a magazine format which allows information to be chunked into digestible sections, making it easier for students to memorize and retain content. This is particularly useful for learning about vitamins, their functions, and the diseases which can get overwhelming quickly if presented all at once. An infographic often dumps all the information onto a single page. The magazine format organizes content in a way that guides the reader step by step. I also incorporated cartoon and clip-art images and diagrams to illustrate concepts. These images are easy to the eye and were carefully chosen to aid memorization, make the experience of my magazine more engaging, and help students connect ideas.

9. If you used an AI tool, please copy and paste the prompt(s)/question(s) used along with the output(s)/answer(s) from the AI tool.

The response here is to allow others to replicate the team's work. If the prompts/outputs are lengthy (over 1 page), please attach it as a separate document and note below [Please see attached document].

[Please see attached document]

Group 45 Path3500 - AI USE

10. If you did not use an AI tool, please attach a copy of the team's notes to the assignment.

The response here is to allow others to observe the 'behind the scenes' team's work.

[Please see attached document]

Group 45 PATH3500 - Notes

11. How did the team ensure the veracity of the information presented in the PULSE assignment?

The response should highlight how the team has ensured that the information presented in the assignment is evidence-based and not spreading misinformation. You should specifically

mention which databases (if any) or textbook materials you used, and how you kept track of the sources/references for each claim. If AI provided you with false information, please describe how the team has fact-checked the AI response and the legitimate (scientific) sources you used. A reference document should be provided in the reference section (15. References) below. Please ensure to include in-text citations in your assignment where applicable.

I ensured that all the information presented in the PULSE assignment by only taking information from medically reviewed resources taken from verified hospitals and institutions. Most of my articles came from StatPearls, PubMed, and the National Institute of Health.

I ensured that AI did not give me any false information because when generating my practice activities, I attached my research notes (that I created by hand) in my prompt and only asking it to use information from the attached notes.

12. Write a meaningful team reflection about the PULSE session (max 250 words).

Prompts to help your team write the reflection: Were there any team/individual biases that surfaced when creating content for the assignment? Did the team implement any practices to ensure the content was equitable, diverse, and/or inclusive? How has the PULSE assignment helped with the team's learning? If the team had to estimate, how long did the assignment take? What worked well for your team? What would the team do differently next time? What were the opportunities and challenges with creating the PULSE assignment to help others' learning? Were there any barriers or limitations?

The assignment took me about 35-40 hours to complete. A good chunk of that time was spent researching and working on the annotated bibliography. Regarding individual biases, I wanted all the images I used in my project to be cartoon/clip-art style. This is because a consistent, simplified art style makes the content more approachable and easier to understand for a student audience. Yes, I did implement practices to ensure the content was equitable, diverse, and inclusive. I said the words "men" and "women" many times during my project (pg. 18 & 22), but I changed it to XX and XY individuals respectively, to be more inclusive. The PULSE assignment helped with my learning because I did not do so well on this portion during exam #2, so going back helped me learn new things that I did not catch the first time, such as how PTH and vitamin D interact. What worked well for me was prioritizing the research first, instead of focusing on the visuals, and the medium that I was going to choose. I don't think I would do anything differently. A good opportunity was working with Canva, which made creating my magazine very simple, but it was also quite challenging as many features were blocked behind a paywall (more than half of stock images were locked). When making my notes it was also challenging to try to describe specific pathways and diseases in a way that is comprehensible for 1st-2nd year students but also detailed.

13. Write the contributions of individual team members using unique initials.

Example: All team members contributed to the design of the prompts used in the technology tool, ChatGPT (GPT-3.5). T.K and T.K2 fact checked the information presented by ChatGPT using published literature on PubMed (PMID 29211319, 32477271). Y.Z finalized and formatted the final infographic and compiled the prompts and outputs. P.E was involved in...

YA - I worked alone so I completed all parts.



15. References

Please provide a numbered reference list with Nature citation style. [Please feel free to use citation management software (i.e., free citation manager, e.g., Zotero and Mendeley)]

1. Reddy P, Jialal I. Biochemistry, vitamin, fat soluble [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2022. [cited 2026 Apr 5]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK534869/>
2. Manetti S. Vitamins: MedlinePlus Medical Encyclopedia [Internet]. Medlineplus.gov. National Library of Medicine; 2023. [cited 2026 Apr 5]. Available from: <https://medlineplus.gov/ency/article/002399.htm>
3. Darling M. Metabolic & Nutritional Diseases III (video) [Internet]. 2025 [cited 2026 Apr 5]. Available from: Western Brightspace PATH3500
4. Chea EP, Milstein H. Vitamin A [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2020. [cited 2026 Apr 5]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482362/>
5. MedlinePlus. Vitamin A: MedlinePlus Medical Encyclopedia [Internet]. Medlineplus.gov. 2023. [cited 2026 Apr 5]. Available from: <https://medlineplus.gov/ency/article/002400.htm>
6. NHS. Vitamin A - Vitamins and minerals [Internet]. NHS. 2020. [cited 2026 Apr 5]. Available from: <https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-a/>
7. Kumar V, Abbas AK, Fausto N, Aster JC. Robbins & Cotran Pathologic Basis of Disease E-Book. Saunders; 2009. p. 430-438. [cited 2026 Apr 5]. Available from: https://books.google.ca/books?id=1Zmvm4JVNC&printsec=frontcover&source=gbg_summary_r&cad=0#v=onepage&q&f=false
8. Darling M. Metabolic and Nutritional Disorders (lecture notes) [Internet]. [cited 2026 Apr 5]. Available from: Western Brightspace PATH3500
9. National Institutes of Health. Vitamin D [Internet]. National Institutes of Health. 2025. [cited 2026 Apr 5]. Available from: <https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/>
10. Krati Chauhan, Huecker MR. Vitamin D [Internet]. Nih.gov. StatPearls Publishing; 2019. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK441912/>

11. howvitDformed [Internet]. Upenn.edu. 2025. [cited 2026 Apr 5]. Available from: <https://www.sas.upenn.edu/~zhall/chem507/howvitDformed.html>
12. Moody B. Calcium Regulation - Vitamin D - PTH [Internet]. TeachMePhysiology. 2024. [cited 2026 Apr 5]. Available from: <https://teachmephysiology.com/biochemistry/electrolytes/calcium-regulation/>
13. Cleveland Clinic. Parathyroid hormone: What it is, function & levels [Internet]. Cleveland Clinic. 2021. [cited 2026 Apr 5]. Available from: <https://my.clevelandclinic.org/health/articles/22355-parathyroid-hormone>
14. National Institute of Health. Vitamin C [Internet]. National Institutes of Health. National Institutes of Health; 2021. [cited 2026 Apr 5]. Available from: <https://ods.od.nih.gov/factsheets/VitaminC-HealthProfessional/>
15. DePhillipo NN, Aman ZS, Kennedy MI, Begley JP, Moatshe G, LaPrade RF. Efficacy of Vitamin C Supplementation on Collagen Synthesis and Oxidative Stress After Musculoskeletal Injuries: A Systematic Review. Orthopaedic Journal of Sports Medicine [Internet]. 2018 Oct;6(10):232596711880454. [cited 2026 Apr 5]. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC6204628/>
16. Harvard T.H. Chan. Folate (Folic Acid) – Vitamin B9 [Internet]. The Nutrition Source. 2012. [cited 2026 Apr 5]. Available from: <https://nutritionsource.hsph.harvard.edu/folic-acid/>
17. National Institutes of Health. Vitamin B12 [Internet]. Nih.gov. National Institutes of Health; 2024. [cited 2026 Apr 5]. Available from: <https://ods.od.nih.gov/factsheets/VitaminB12-HealthProfessional/>
18. Medicine N. What Does Folic Acid Do for the Body? [Internet]. Northwestern Medicine. [cited 2026 Apr 5]. Available from: <https://www.nm.org/healthbeat/healthy-tips/what-does-folic-acid-do-for-the-body>
19. Hasdemir B. What's the Difference Between Folic Acid and Vitamin B12 Deficiency? [Internet]. Liv Hospital. [cited 2026 Apr 5]. Available from: <https://int.livhospital.com/is-folic-acid-the-same-as-b12/>

20. Mayo Clinic. Spina Bifida - Symptoms and Causes [Internet]. Mayo Clinic. 2023. [cited 2026 Apr 5]. Available from: <https://www.mayoclinic.org/diseases-conditions/spina-bifida/symptoms-causes/syc-20377860>
21. Al-Awami HM, Raja A, Soos MP. Physiology, Intrinsic Factor (Gastric Intrinsic Factor) [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2020. [cited 2026 Apr 5]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546655/>
22. Cleveland Clinic. Pernicious Anemia: Definition, Symptoms, Causes & Treatment [Internet]. Cleveland Clinic. 2022. [cited 2026 Apr 5]. Available from: <https://my.clevelandclinic.org/health/diseases/22377-pernicious-anemia>

16. Annotated Bibliography

1. Reddy P, Jialal I. Biochemistry, vitamin, fat soluble [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2022. [cited 2026 Apr 5]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK534869/>
This website provides a comprehensive overview of fat-soluble vitamins (A, D, E, and K), focusing on their biochemical properties, absorption mechanisms, storage in adipose tissue, and physiological roles. The article also briefly outlines deficiency symptoms and the clinical importance of maintaining proper levels. This source is highly credible as it is published through StatPearls and hosted by the NCBI, a well-respected scientific database. It is written by medical professionals and undergoes peer review, making it reliable for foundational biochemical knowledge. A strength is its clear, medically accurate explanations; however, it is somewhat technical and less accessible for beginners. This source was useful in my assignment for building a strong foundational understanding of fat-soluble vitamins. I used it to explain how these vitamins are absorbed and stored differently from water-soluble vitamins, which helped support my comparisons and explanations throughout the magazine.
2. Manetti S. Vitamins: MedlinePlus Medical Encyclopedia [Internet]. Medlineplus.gov. National Library of Medicine; 2023. [cited 2026 Apr 5]. Available from: <https://medlineplus.gov/ency/article/002399.htm>
This source provides a general overview of vitamins, including their classification into fat-soluble and water-soluble categories, their biological roles, and their importance in maintaining overall health. It explains how vitamins support processes such as metabolism, immune function, and tissue repair, while also briefly addressing deficiency and excess conditions. MedlinePlus is a highly credible source because it is produced by the U.S. National Library of Medicine and is designed to provide evidence-based medical information to the public. A key strength of this source is its accessibility—it presents complex scientific concepts in a way that is easy to understand. However, because it is designed for a general audience, it does not go into deep biochemical detail. I used this source to introduce the concept of vitamins in my assignment and to explain the differences between water-soluble and fat-soluble vitamins.

3. Darling M. Metabolic & Nutritional Diseases III (video) [Internet]. 2025 [cited 2026 Apr 5]. Available from: Western Brightspace PATH3500
This lecture summarizes key concepts related to metabolic and nutritional disorders, with a strong focus on vitamin deficiencies and their physiological effects. The lecture outlines important pathways, mechanisms, and disease outcomes, providing a structured overview of how imbalances in vitamins impact the body. This source is credible because this is the lecture that we initially got our information from and it is from an established university. Weakness is lack of detail compared to textbook. This lecture served as a primary foundation for my assignment. I used it to guide my understanding of how vitamin deficiencies develop and their physiological consequences. It was particularly helpful for ensuring my explanations were accurate and aligned with course expectations, and I used it to cross-check information gathered from external sources.
4. Chea EP, Milstein H. Vitamin A [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2020. [cited 2026 Apr 5]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482362/>
This source provides a detailed overview of vitamin A, including its forms (retinol, retinal, and beta-carotene), metabolism, and physiological roles in vision, immune function, and epithelial maintenance. It also explains the clinical effects of deficiency, such as night blindness and xerophthalmia, as well as toxicity risks. The source is highly credible as it is published through StatPearls and hosted by the NCBI. It is written by medical professionals and based on scientific evidence. A strength is its detailed explanation of biochemical mechanisms, though it may be too technical for beginners. I used this source to better understand the biochemical differences between retinol and beta-carotene. It helped me explain how vitamin A functions in the body and how deficiencies lead to specific symptoms
5. MedlinePlus. Vitamin A: MedlinePlus Medical Encyclopedia [Internet]. Medlineplus.gov. 2023. [cited 2026 Apr 5]. Available from: <https://medlineplus.gov/ency/article/002400.htm>
This source explains the functions, dietary sources, and health effects of vitamin A. It highlights its importance in vision, immune function, and skin health, and identifies common food sources such as carrots, dairy products, and leafy greens. It also discusses deficiency symptoms and potential toxicity. This source is credible because it is produced by MedlinePlus, a trusted platform run by the U.S. National Library of Medicine. Its main strength is clarity and accessibility, making it suitable for general audiences. However, it lacks in-depth biochemical explanations. I used this source to identify dietary sources of vitamin A for my assignment.

6. NHS. Vitamin A - Vitamins and minerals [Internet]. NHS. 2020. [cited 2026 Apr 5]. Available from: <https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-a/>

This source outlines the role of vitamin A in the body, recommended daily intake, and dietary sources. It also discusses the risks of both deficiency and excessive intake, emphasizing the importance of balanced consumption. The NHS is a highly credible public health organization, making this source reliable and trustworthy. A strength is its focus on practical health guidance, though it does not provide detailed scientific explanations. I used this source to support my discussion of vitamin A intake recommendations and food sources.

7. Kumar V, Abbas AK, Fausto N, Aster JC. Robbins & Cotran Pathologic Basis of Disease E-Book. Saunders; 2009. p. 430-438. [cited 2026 Apr 5]. Available from:

https://books.google.ca/books?id=1Zmvm4JVNcC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

This textbook provides an in-depth explanation of the pathological basis of nutritional deficiencies, including how vitamin deficiencies affect different organ systems. It describes both the normal physiological roles of vitamins and the structural and functional changes that occur when deficiencies arise. This source is extremely credible, as it is a widely used medical textbook in pathology and it is the one we use for this class. I used this source to gain a deeper understanding of the pathological effects of vitamin deficiencies. It helped me accurately explain disease mechanisms in my assignment and ensured my content aligned with the level of detail expected in my course.

8. Darling M. Metabolic and Nutritional Disorders (lecture notes) [Internet]. [cited 2026 Apr 5]. Available from: Western Brightspace PATH3500

The lecture notes summarize key concepts related to metabolic and nutritional disorders, with a strong focus on vitamin deficiencies and their physiological effects. The notes outline important pathways, mechanisms, and disease outcomes, providing a structured overview of how imbalances in vitamins impact the body. This source is credible because this is the notes that we initially got our information from and it is from an established university. Weakness is lack of detail compared to textbook. This lecture served as a primary foundation for my assignment. I used it to guide my understanding of how vitamin deficiencies develop and their physiological consequences. It was particularly helpful for ensuring my explanations were accurate and aligned with course expectations, and I used it to cross-check information gathered from external sources.

9. National Institutes of Health. Vitamin D [Internet]. National Institutes of Health. 2025. [cited 2026 Apr 5]. Available from: <https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/>
This source provides a comprehensive overview of vitamin D, including its functions in calcium regulation, bone health, and immune function. It explains how vitamin D is obtained through diet and sunlight exposure, as well as its metabolism and activation in the body. It also discusses recommended intake levels and deficiency risks. The NIH is a highly credible government organization, and this resource is evidence-based and intended for health professionals. Its strength lies in its accuracy and depth. I used this source to understand the role of vitamin D in calcium homeostasis and to identify dietary sources. It was particularly useful for explaining how vitamin D supports bone health and how deficiencies can lead to conditions like rickets.
10. Krati Chauhan, Huecker MR. Vitamin D [Internet]. Nih.gov. StatPearls Publishing; 2019. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK441912/>
This source explains the synthesis and activation of vitamin D, particularly how UVB radiation converts precursors in the skin into vitamin D3. It also outlines the steps involved in activation through the liver and kidneys, as well as its physiological effects. This source is credible as it is published through StatPearls and written by medical professionals. Its strength is its detailed explanation of biochemical pathways, though it can be technical. I used this source to understand how vitamin D is produced in the body from sunlight. This helped me explain the biological process in my assignment and connect environmental exposure (UVB rays) to vitamin function.
11. howvitDformed [Internet]. Upenn.edu. 2025. [cited 2026 Apr 5]. Available from: <https://www.sas.upenn.edu/~zhall/chem507/howvitDformed.html>
This source explains the biochemical steps involved in vitamin D synthesis, including the conversion of 7-dehydrocholesterol into vitamin D3 through UVB exposure and subsequent activation steps. The source is moderately credible as it comes from an academic institution. Its strength is its clear explanation of biochemical processes, though it may not be formally peer-reviewed. I used this source alongside others to reinforce my understanding of vitamin D synthesis. It helped me clearly explain the process in a step-by-step manner in my assignment.

12. Moody B. Calcium Regulation - Vitamin D - PTH [Internet]. TeachMePhysiology. 2024. [cited 2026 Apr 5]. Available from: <https://teachmephysiology.com/biochemistry/electrolytes/calcium-regulation/>
This source explains how calcium levels are regulated in the body through the interaction of vitamin D and parathyroid hormone (PTH). It describes how PTH increases calcium levels by acting on bones, kidneys, and intestines, and how vitamin D enhances calcium absorption. This educational platform is designed for medical students, making it reliable and easy to understand. A strength is its simplified explanations, though it may lack depth compared to primary literature. I used this source to understand how vitamin D and PTH work together to maintain calcium homeostasis. It was especially useful for explaining the pathway in a clear and simplified way in my assignment.
13. Cleveland Clinic. Parathyroid hormone: What it is, function & levels [Internet]. Cleveland Clinic. 2021. [cited 2026 Apr 5]. Available from: <https://my.clevelandclinic.org/health/articles/22355-parathyroid-hormone>
This source describes the function of parathyroid hormone, including how it regulates calcium levels in the blood. It explains how PTH acts on bones, kidneys, and intestines to maintain calcium balance. The Cleveland Clinic is a highly reputable medical institution, making this a credible and reliable source. Its strength is its clarity and clinical relevance. I used this source to support my explanation of PTH function and its interaction with vitamin D. It helped me ensure that my explanation of calcium regulation was accurate and clinically relevant.
14. National Institute of Health. Vitamin C [Internet]. National Institutes of Health. National Institutes of Health; 2021. [cited 2026 Apr 5]. Available from: <https://ods.od.nih.gov/factsheets/VitaminC-HealthProfessional/>
This source outlines the functions of vitamin C, including its role in collagen synthesis, antioxidant activity, and immune support. It also discusses dietary sources and deficiency effects. The NIH is a highly credible government organization, and this resource is evidence-based and intended for health professionals. Its strength lies in its accuracy and depth. I used this source to identify dietary sources of vitamin C and explain its role in maintaining connective tissue health in my assignment.

15. DePhillipo NN, Aman ZS, Kennedy MI, Begley JP, Moatshe G, LaPrade RF. Efficacy of Vitamin C Supplementation on Collagen Synthesis and Oxidative Stress After Musculoskeletal Injuries: A Systematic Review. Orthopaedic Journal of Sports Medicine [Internet]. 2018 Oct;6(10):232596711880454. [cited 2026 Apr 5]. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC6204628/>
This systematic review examines the effects of vitamin C supplementation on collagen synthesis and oxidative stress following injuries. It highlights the importance of vitamin C in tissue repair. This is a peer-reviewed journal article, making it highly credible. Its strength is its evidence-based analysis, though it is more specialized. I used this source to understand the functional role of vitamin C in the body and how deficiency impacts tissue repair, which I included in my assignment.
16. Harvard T.H. Chan. Folate (Folic Acid) – Vitamin B9 [Internet]. The Nutrition Source. 2012. [cited 2026 Apr 5]. Available from: <https://nutritionsource.hsph.harvard.edu/folic-acid/>
This source explains the role of folate in DNA synthesis, cell division, and overall health. It also discusses dietary sources and the importance of folate during pregnancy. Harvard's Nutrition Source is highly credible and research-based. Its strength is its ease to understand and scientific accuracy. I used this source to identify dietary sources of vitamin B9 and explain its importance in DNA synthesis.
17. National Institutes of Health. Vitamin B12 [Internet]. Nih.gov. National Institutes of Health; 2024. [cited 2026 Apr 5]. Available from: <https://ods.od.nih.gov/factsheets/VitaminB12-HealthProfessional/>
This source provides an overview of vitamin B12, including its role in red blood cell formation and neurological function. It also discusses dietary sources and deficiency risks. The NIH is a highly credible government organization, and this resource is evidence-based and intended for health professionals. Its strength lies in its accuracy and depth. I used this source to explain the functions of vitamin B12 and identify dietary sources for my assignment.
18. Medicine N. What Does Folic Acid Do for the Body? [Internet]. Northwestern Medicine. [cited 2026 Apr 5]. Available from: <https://www.nm.org/healthbeat/healthy-tips/what-does-folic-acid-do-for-the-body>
This source explains the functions of folic acid, particularly in cell division and development. It emphasizes its importance in growth and health. This is a credible medical resource, though slightly less detailed than academic sources. I used this source to better understand the role of folic acid and support my explanation of its function in the body.

19. Hasdemir B. What's the Difference Between Folic Acid and Vitamin B12 Deficiency? [Internet]. Liv Hospital. [cited 2026 Apr 5]. Available from: <https://int.livhospital.com/is-folic-acid-the-same-as-b12/>
This source compares folate and vitamin B12, highlighting similarities and differences in their roles in the body, particularly in red blood cell production. This is a general health resource and moderately credible. Its strength is its clear comparison. I used this source to differentiate between B9 and B12 in my assignment and explain their overlapping roles.
20. Mayo Clinic. Spina Bifida - Symptoms and Causes [Internet]. Mayo Clinic. 2023. [cited 2026 Apr 5]. Available from: <https://www.mayoclinic.org/diseases-conditions/spina-bifida/symptoms-causes/syc-20377860>
This source explains spina bifida, including its causes, symptoms, and complications. It highlights its link to folate deficiency during pregnancy. The Mayo Clinic is highly credible and widely trusted. I used this source to explain the consequences of vitamin B9 deficiency and provide a real-world example of its importance.
21. Al-Awami HM, Raja A, Soos MP. Physiology, Intrinsic Factor (Gastric Intrinsic Factor) [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2020. [cited 2026 Apr 5]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546655/>
This source explains intrinsic factor and its role in vitamin B12 absorption. It describes how deficiency leads to impaired absorption. This is a credible medical source from StatPearls. I used this source to explain how vitamin B12 is absorbed and how intrinsic factor deficiency contributes to disease.
22. Cleveland Clinic. Pernicious Anemia: Definition, Symptoms, Causes & Treatment [Internet]. Cleveland Clinic. 2022. [cited 2026 Apr 5]. Available from: <https://my.clevelandclinic.org/health/diseases/22377-pernicious-anemia>
This source describes pernicious anemia, including its causes, symptoms, and link to vitamin B12 deficiency and intrinsic factor. The Cleveland Clinic is a highly reputable medical institution, making this a credible and reliable source. Its strength is its clarity and clinical relevance. I used this source to explain the clinical effects of vitamin B12 deficiency and connect it to intrinsic factor and disease mechanisms.