

Enzyme Report Project

Instructions:

The assignment is to create a web report on an enzyme or protein of your choice. In order to complete the project you will need to collect a variety of data on an enzyme/protein and assemble it into a clear and concise report comprised of a web abstract page, PDF file of the Enzyme Report, and Powerpoint file to be used in an oral presentation. The details of the organization of the report and posting of the report to your web site are described below. Your choice of the protein is VERY important. The protein choice, including a written introduction/abstract describing the protein, will count for 20% of your grade for this assignment. You should try to choose a protein that either employs an interesting structural motif, interesting enzymatic mechanism, undergoes a conformational change in the process of carrying out its function, or has an allosteric transition between two or more conformations. **Be certain to choose a protein for which there is structural information about the substrate or ligand interaction.** Do not choose a static protein structure for which there is little additional information. Creativity in your choice of a protein is as important as the creativity in designing your web presentation. Each student MUST CHOOSE A DIFFERENT PROTEIN. If two students choose the same protein, then the first student to email their protein choice to me will get to use that protein. You are not allowed to choose one of the proteins that were chosen in the last three years. A list of these proteins can be found at

(<http://bmbiris.bmb.uga.edu/8010/moremen/EnzymeReport/OldProteinList1.html>)

I will reply to you if your choice of the protein is OK.

Grading:

20% Creativity in the choice of the protein, posting of the abstract/introduction (see below)

40% Quality of the text and graphics in the report

10% Technical issues: organization, display, links, graphics, references, etc.

30% Oral presentation: clarity, brevity, and effectiveness of graphics in illustrating discussion points

Deadlines:

Each student will be responsible for preparing and posting his or her web documents before various deadlines. These deadlines are as follows:

Aug. 26, 2008: Provide your MyID for your MyWeb account and your email address

Before Sept. 18, 2008: Email your choice of protein to me (moremen@uga.edu).

Sept 18, 2008: Post your introduction/abstract page on your MyWeb web site (using MyDrive, see below).

Nov. 6, 2008: Post your background and description write-up for your protein on your MyWeb site.

Nov. 20, 2008: Post your Powerpoint file for your oral presentation.

Dec. 2 and 6, 2008: Oral presentations of your Enzyme Report

Creating your UGA Mail/MyWeb web account and posting your report documents:

Each member of the class will be responsible for establishing a computer account on UGA Mail/MyWeb (the university email and web server). If you do not already have an account on UGA Mail/MyWeb you must establish an account by logging on through the web site at: (<https://www.myweb.uga.edu/myid/>).

Once you have an email account you also automatically get access to web server space on the university server After you establish your account the first thing you must do is send an email to me containing

your UGA Mail/MyWeb account name (deadline Aug 20, 2007). I will be creating an index page for the class web site so that anyone in the class can see your Enzyme Report Project. The next thing that you must do: read the instructions on managing your files on the web server using the MyWeb and MyDrive server software that can be found at: (<https://mydrive.uga.edu/NetStorage/>) with instructions that are found at: (<http://eits.uga.edu/myweb/>). Once you have established your site in the UGAMail/MyWeb/MyDrive web space and practiced transferring files into and out of the account, you will need to navigate to the “www” directory (NetStorage -> Home@UGA -> www) and create a folder called “bcmb8010” in all lower case. The easiest way is to go to use the folder view and use the “File” pull down menu to select “new folder”. Enter “bcmb8010” and click OK. A new directory folder should appear with that directory name (be sure that it is inside the “www” folder). All of the documents relating to the Enzyme Report Project will be transferred into the “bcmb8010” folder. This is important because I will be creating the class database to access the report assuming that all of the relevant information is in this folder. Once your files are transferred to this directory, they are theoretically visible to the world so you must be careful to follow the rules about using copyrighted material discussed below. The top-level page in the report will be the ABSTRACT/INTRODUCTION page and it MUST be called “index.html”. You will create this page and transfer it into the “bcmb8010” folder using the pull-down menu command within MyDrive (File -> Upload). A pop-up window will appear that will allow you to navigate to the location on your computer where the file exists (click the “Browse” link) and you select the file and click open. The path to the file will now appear in the File: box. Click “Upload” and the file should appear in the directory that was active at the time of the download. BE CERTAIN THAT ALL OF THE UPLOADED FILES ARE IN YOUR ‘bcmb8010’ FOLDER OR THEY WILL NOT BE VISIBLE TO THE CLASS (INCLUDING ME!).

Choosing your protein and writing an abstract/introduction:

The first page of your report is the abstract/introduction. It should clearly describe the following information in <500 words:

- 1) name of the protein
- 2) function of the protein
- 3) interesting features/cofactors of the protein
- 4) brief description of the aspects of activity, conformational change, or interactions of the protein that justify its choice for the enzyme report.
- 5) emphasize any additional relevance that would attract a someone to continue reading the document.

Remember, this is an abstract/introduction. It is meant to be brief, but touch on the key points that will be in your write-up and graphic presentations. It is a good idea to include some graphics about the protein in the page to make it more visually appealing, but don't go overboard!! Graphics are not required and will not enhance your grade. The easiest way to do this is to create a word processing document in MS Word and then save it as a web page (within Word choose the pull down menu File -> Save as Web Page). BE CERTAIN TO NAME THE FILE “index.html”, no caps, with the extension “html” NOT “htm”. Upload the file into your “bcmb8010” directory using MyDrive. IF YOU DO INSERT GRAPHICS IN THE ABSTRACT SEE THE NOTE BELOW IN “ASSEMBLING THE WEB REPORT” ABOUT THE DIRECTORY STRUCTURE AND WHAT YOU NEED TO UPLOAD IN ADDITION TO THE ‘index.html’ file.

Writing the body of the Enzyme Report:

In the body of the Enzyme Report you will summarize what is known about the enzyme including the

following (be certain to note links to other web-accessible data whenever possible):

- 1) History of the enzyme: (how was it discovered, how was the catalytic activity/function determined, how do you assay the enzyme activity/function, pH optimum, ionic strength, redox effects, activators, inhibitors (synthetic or biological), EC number, synonyms or historical names),
- 2) Where has the enzyme/protein been isolated from (species source, natural source or recombinant expression, isolation and purification methods).
- 3) Gene/cDNA isolation (species including accession numbers for protein, cDNA, gene).
- 4) Biological aspects (spatial to temporal expression patterns, trafficking, activation, normal function/substrates, disease involvement (including human disease or animal models, i.e. gene disruptions and transgenic expression in mice or other organisms, cell transfectants).
- 5) Structural biology (This is the most important part of the report. Include graphic representations of the protein as GIF files from Rasmol or PNG files from Pymol and any other graphics on the structure or sequence of the protein that highlights distinguishing features of the protein (INCLUDING THE CATALYTIC MECHANISM). Be creative in your use of the graphics. The structural biology description is where a bulk of your grade will come from.)

The body of the report should be written with a standard word processing program (i.e. MS Word) and should contain **at least 5 pages of single-spaced text** (excluding graphics) describing the details of the protein. Graphics can either be embedded in the text (i.e. with word-wrapping) or as separate pages at the end of the report, but they MUST all be a part of a SINGLE file. Creativity in the creation of the report is important. Use graphics that you have generated yourself as much as possible. Color and graphics should be used as often as possible for illustrating the points in the report. If you use a graphic from some other source **IT MUST BE APPROPRIATELY REFERENCED and COPYRIGHT PERMISSION MUST BE OBTAINED (see below). BE AWARE: YOU SHOULD NOT DIRECTLY QUOTE ANY TEXT OR GRAPHICS FROM ANOTHER SOURCE WITHOUT APPROPRIATE CITATION. UNDER NO CIRCUMSTANCES SHOULD YOU NEED TO DIRECTLY USE TEXT PASSAGES FROM OTHER SOURCES. IF YOU DO YOU WILL IMMEDIATELY GET A ZERO FOR THE ENTIRE ENZYME REPORT ASSIGNMENT. THIS HAS HAPPENED BEFORE AND IT WILL NOT BE TOLERATED. WHEN IN DOUBT ASK ME ABOUT HOW TO DEAL WITH QUOTED MATERIAL. IF YOU GET A ZERO ON THE ENZYME REPORT YOU WILL LIKELY GET AN "F" FOR THE COURSE. TAKE IT SERIOUSLY!!!**

References:

Be certain to appropriately reference all previously published data that you include in your presentation. Do not attempt to omit relevant references. If you discuss data that came from another source without appropriate attribution it is considered PLAGIARISM. The consequences for plagiarism are severe; a drop in letter grade for each occurrence (that means for each unattributed fact in the presentation). When in doubt, include a reference. Make all attempts to avoid directly using copyrighted materials as a part of your presentation. Re-draw figures when possible and cite the original source for the data. **ALL GRAPHICAL REPRESENTATIONS OF PROTEIN STRUCTURES MUST HAVE A FIGURE LEGEND CONTAINING THE PDB ID CODE AND A REFERENCE CITATION FOR THE ORIGINAL ARTICLE DESCRIBING THE STRUCTURE. EACH FIGURE ALSO MUST DESCRIBE WHAT PROGRAM WAS USED TO GENERATE THE GRAPHIC** (i.e. Rasmol, Pymol, Powerpoint, Illustrator, Photoshop, etc.). If it is necessary to copy a copyrighted figure as a graphic **BE ABSOLUTELY CERTAIN THAT YOU REFERENCE THE ORIGINAL SOURCE**

CORRECTLY AND STATE THAT COPYRIGHT PERMISSION WAS OBTAINED. REMEMBER: this will be a public-access web site and copyright laws apply even to instructional materials. You need to get permission from the publication source to use the figure in your web report. This takes time (often more than 1 month). Since the write-up is due Nov. 6th, you have until Nov. 6th to obtain permission to use copyrighted material. If no permission is obtained in writing or by email then the graphic must be removed. Proof of copyright permission must be forwarded to Dr. Moremen by Nov. 6th. Each inclusion of copyrighted materials in the report after this deadline without proof of permission will result in a 10 point penalty.

For all references be certain to follow a standard reference style. For example the reference instructions for J. Biol. Chem. Are as follows:

- 1) Cite references in text by number rather than author and date.
- 2) Number references consecutively in the order of appearance in the manuscript.
- 3) References for journals and books should be in the following styles:
 1. MacDonald, G. M., Steenhuis, J. J., and Barry, B. A. (1995) J. Biol. Chem. 270, 8420-8428
 2. Sambrook, J., Fritsch, E. F., and Maniatis, T. (1989) Molecular Cloning: A Laboratory Manual, 2nd Ed., Cold Spring Harbor Laboratory, Cold Spring Harbor, NY

Journal names are abbreviated according to Chemical Abstracts. Authors are fully responsible for the accuracy of the references.

Footnotes are used to cite manuscripts in preparation, unpublished observations, and personal communications.

All abbreviations used in the text must be defined in a single footnote inserted at the end of the report. The abbreviations of some important biochemical compounds, e.g. ATP, NADH, DNA, and amino acids in proteins, need not be defined. Phrases such as "central nervous system" or "red blood cells" should not be abbreviated. Names of enzymes are usually not abbreviated except in terms of the substrates for which there are accepted abbreviations, e.g. ATPase and RNase.

A few starting points as sources for information:

RCSB database of PDB files: (<http://www.rcsb.org/pdb/>)

ENTREZ search engine: (<http://www.ncbi.nlm.nih.gov/gquery/gquery.fcgi>) allows searches of PubMed (Medline reference database), Nucleotide (DNA/RNA sequences from GenBank), Protein (protein sequences from GenBank), Genome (complete genome sequence information), Structure (a different structural database than RCSB), PopSet (a database of population sequences).

In addition be sure to check **OMIM** for human disease information:

(<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=OMIM>)

BLAST, PSI-BLAST and PHI-BLAST searches for identifying related sequences:

(<http://www.ncbi.nlm.nih.gov/BLAST/>)

Remember: many of these databases are linked to each other so additional reference and resource information is just a mouse click away.

There are additional database resources available for specific protein/enzyme classes such as

SCOP: Structural Classification of Proteins: (<http://scop.mrc-lmb.cam.ac.uk/scop/>)

CATH: Protein Structure Classification: (<http://www.cathdb.info/latest/index.html>)

CAZY: Carbohydrate-Active enzymes: (<http://afmb.cnrs-mrs.fr/CAZY/>)

ENZYME: Enzyme nomenclature database: (<http://us.expasy.org/enzyme/>)

ExPASy: Expert Protein Analysis System: (<http://us.expasy.org/>)

Bioinformatics Tools: Atelier BioInformatique Online Analysis tools: (<http://www.up.univ->

mrs.fr/~wabim/english/logligne.html)

Enzyme structure databases: from Biomolecular Structure and Modelling group at University College:
(<http://www.biochem.ucl.ac.uk/bsm/enzymes/index.html>)

A very comprehensive resource for all sorts of analytical resource tools for sequence analysis can be found at: (http://www.public.iastate.edu/~pedro/research_tools.html)

And the biggest resource of information of all types can be found at:

(http://www.pasteur.fr/recherche/BNB/bookmarks/bookmarks-types_ressources:criteres_bio:organismes.html) (it is HUGE and loads very slowly). A search engine for the latter link is at (<http://www.pasteur.fr/recherche/BNB/bnb-en.html>)

Creating graphics for the Enzyme Report

Create all of the static graphic images in an appropriate graphics program and save the images in JPEG, GIF, PICT, or TIFF format for import into your word processing document. To make protein structure graphic images download the relevant PDB files, load them in RasMol, and modify the display of the structure using the RasMol command line interface. Once you have the display illustrating the points that you want to make you will save the view as a static graphic (use the menubar EXPORT -> GIF command). You can then import the graphic into Powerpoint to add extra graphic elements (i.e. arrows, boxes, text) then save the Powerpoint slide as a JPEG, GIF, PICT, or TIFF format for importing into your word processing document. A similar approach can be used to display your proteins structures in Pymol. Open the PDB file in Pymol, modify the display characteristics using the pull-down menus and command interface. Ray trace the image using the image using the button on the upper right of the screen. Save the image as a PNG file using the pull-down menus (File > Save Image As > PNG commands). Import the PNG file into a Powerpoint slide and label it as you wish. Save the Powerpoint slide as a JPEG, GIF, PICT, or TIFF format for importing into your word processing document.

How do I assemble the pieces for the Enzyme Report?

First prepare the content of the web report:

The best plan is to first create each element of the presentation separately. Write the text for the body of the descriptive material in a word processor. You should plan on using a minimum of at least 5 static graphics and AT LEAST 5 PAGES of single-spaced text content (as viewed in a word processor) excluding graphics, tables, or references. Feel free to be more creative in the design of your presentation using more links and graphics. To insert the graphics into the Word document use the Insert-> Picture-> From File pull-down menu and browse to find the relevant graphic. Resize the graphic and wrap the text as desired and save the document first as a Word document. When the report is completed you will then save the report as a PDF formatted file (Adobe Acrobat format). Some computers/word processing software allow you to directly save a document as a PDF formatted file, either by saving them directly as a PDF file in the "Save as" dialog box or "printing" them as a file that you save to your disk. If your computer/software does not allow you to directly convert to a PDF formatted file then you can use software available from the UGA Graduate School (Ghostscript, pdfEdit995, or Adobe Acrobat) that will be able to convert a complex Word document to a PDF file. The software can be found at: (http://www.grad.uga.edu/academics/thesis_pdfEDITinstructions.html). Remember that web links will probably be removed from your text document when saved as a PDF file. They can be added back after you have saved it as a PDF file by using Adobe Acrobat, but it is not required that you have active links in your final PDF file. The organization of the content material in the uploaded PDF file is up to you. You should name the final PDF file of the enzyme report "report.pdf".

Assembling the Web Report:

It will be necessary for you to assemble the parts of the report into a collection of linked pages. There are three parts to the report. The first part is the abstract page. Assemble the abstract/introduction page by writing the body of the abstract in a word processing program such as MS Word as described above and save it as a “Web Page” using the “save as Web page” feature of MS Word. There are many other options for saving as a web page from other programs that I can provide assistance with if needed. Once you have made the simple abstract/introduction page you can add links and graphics to the page. You can insert graphics into the web page just as you did in the report body by opening the web page in MS Word and using the Insert -> Picture -> From File pull-down menu and browse to find the relevant graphic. Resize the graphic and wrap the text as desired and save the document again as a web page. BE AWARE: if you add graphics to the page in MS Word and then save the file it will create a separate folder along with your web page document (the folder is usually called “index_files”). Within this folder are the individual graphics files that you inserted into the web page. You will have to upload all of the files in this folder onto your MyWeb space using MyDrive when you upload the web page file. To do this you will need to create a folder within your “bcmb8010” folder called “index_files” and upload all of the files (one at a time upload the filelist.xml, image001.jpg, image002.jpg...) into this server directory.

The second part of the report is the PDF version of the enzyme report. You should call this file “report.html” and upload it into the “bcmb8010” folder.

The third part of the report is the Powerpoint file that you will use in your oral presentation. Each student will present a 4 min oral report in the last two class periods of the semester summarizing the important issues that were discussed in the body of your Enzyme Report using a series of Powerpoint slides. Since you only have 4 min you will need to think carefully about the composition of the slides. Usually you will only have time for 2-3 slides on the background and function of the protein and 3-4 slides on the structure and mechanism of action, followed by a summary slide. Practice the presentation so that you can fit the presentation into a 4 min time slot. When your 4 min are up your presentation is over, whether you got to the last slide or not!!! Name the Powerpoint file with your “LastName.ppt” and upload it into your “bcmb8010” folder.

You will then modify the abstract page to create a series of links: one link to the PDF file version of the report and the other link will be to the Powerpoint file for your oral report. First, check that all of the files are in the “bcmb8010” folder on your MyWeb server site and that they are named “index.html” (for the abstract), “report.pdf” (the PDF file of the enzyme report), “LastName.ppt” (your Powerpoint file for your oral report), and any accessory files in the “index_files” folder associated with the graphics in the abstract. You will now create a links from the bottom of the abstract page to the other files. Create text at the bottom of the page that you will use to link to the Enzyme Report PDF file. Select the text with the cursor and then go to the MS Word pull-down for Insert -> Hyperlink and in the “Link to” box type “http://USERNAME.myweb.uga.edu/bcmb8010/report.pdf” where USERNAME is replaced by your MyID username. Similarly, create text at the bottom of the page that you will use to link to the Powerpoint file for the oral report. Select the text with the cursor and then go to the MS Word pull-down for Insert -> Hyperlink and in the “Link to” box type “http://USERNAME.myweb.uga.edu/bcmb8010/LastName.ppt” where USERNAME is replaced by your MyID username and LastName.ppt is the name of your Powerpoint file. Save the abstract file as “index.html” and upload it back to the MyWeb space overwriting the prior “index.html” file. Now the abstract page will act as an index page for navigating to the body of the report and the oral report

information.

Other references and sources of information:

There are also several pages of tutorials and instructions for preparing RasMol scripts and incorporating them into Web presentations.

Try visiting these links:

Save scripts of desired views from RasMol, then play them back:

(<http://www.umass.edu/microbio/chime/prsswc/prssft.htm>)

Animated tutorials on biomolecular structures: (<http://www.umass.edu/microbio/rasmol/scripts.htm>)

World Index of BioMolecular Visualization Resources: (<http://molvis.sdsc.edu/visres/index.html>)

Final file structure of your MyWeb/MyDrive web site for the Enzyme Report:

Things to remember in preparing the Web Report:

All of the students in the class will be able to read the web reports of other students in the class, but only you will have access to write in your own folder. This way you can compare your efforts with the reports of the other students in the class. This should allow you to obtain inspiration, motivation, and hopefully assistance in troubleshooting problems with inserting links and graphics. This is meant to be a learning process. You will not be allowed to hide menubar or source code access to the presentation from the other students or points will be taken off from your presentation. It is important to be creative but also be helpful to other students in their efforts to learn how to make web presentations.

When the final report is complete and uploaded the directory structure inside your “www” folder should look like the following:

Other files and folders in your “www” folder....

A “bcmb8010” folder containing:

- a) index.html (this is the abstract introduction page)
- b) report.pdf (this is the report on the enzyme/protein containing all of the graphics converted into a pdf file.)
- c) Last Name.ppt (this is the series of slides that will be used in your oral report)
- d) a folder called “index_files” containing a file called “filelist.xml” and others called image001.jpg, image002.jpg, etc (if you added graphics to the abstract)

Final checklist:

- 1) At the top of every page, add this line; **"Please note these web pages are part of an assignment for a graduate course in Advanced Biochemistry and Molecular Biology BCMB8010 at the University of Georgia. Questions should be directed to YOUR NAME (your email address)."**
- 2) Do not have any fancy backgrounds on any page. In general, it is better to keep it simple.
- 3) The color of text should be black on a light-colored background for easy reading.
- 4) All references must be written in the proper format.
- 5) At the bottom of your abstract/introduction page, you must put your contact information and a link back to the BCMB8010 web page.
- 6) Be certain to change the title line of the browser window to indicate the name of your protein. Change it to the name of your protein.

Technical Issues (be sure to check all of these issues in BOTH Windows and Mac platforms):

Do all your links work?

Are all your images visible?

Is it easy to read your text (dark letters on light background)?

Did you provide the student assignment disclaimer on your page?

Did you provide links back to the BCMB8010 course page, and any other appropriate pages?

Did you provide your email address for readers to use when contacting you?

Oral Report of the Enzyme Report Project:

On either Dec. 2 or 4, 2008 each member of the class will give an oral presentation of their web report. Each student will present the important issues that were discussed in the body of the report using a series of Powerpoint slides. Each oral report will last for 4 min. It will be critical that each student prepares well in advance and that all aspect of the web report are functional. The oral presentation will be graded for clarity, brevity, and effectiveness of graphics in illustrating discussion points. Half of the class will present their reports on each day (~20 reports each day). You will need to post your Powerpoint file to your web site by Nov 20th and be certain that any relevant links work. I will download each of the Powerpoint files to the class computer in the lecture room and the presentations will be run from the computer on the lecture podium.

Importance of the oral reports for the final exam:

The contents of the oral reports presented in class will be included as material in the final exam on Dec 11, 2007. The final exam will ask questions on 3 of the reports that were presented in the last two class periods. You will be informed before the oral presentations which of the 3 reports will be included in the exam. The importance of clarity in your report is obvious; four of you will be determining both the quality of your own grade in your oral presentation and everyone else's grade in the final exam. Students will need to pay attention to the presentations in order to answer the questions in the final exam. Obviously if your report is chosen, then you will only have to learn the content of three other reports, because you presumably know your own!!! Remember the criteria for the descriptions in the body of the report:

- 1) History of the enzyme?
- 2) Where has the enzyme/protein been isolated from?
- 3) Gene/cDNA isolation source?
- 4) Biological aspects?
- 5) Structural biology (INCLUDING THE CATALYTIC MECHANISM)?

The criteria for grading the Enzyme Report from 2007 is as follows (no guarantee that it will be the same for 2008):

Introduction/Abstract: (20pts total)

Sufficient introduction to the protein, summary of the highlights of the report (7pts)

Clarity of description (6 pts)

Justification/relevance for the choice of the protein (7 pts)

Body of the report: background, biological aspects, and structural biology: (40 pts total)

Completeness of the background material (10 pts)

Creativity and appropriate use of graphics to illustrate pathways, mechanisms, or other relevant background information (10 pts)

Sufficient detail in the description of the protein structure and mechanism of action (15)

Appropriate use of references and links (3 pts)

Text description of graphic images in legends and text (relevance to interpretation of graphic

images) (2 pts)

Technical Issues: (10 pts total)

Organization, display, links, graphics (6 pts):

References (4 pts):

Completeness of citations (appropriate formatting) (1 pt)

Appropriate use of references in text and legends to figures (2 pts)

Sufficient number of references to provide reference material for the Background section (1 pt)

Oral Report: (30 pts total)

Effective introduction of the protein (5 pts)

Effective description of the protein function (10 pts)

Clarity, effectiveness of graphics in illustrating discussion points (10 pts)

Brevity, completion of the presentation on time (5 pts)