GaDOE One Day AP Biology Workshop East Coweta High School

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Welcome…

apbiopengins.weebly.com

- 9 years of Classroom Experience
- 5 Years of AP Reading Experience
- 3 Year AP Question Writer
- 3 Year AP Mentor
- Last Year: 81% Pass Rate

Agenda

- 8:30 – 9:00 Introductions & My Classroom Dynamics
- 9:00 – 10:00 DNA Replication Manipulatives
- 10:00 – 10:20 FRQ Workshop
- 10:20 – 10:35 BREAK
- 10:35 – 11:00 FRQ Workshop
- 11:00 – 11:45 Paper Gel Electrophoresis
- 11:45 – 1:00 Lunch and Informal Discussion Groups
- 1:00 – 1:30 Data Talk
- 1:30 – 2:30 HHMI Population Genetics Activity
- 2:30 – 2:40 HHMI Prizes
- 2:40 – 3:00 Evaluation & Dismissal

My Classroom Dynamics

Classroom Schedule

- Monday – Notes Quiz
- Tuesday – Vocabulary Practice/Games
- Wednesday – FRQ
- Thursday – Scientific Application/SSE
- Friday – CER/Data Nuggets

DNA Replication Manipulatives

- You will be given a paper with the code for a strand of DNA of a suspect, victim, or murderer; using the pop-beads (see key) construct the DNA strand you were given.
- Remember your base-pairing rules (A – T & C – G) and directionality of the structure (5'→3' & 3←5')
- THIS STRAND WILL BE VERY IMPORTANT SO BE SURE TO CONSTRUCT IT CORRECTLY!!
    - Note: There are not enough clear plastic pieces for every nitrogenous base. This is on purpose to save your fingers when it is time to disassemble/replicate

A = yellow bead
T = orange bead
G = green bead
C = blue bead

Phosphate = red bead
Sugar (deoxyribose) = white bead
Hydrogen bond = clear rod

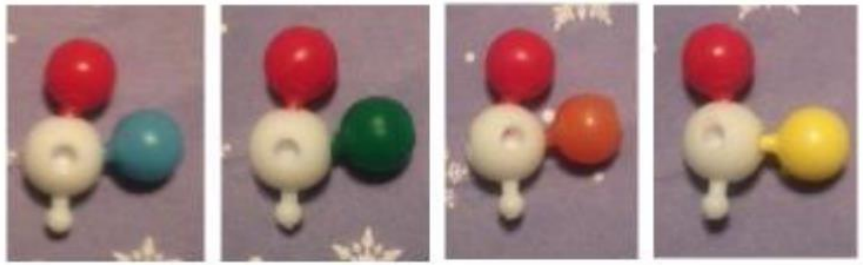
DNA Replication Manipulatives

- Yes, I know you love me…
- You will be making a DNA strand using a specific sequence given to you in the folder
  - Recall…
    - Adenine binds with thymine (yellow & orange)
    - Cytosine binds with guanine (blue & green)
    - DNA is ANTIPARALLEL
    - 5' end is phosphate (red bead)
    - 3' end is hydroxyl (white bead)
  - WHEN BUILDING… RED BEAD MUST BE FIRST AT 5' END AND THE LAST BEAD IN CHAIN SHOULD BE WHITE WITH A NUB!

DNA Replication Manipulatives

DNA Replication Manipulatives

- Using your Crime Scene DNA, you are to complete all steps of DNA Replication (recall your reading of the jobs of the various enzymes and the directionality of replication)
  - Use the video on itsLearning to ensure understanding of DNA Replication with the popbeads.
- After completion, please REASSEMBLE the container appropriately.
  - Easiest way to break the strand without breaking the nucleotides is to pop apart at the white nubs in the chain



- When you are finished you will reset the container back to normal
  - 15 of each color NUCLEOTIDE
    - DO NOT TAKE APART THE NUCLEOTIDES
    - Each nucleotide should look like above with the white bead attached to a color on the side and the red bead on the bottom (white bead with nub and red bed without nub)
  - 10 connectors in each baggie
  - Return extra pieces to their homes

FRQ Workshop

AP Reading Experience

- Collaboration with other teachers
- Insight to scoring guidelines

  (what is acceptable or not acceptable)
- 2020 AP Reading (Biology)

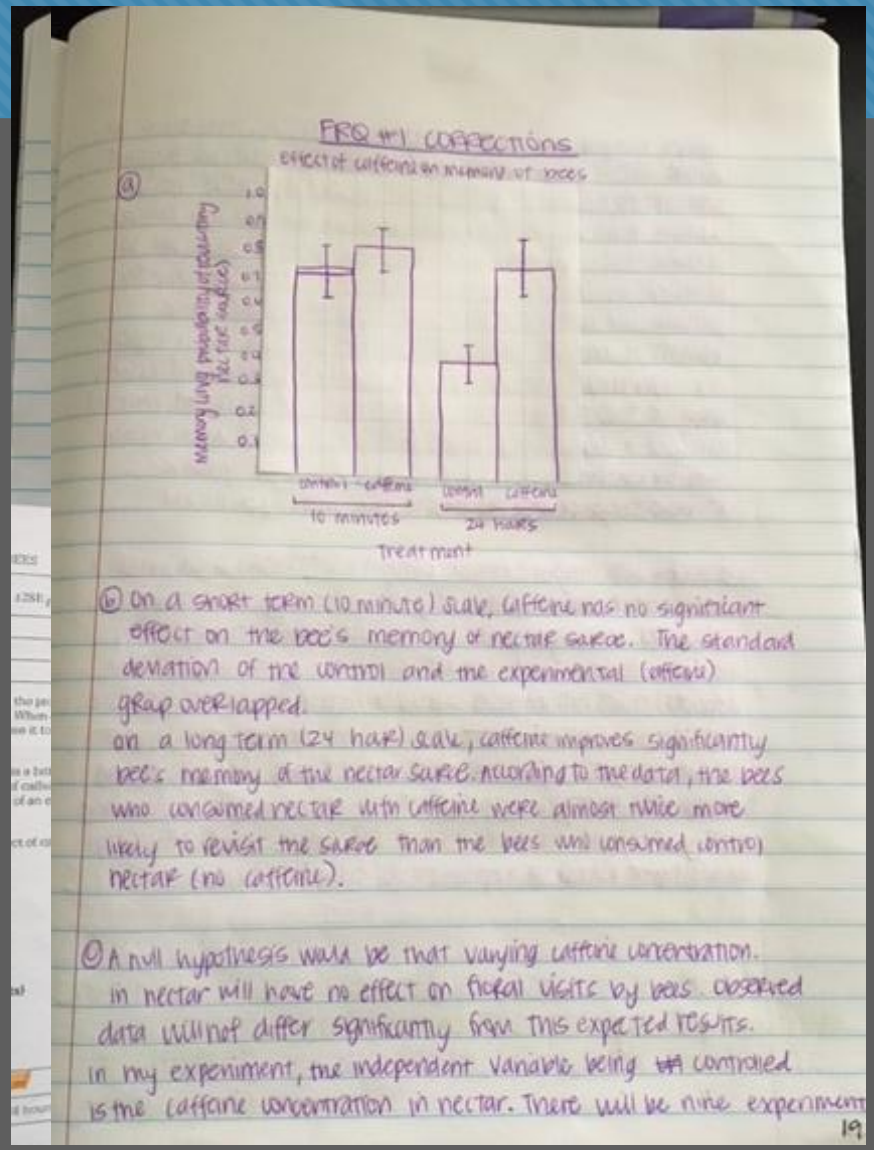
  Kansas City June 11 – 18

collegeboard.org/readAP

FRQ Workshop – FRQ Notebook

FRQ Notebook

- Located in Composition Notebook
- Tape/Glue Question
- 20 Minutes to Write FRQ
- Self/Peer Grade
- Tape/Glue Scoring Guidelines
- Corrections



FRQ Workshop – 2018 #2

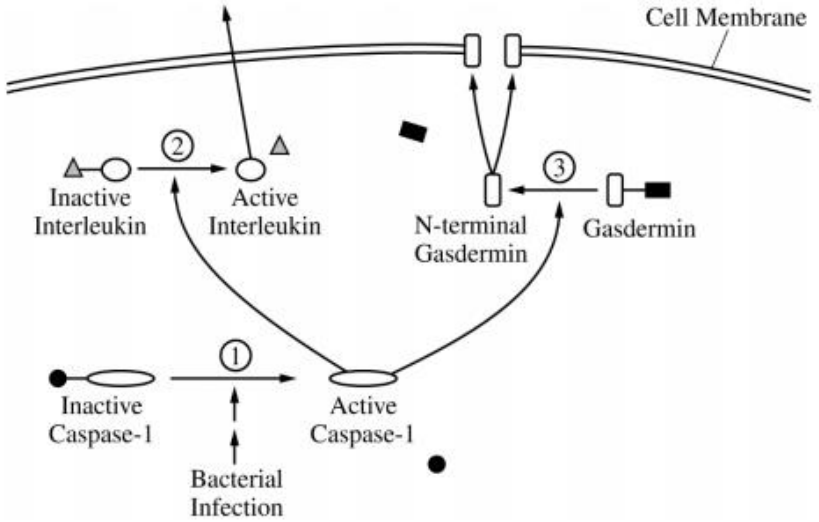


Figure 1. Cellular response to infection by pathogenic bacteria

Some pathogenic bacteria enter cells, replicate, and spread to other cells, causing illness in the host organism. Host cells respond to these infections in a number of ways, one of which involves activating particular enzymatic pathways (Figure 1). Cells normally produce a steady supply of inactive caspase-1 protein. In response to intracellular pathogens, the inactive caspase-1 is cleaved and forms an active caspase-1 (step 1). Active caspase-1 can cleave two other proteins. When caspase-1 cleaves an inactive interleukin (step 2), the active portion of the interleukin is released from the cell. An interleukin is a signaling molecule that can activate the immune response. When caspase-1 cleaves gasdermin (step 3), the N-terminal portions of several gasdermin proteins associate in the cell membrane to form large, nonspecific pores.

Researchers created the model in Figure 1 using data from cell fractionation studies. In the experiments, various parts of the cell were separated into fractions by mechanical and chemical methods. Specific proteins known to be located in different parts of the cell were used as markers to determine the location of other proteins. The table below shows the presence of known proteins in specific cellular fractions.

CELL FRACTIONS CONTAINING DIFFERENT CELLULAR PROTEINS

	Aconitase (Krebs cycle protein)	DNA polymerase	GAPDH (glycolytic protein)	Sodium-potassium pump	NF-κB (Immune response protein)
Whole cell sample	+	+	+	+	+
Fraction 1	+				
Fraction 2		+			+
Fraction 3			+		+
Fraction 4				+	

+ = presence of protein

FRQ Workshop – 2018 #2

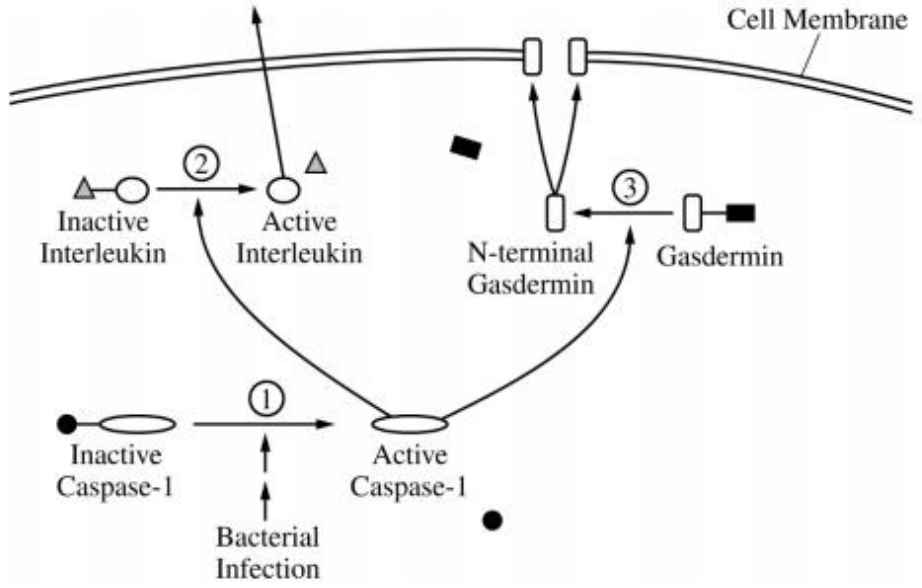


Figure 1. Cellular response to infection by pathogenic bacteria

(a) **Describe** the effect of inhibiting step 3 on the formation of pores AND on the release of interleukin from the cell.

Description (2 points)

- Pores will not form.
- Interleukin release will not be affected/interleukin release continues.

FRQ Workshop – 2018 #2

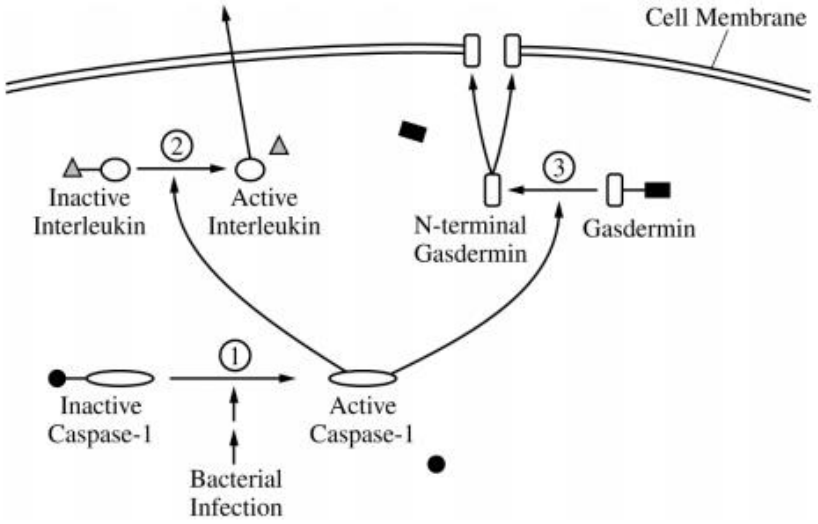


Figure 1. Cellular response to infection by pathogenic bacteria

(b) **Make a claim** about how cleaving inactive caspase-1 results in activation of caspase-1. A student claims that preinfection production of inactive precursors shortens the response time of a cell to a bacterial infection. **Provide ONE reason** to support the student's claim.

Claim (1 point)

- Removes inhibitor/repressor/inhibitory domain of protein
- Changes the shape/protein structure

Reasoning (1 point)

- Cleaving a precursor/protein/molecule is faster than making one upon infection.
- Cells do not have to wait for transcription and translation/protein synthesis.

FRQ Workshop – 2018 #2

(c) A student claims that the NF-*k*B protein is located in the cytoplasm until the protein is needed for transcription. **Justify** the student's claim with evidence. **Identify TWO** fractions where N-terminal gasdermin would be found in cells infected with pathogenic bacteria.

Justification (1 point)

- NF-*k*B and glycolytic enzymes/GAPDH are found together (in the cytoplasm).

Identification (2 points)

- Fraction 3
- Fraction 4

CELL FRACTIONS CONTAINING DIFFERENT CELLULAR PROTEINS

	Aconitase (Krebs cycle protein)	DNA polymerase	GAPDH (glycolytic protein)	Sodium-potassium pump	NF-κB (Immune response protein)
Whole cell sample	+	+	+	+	+
Fraction 1	+				
Fraction 2		+			+
Fraction 3			+		+
Fraction 4				+	

+ = presence of protein

FRQ Workshop – 2018 #2

(d) **Describe** the most likely effect of gasdermin pore formation on water balance in the cell in a hypotonic environment.

Description (1 point)

- Water enters the cell.

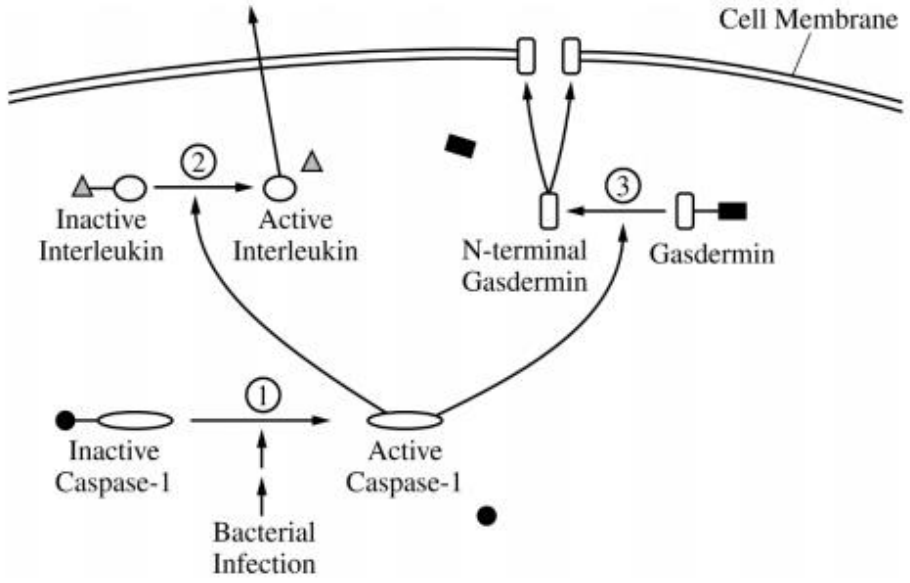


Figure 1. Cellular response to infection by pathogenic bacteria

FRQ Workshop – 2018 #2

(e) **Explain** how gasdermin pore formation AND interleukin release contribute to an organism's defense against a bacterial pathogen.

Explanation (2 points)

- Cell lysis destroys infected cells OR cell lysis prevents bacteria from replicating.
- Interleukin signaling will stimulate immune cells/components of the immune system (to destroy the infected cells or bacteria).

FRQ Workshop – 2018 #2

(a) **Describe** the effect of inhibiting step 3 on the formation of pores AND on the release of interleukin from the cell.

Description (2 points)

- Pores will not form.
- Interleukin release will not be affected/interleukin release continues.

(a) By inhibiting step 3, caspase 1 won't end up cleaving gasdermin. This means the response of large nonspecific pores forming won't occur as there won't be N-terminal portion of gasdermin protein to associate and form the pores in the cellular membrane.

By inhibiting the release of interleukin, the immune response can't be activated as interleukin is the signaling molecule. A consequence would be far spreading of the bacteria and illness.

FRQ Workshop – 2018 #2

(b) **Make a claim** about how cleaving inactive caspase-1 results in activation of caspase-1. A student claims that preinfection production of inactive precursors shortens the response time of a cell to a bacterial infection. **Provide ONE reason** to support the student's claim.

Claim (1 point)

- Removes inhibitor/repressor/inhibitory domain of protein
- Changes the shape/protein structure

Reasoning (1 point)

- Cleaving a precursor/protein/molecule is faster than making one upon infection.
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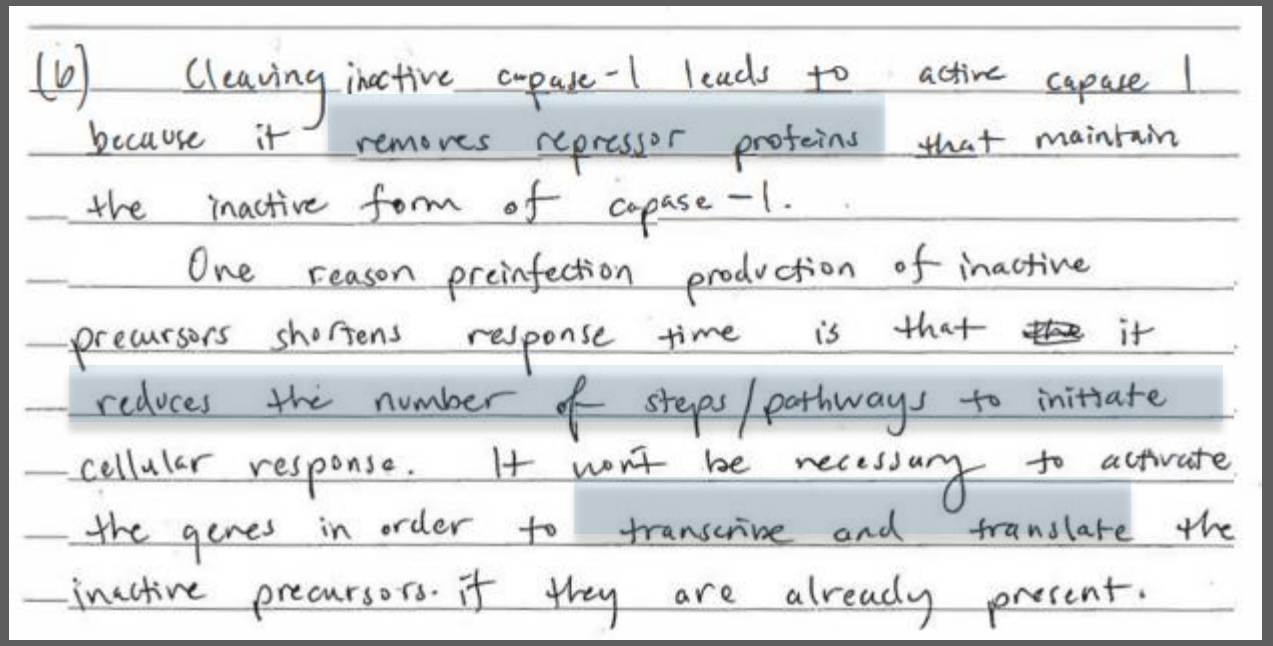


(b) Cleaving inactive capase-1 leads to active capase 1 because it removes repressor proteins that maintain the inactive form of capase-1.

One reason preinfection production of inactive precursors shortens response time is that ~~the~~ it reduces the number of steps/pathways to initiate cellular response. It won't be necessary to activate the genes in order to transcribe and translate the inactive precursors. if they are already present.

FRQ Workshop – 2018 #2

(c) A student claims that the NF-*k*B protein is located in the cytoplasm until the protein is needed for transcription. **Justify** the student's claim with evidence. **Identify TWO** fractions where N-terminal gasdermin would be found in cells infected with pathogenic bacteria.

Justification (1 point)

- NF-*k*B and glycolytic enzymes/GAPDH are found together (in the cytoplasm).

Identification (2 points)

- Fraction 3
- Fraction 4

(c) Evidence that NF-kB remains in the cytoplasm till needed comes from fraction 3. ~~a~~ This is because GAPDH is a glycolytic protein that would be present in the cytoplasm to the cellular membrane. It wouldn't be in an organelle. As a result, the fraction 3 indicates NF-kB isn't being used for transcription and would be located in the cytoplasm until needed. If ~~[illegible]~~ NF-kB isn't generated until transcription is taking place, then NF-kB wouldn't be in a fraction with GAPDH, a glycolytic protein. NF-kB would only be observed near DNA such as in fraction 2.

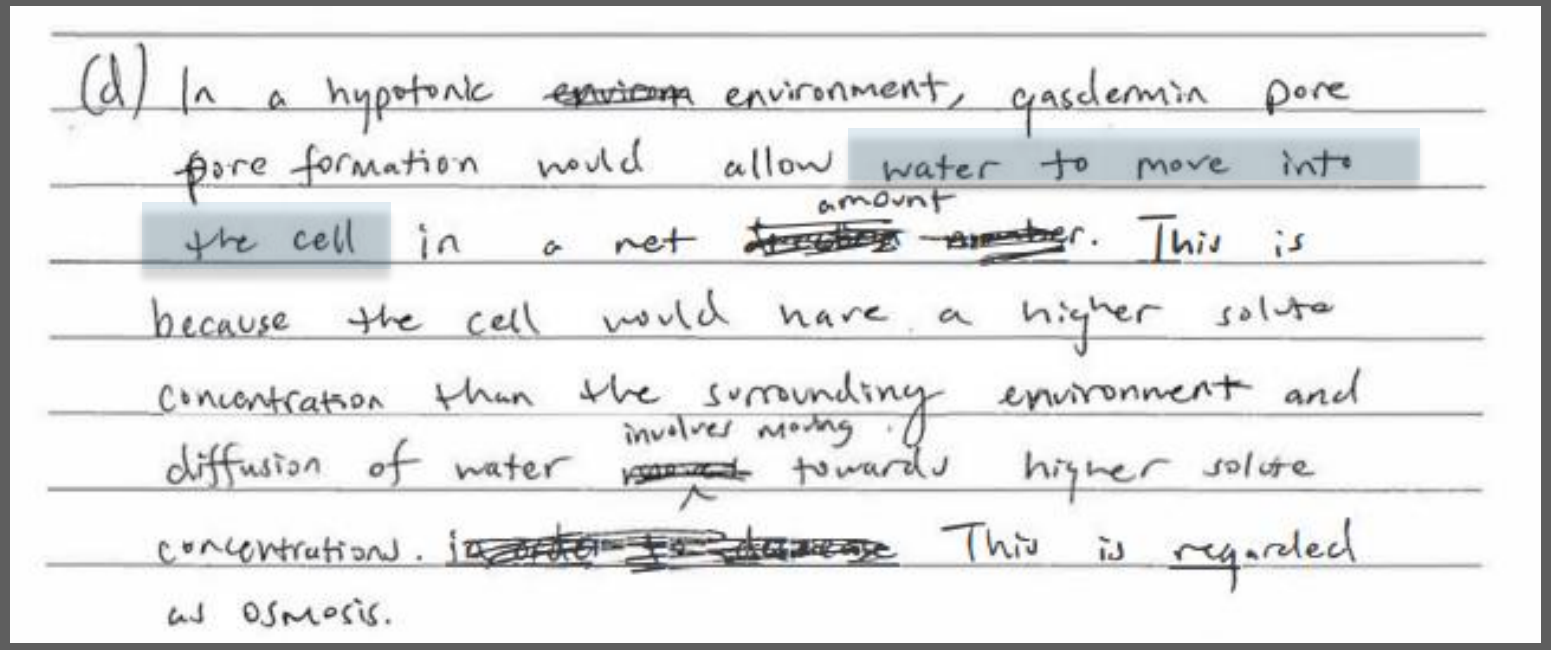
N terminal gasdermin would be found in fractions 4 and 3 since these fractions are closest to the cellular membrane.

FRQ Workshop – 2018 #2

(d) **Describe** the most likely effect of gasdermin pore formation on water balance in the cell in a hypotonic environment.

Description (1 point)

- Water enters the cell.

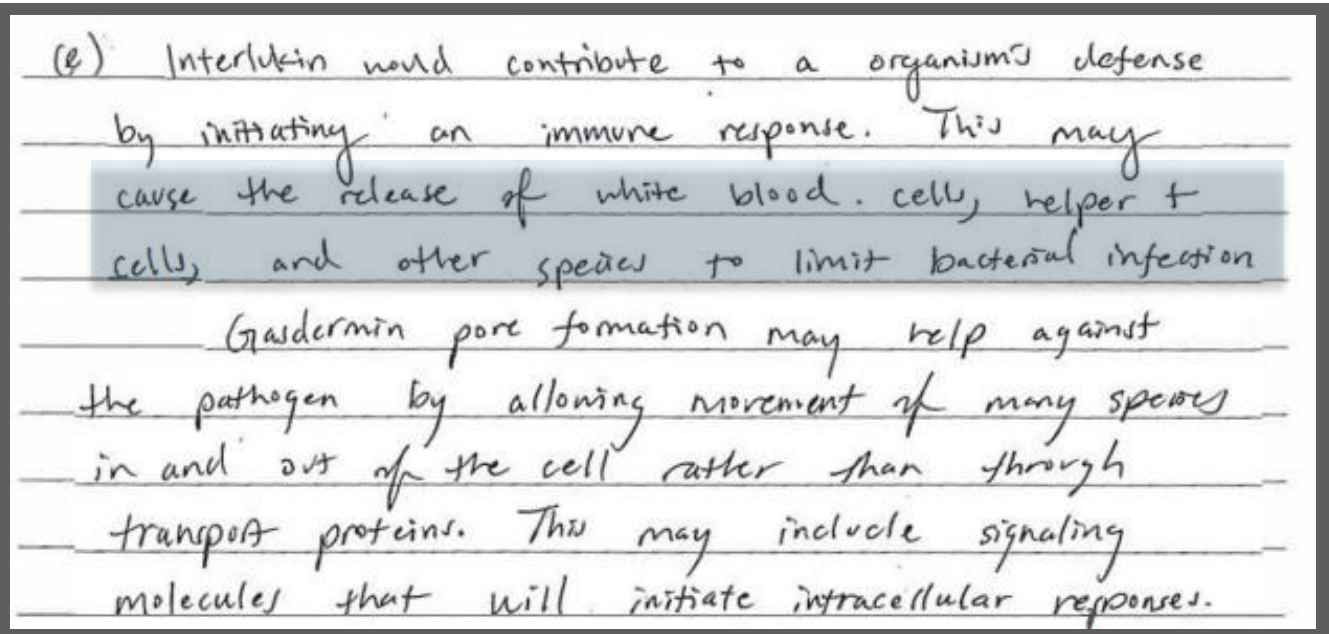


FRQ Workshop – 2018 #2

(e) **Explain** how gasdermin pore formation AND interleukin release contribute to an organism's defense against a bacterial pathogen.

Explanation (2 points)

- Cell lysis destroys infected cells OR cell lysis prevents bacteria from replicating.
- Interleukin signaling will stimulate immune cells/components of the immune system (to destroy the infected cells or bacteria).


(e) Interleukin would contribute to a organism's defense by initiating an immune response. This may cause the release of white blood cells, helper t cells, and other species to limit bacterial infection

Gasdermin pore formation may help against the pathogen by allowing movement of many species in and out of the cell rather than through transport proteins. This may include signaling molecules that will initiate intracellular responses.

FRQ Workshop – 2018 #2

Student A scored an 8

Student B scored a 6

Student C scored a 10

There are many restaurants nearby. Chick fil A, McDonalds, Burger King, Taco Bell, KFC, Bojangles, Wendy's, Chylaca's Mexican Restaurant, China Kitchen, Duff's Wings, Subway, Jersey Mike's, Dicky's BBQ, Wing N Things, Tomo Japanese & Sushi - all within 5 miles.

Please choose fast options so you won't be late for the afternoon sessions

LUNCH BREAK

11:45 – 1:00

FRQ Workshop – 2017 #1

TABLE 1. EFFECT OF 0.1 mM CAFFEINE ON MEMORY IN BEES

Treatment	Memory (average probability of revisiting a nectar source $\pm 2SE_{\bar{x}}$)	
	10 Minutes	24 Hours
Control	0.72 ± 0.09	0.41 ± 0.07
Caffeine	0.83 ± 0.07	0.78 ± 0.08

In flowering plants, pollination is a process that leads to the fertilization of an egg and the production of seeds. Some flowers attract pollinators, such as bees, using visual and chemical cues. When a bee visits a flower, in addition to transferring pollen, the bee can take nectar from the flower and use it to make honey for the colony.

Nectar contains sugar, but certain plants also produce caffeine in the nectar. Caffeine is a bitter-tasting compound that can be toxic to insects at high concentrations. To investigate the role of caffeine in nectar, a group of researchers studied the effect of 0.1 mM caffeine on bee behavior. The results of an experiment to test the effect of caffeine on bees' memory of a nectar source are shown in Table 1.

FRQ Workshop – 2017 #1

TABLE 1. EFFECT OF 0.1 mM CAFFEINE ON MEMORY IN BEES

Treatment	Memory (average probability of revisiting a nectar source $\pm 2SE_{\bar{x}}$)	
	10 Minutes	24 Hours
Control	0.72 ± 0.09	0.41 ± 0.07
Caffeine	0.83 ± 0.07	0.78 ± 0.08

(a) On the axes provided, **construct** an appropriately labeled graph to illustrate the effect of caffeine on the probability of bees revisiting a nectar source (memory). **(3 points)**

Construct graph (3 points)

- Correctly plotted means on a bar graph/modified bar graph
- Appropriate labels, units, and scaling
- Correctly plotted error bars

FRQ Workshop – 2017 #1

(b) Based on the results, **describe** the effect of caffeine on each of the following: **(2 points)**

- Short-term (10 minute) memory of a nectar source
- Long-term (24 hour) memory of a nectar source

Description (2 points)

Short-term	Caffeine does not affect short-term memory/memory at 10 minutes.
Long-term	Caffeine improves/increases the long-term memory/memory at 24 hours.

FRQ Workshop – 2017 #1

(c) **Design an experiment** using artificial flowers to investigate potential negative effects of increasing caffeine concentrations in nectar on the number of floral visits by bees. **Identify** the null hypothesis, an appropriate control treatment, and the predicted results that could be used to reject the null hypothesis. **(3 points)**

Identification (3 points; 1 point per row)

Null hypothesis	Increasing caffeine concentration has no effect (on the number of floral visits by bees).
Control	(Nectar/flowers with) no caffeine
Predicted results	• The number of floral visits by bees is different at increasing caffeine concentrations. • The number of floral visits by bees is different than the control.

FRQ Workshop – 2017 #1

(d) Researchers found that nectar with caffeine tends to have a lower sugar content than nectar without caffeine. Plants use less energy to produce the caffeine in nectar than they do to produce the sugar in nectar. **Propose ONE benefit** to plants that produce nectar with caffeine and a lower sugar content. **Propose ONE cost** to bees that visit the flowers of plants that produce nectar with caffeine and a lower sugar content. **(2 points)**

Proposed plant benefit (1 point)

- More pollen is transferred/more visits by pollinators.
- Plants store energy/have more energy available for other uses.

Proposed bee cost (1 point)

- (Individual) bees visit more flowers.
- (Individual) bees use more energy.
- The colony/bees may produce less honey
- The colony/bees may produce lower quality honey/honey that provides less energy.

FRQ Workshop – 2017 #1

(a) On the axes provided, **construct** an appropriately labeled graph to illustrate the effect of caffeine on the probability of bees revisiting a nectar source (memory). **(3 points)**

Construct graph (3 points)

- Correctly plotted means on a bar graph/modified bar graph
- Appropriate labels, units, and scaling
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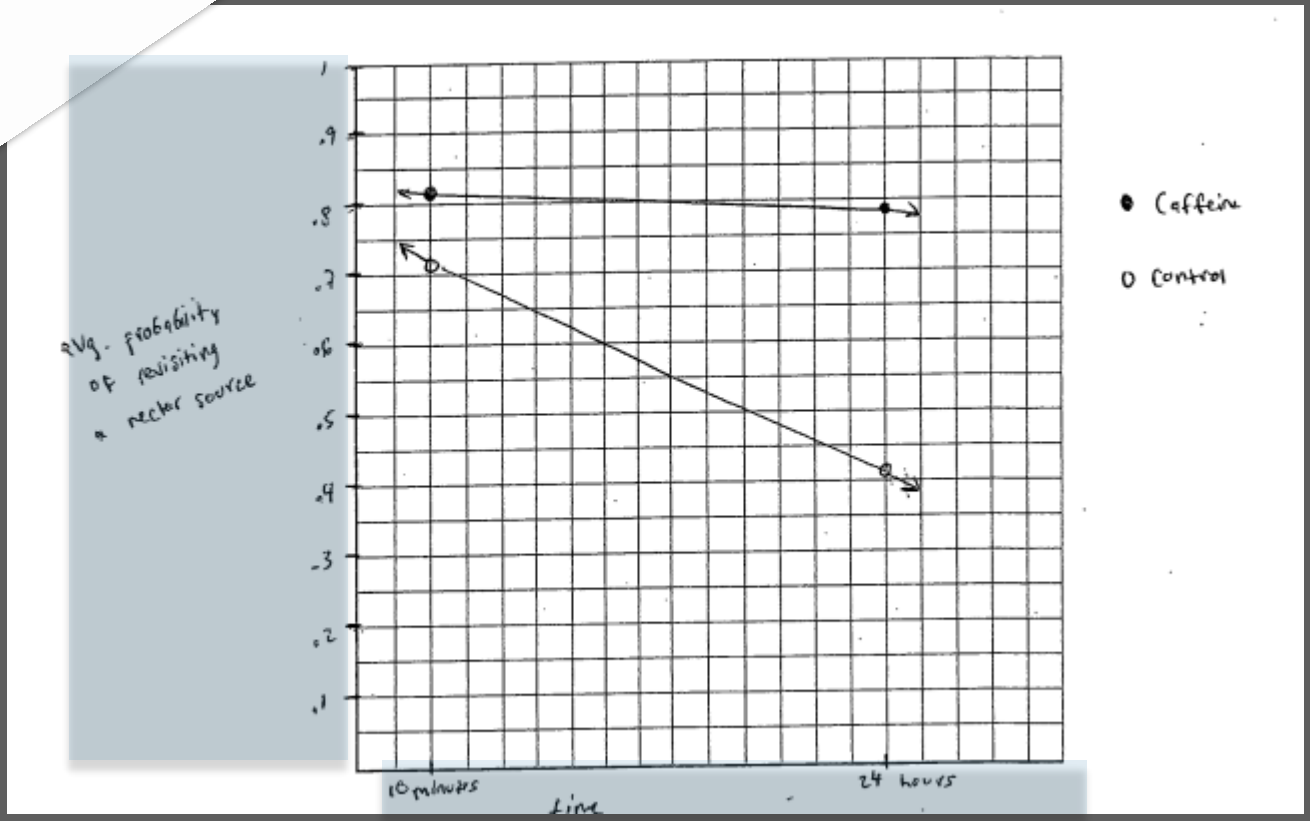

FRQ Workshop – 2017 #1

(b) Based on the results, **describe** the effect of caffeine on each of the following: **(2 points)**

- Short-term (10 minute) memory of a nectar source
- Long-term (24 hour) memory of a nectar source

Description (2 points)

Short-term	Caffeine does not affect short-term memory/memory at 10 minutes.
Long-term	Caffeine improves/increases the long-term memory/memory at 24 hours.

b The short term effects of caffeine on memory of a nectar source is that there is a slight increase in memory. The long term effects of caffeine on memory of a nectar source is that there is a large increase in memory.

FRQ Workshop – 2017 #1

c

H_0: Caffeine concentration has no effect on number of floral visits by bees.

H_1: Caffeine concentration has negative effects on number of floral visits by bees.

First, you would take 1000 artificial flowers and 500 bees. Take a random sample of 500 artificial flowers and put caffeine in them (use the same amount of caffeine for each flower). Put all the flowers in a controlled environment and assort them randomly. Let the bees loose in the controlled environment and over a period of a week track how many visits each artificial flower gets. The control treatment is the 500 flowers without caffeine. The predicted results are that on average the flowers without caffeine in them will get more visits by bees than flowers with caffeine, and these results could be used to reject the null hypothesis H_0.

Identification (3 points; 1 point per row)

Null hypothesis	Increasing caffeine concentration has no effect (on the number of floral visits by bees).
Control	(Nectar/flowers with) no caffeine
Predicted results	• The number of floral visits by bees is different at increasing caffeine concentrations. • The number of floral visits by bees is different than the control.

FRQ Workshop – 2017 #1

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Proposed plant benefit (1 point)

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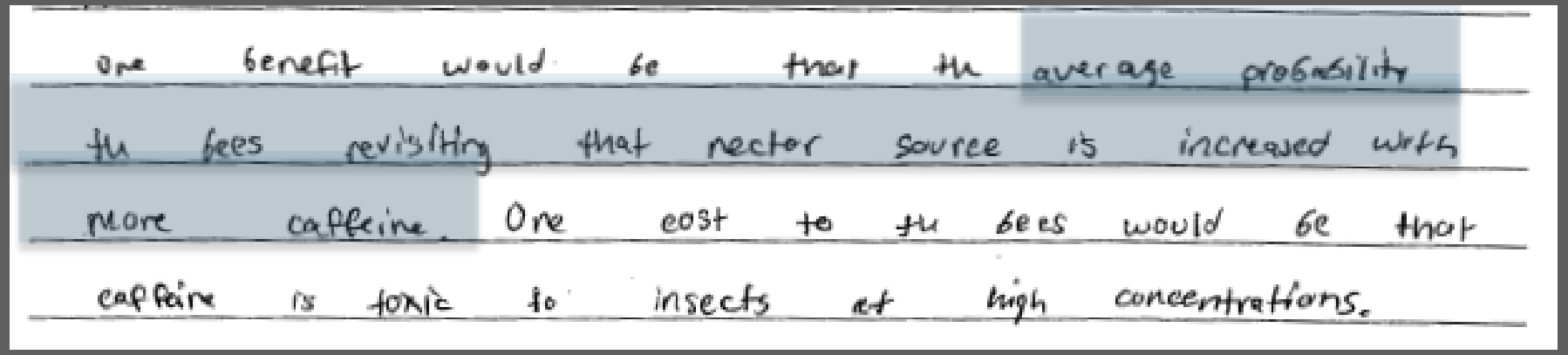


FRQ Workshop – 2017 #1

Student A scored a 6

Student B scored a 10

Student C scored an 8

Paper Gel Electrophoresis

NEGATIVE ELECTRODE

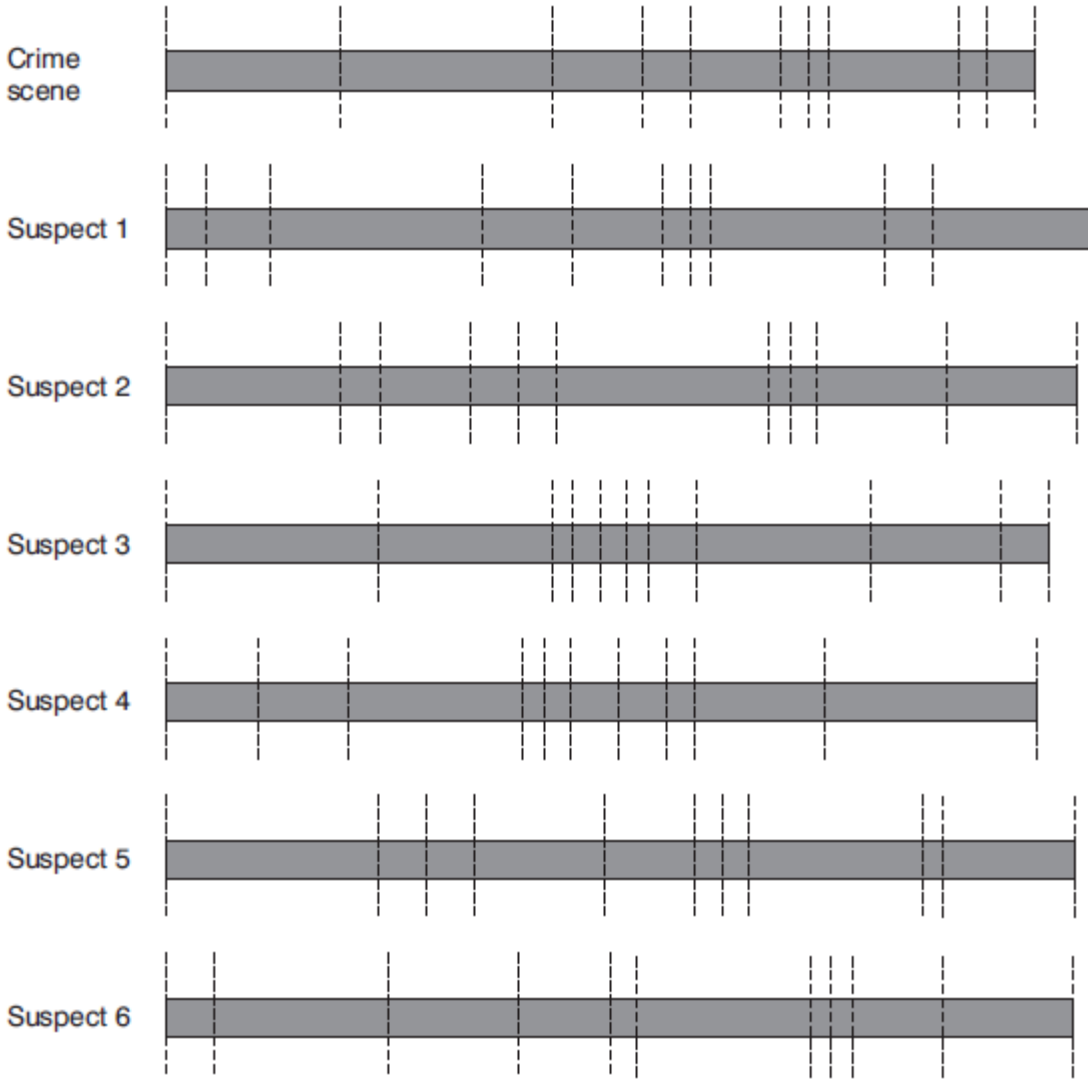
Sample Sizes	Well to Deposit DNA Suspect #1	Well to Deposit DNA Suspect #2	Well to Deposit DNA Suspect #3
10			
9			
8			
7			
6			
5			
4			
3			
2			
1			

POSITIVE ELECTRODE

Models of DNA Samples

Dotted lines represent locations where restriction enzymes will cut these pieces of DNA.

DNA Samples



Data Talk

Data Analysis

- Quiz: Break down by Section
- Exam: Break down by Chapter/Topic
- Used for:
  - Strengths/Weakness
  - Item Analysis
  - Communication
  - Personalized Remediation

Ch. 8	Avg	Ch. 9	Avg	Ch. 10	Avg	Ch. 11	Avg
6		**9**		**9**		**8**	
3	50	4	44.44444	6	66.66667	5	62.5
5	83.33333	4	44.44444	8	88.88889	8	100
2	33.33333	3	33.33333	1	11.11111	3	37.5
4	66.66667	2	22.22222	5	55.55556	4	50

SciQ	Avg	Science Practice	Avg	AP	Avg	Quiz	Avg
1		**1**		**11**		**14**	
0	0	0	0	7	63.63636	8	57.14286
0	0	0	0	8	72.72727	10	71.42857
0	0	1	100	3	27.27273	3	21.42857
0	0	0	0	6	54.54545	5	35.71429

MC		SA	FRQ			Total	
19	52.77778	5	5	50		51.38889	2
27	75	6	7	65		70	4
16	44.44444	3	2	25		34.72222	1
32	88.88889	9	10	95		91.94444	5
25	69.44444	5	5	50		59.72222	3

Data Talk

Mail Merge

- Parent/Student Communication
- Data Analysis Sharing
- Personalized Feedback

Section Breakdown						
	12.1 Avg	12.2 Avg	12.3 Avg	13.2 Avg	13.3 Avg	13.4 Avg
Number of Qs	2	7	1	5	4	1
Student 1	50.0	57.14	0.0	100.0	75.0	100.0
Class Average	51.5	69.7	23.5	65.9	60.3	35.3

Your Score: 70%
Remediation:
• quiz corrections (due by next quiz)

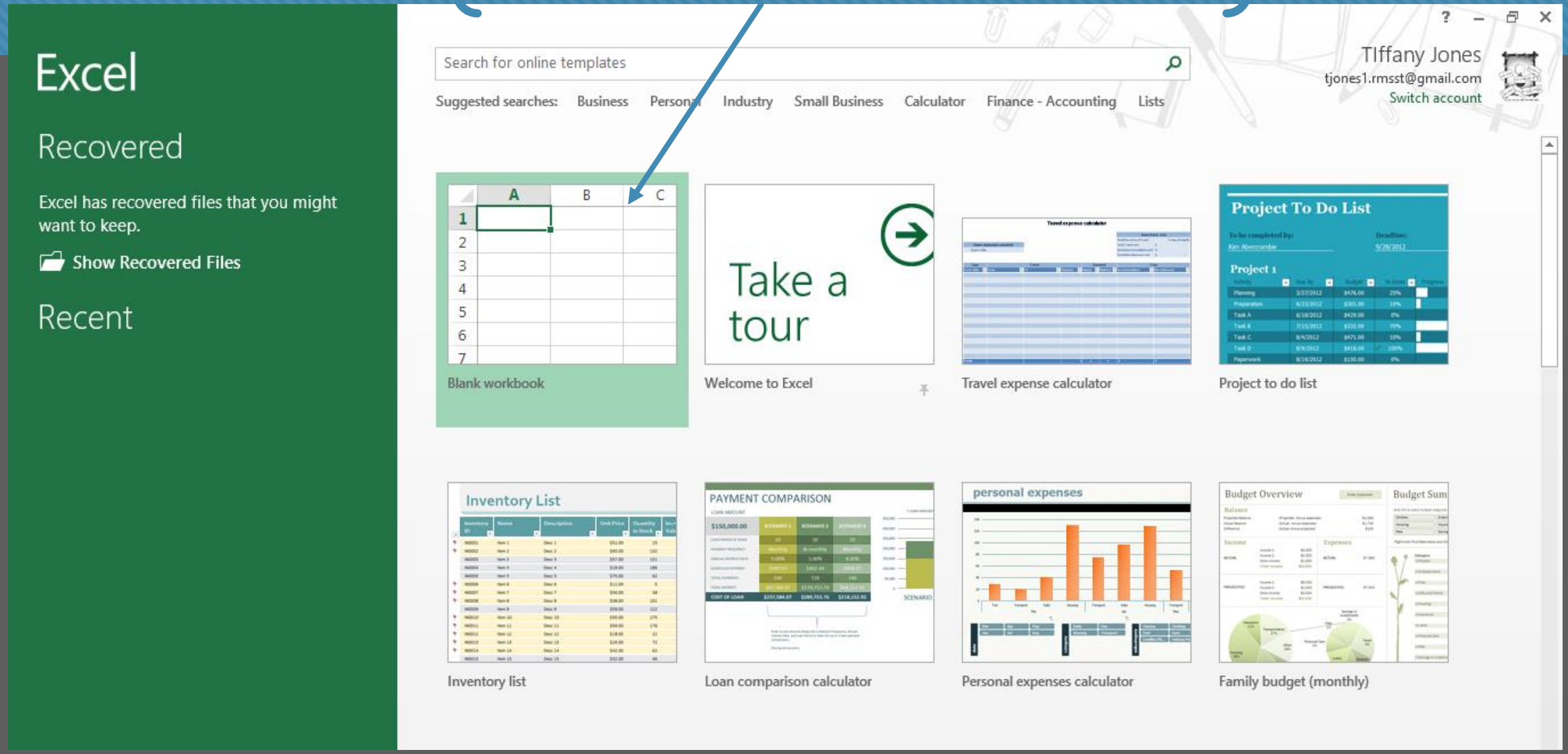
Section Breakdown						
	12.1 Avg	12.2 Avg	12.3 Avg	13.2 Avg	13.3 Avg	13.4 Avg
Number of Qs	2	7	1	5	4	1
Student 2	0.0	57.14	0.0	80.0	75.0	0.0
Class Average	51.5	69.7	23.5	65.9	60.3	35.3

Your Score: 55%
Remediation:
• quiz corrections (due by next quiz)
• choose one of the following:
  o watch a Bozeman/Khan/Crash Course video over topic & write 1-page summary
  o complete remediation work based on weaknesses
  o chapter vocabulary (hand-written, word + definition)

Let's set up a template for you to use in your classroom!

Step 1: Open Excel

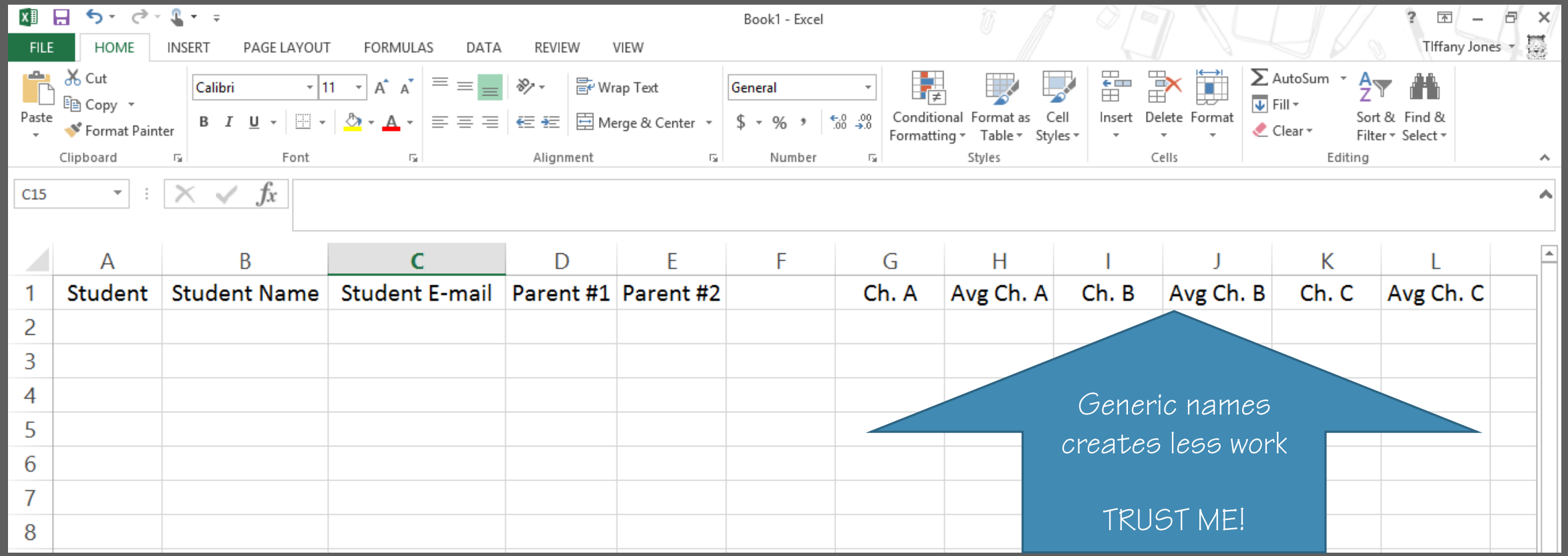
Start a new "blank workbook"



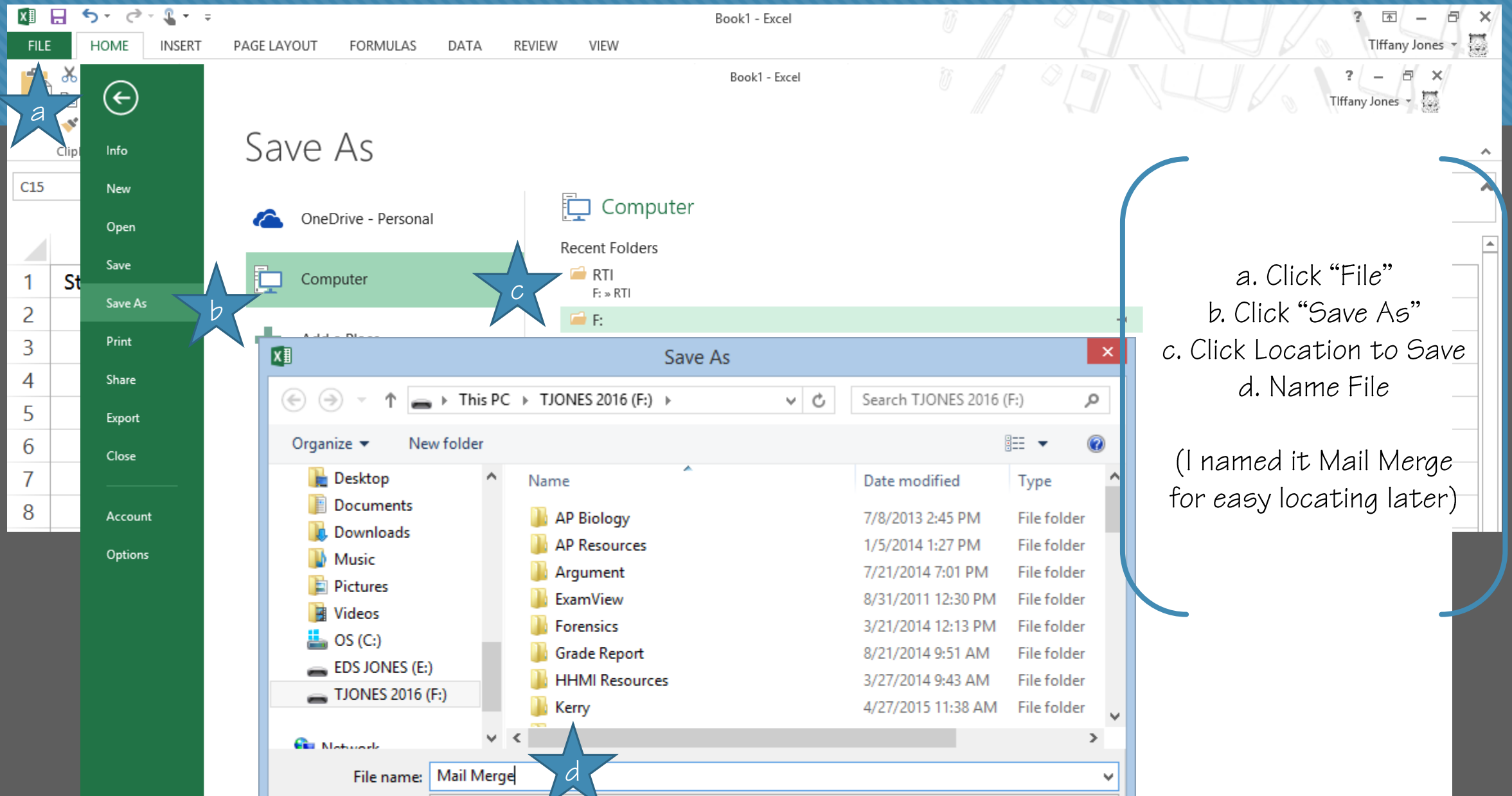
Step 2: Title Your Columns

Hints:

- Use Names You Understand
  - Short hand
- If you want to re-use your file, use generic names



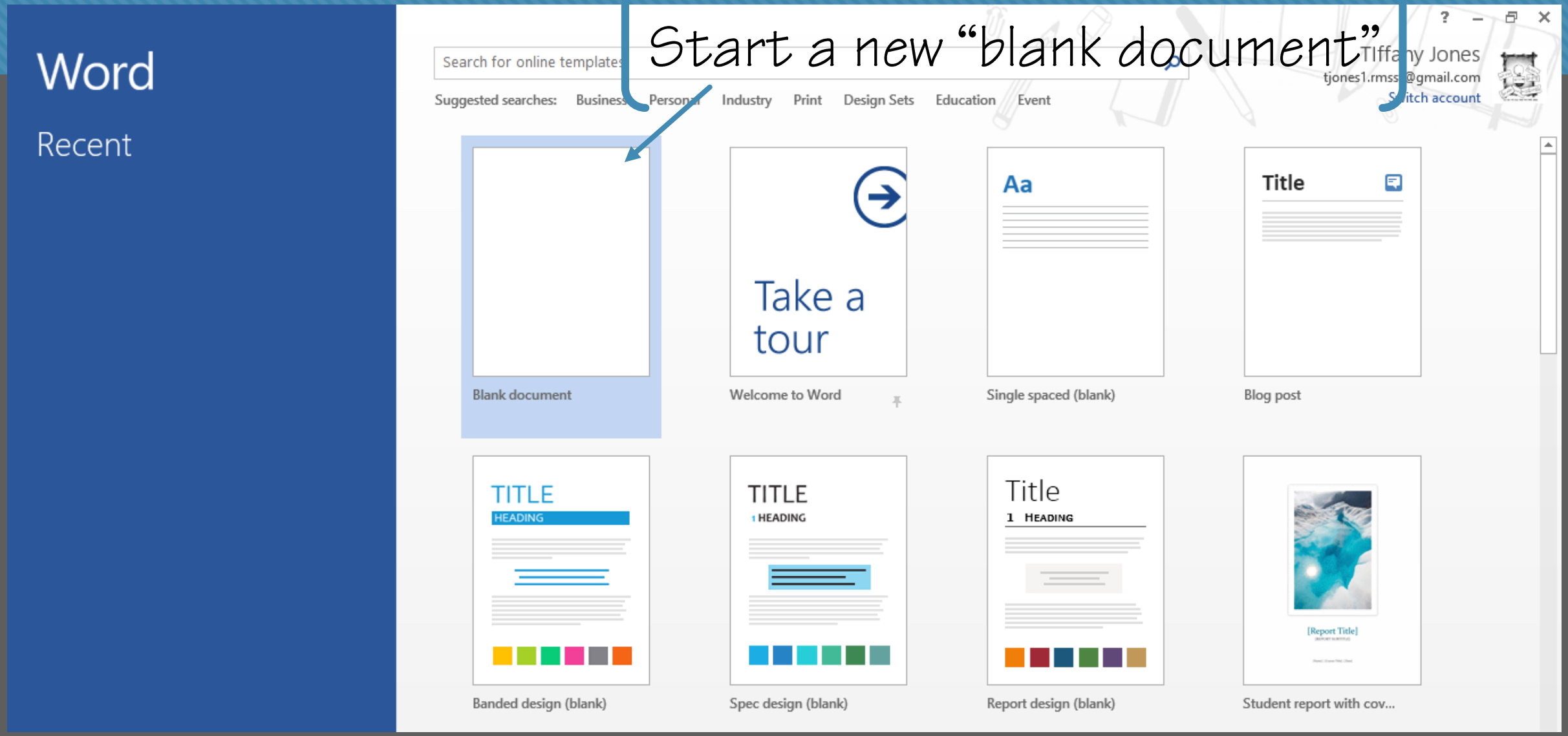
Step 3: Save Your File & Close



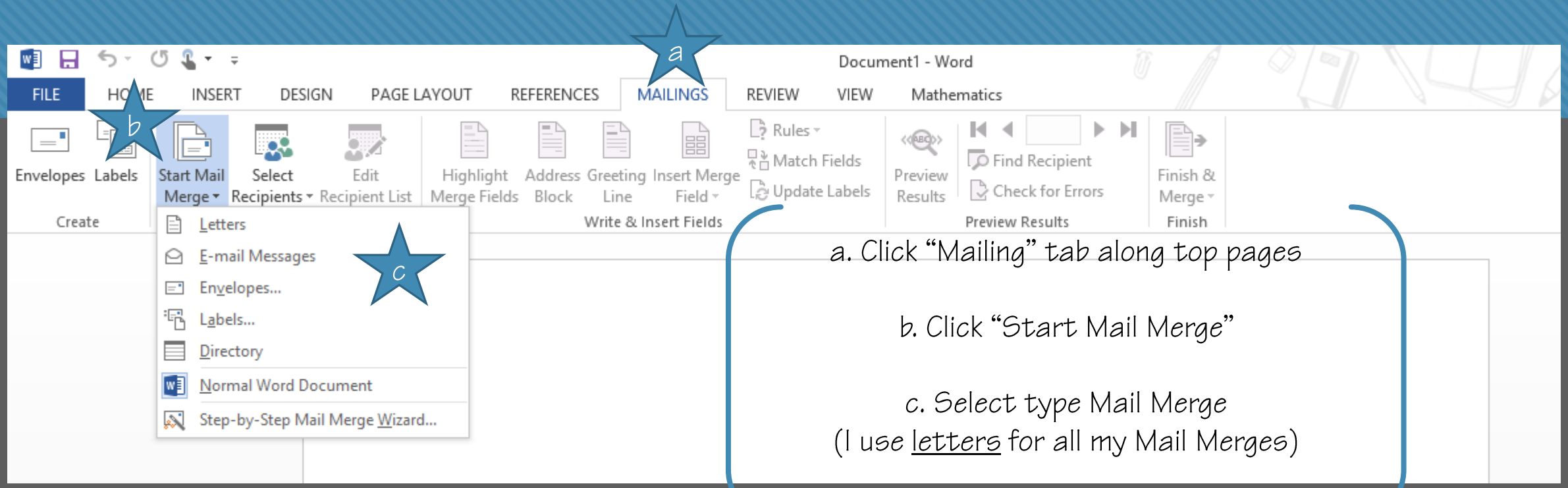
a. Click "File"
b. Click "Save As"
c. Click Location to Save
d. Name File

(I named it Mail Merge for easy locating later)

Step 4: Open New Word Document



Step 5: Start Mail Merge

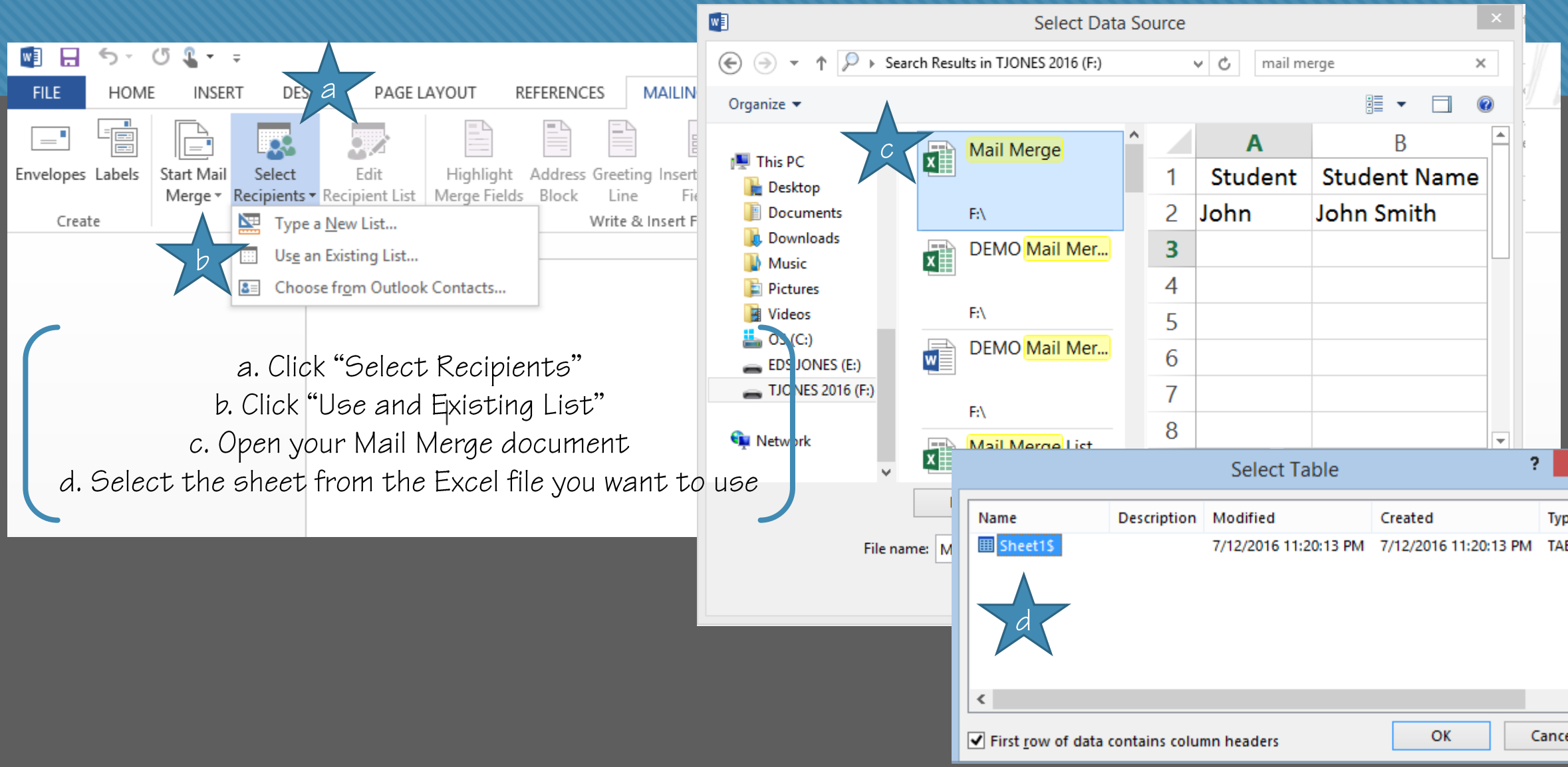


a. Click "Mailing" tab along top pages

b. Click "Start Mail Merge"

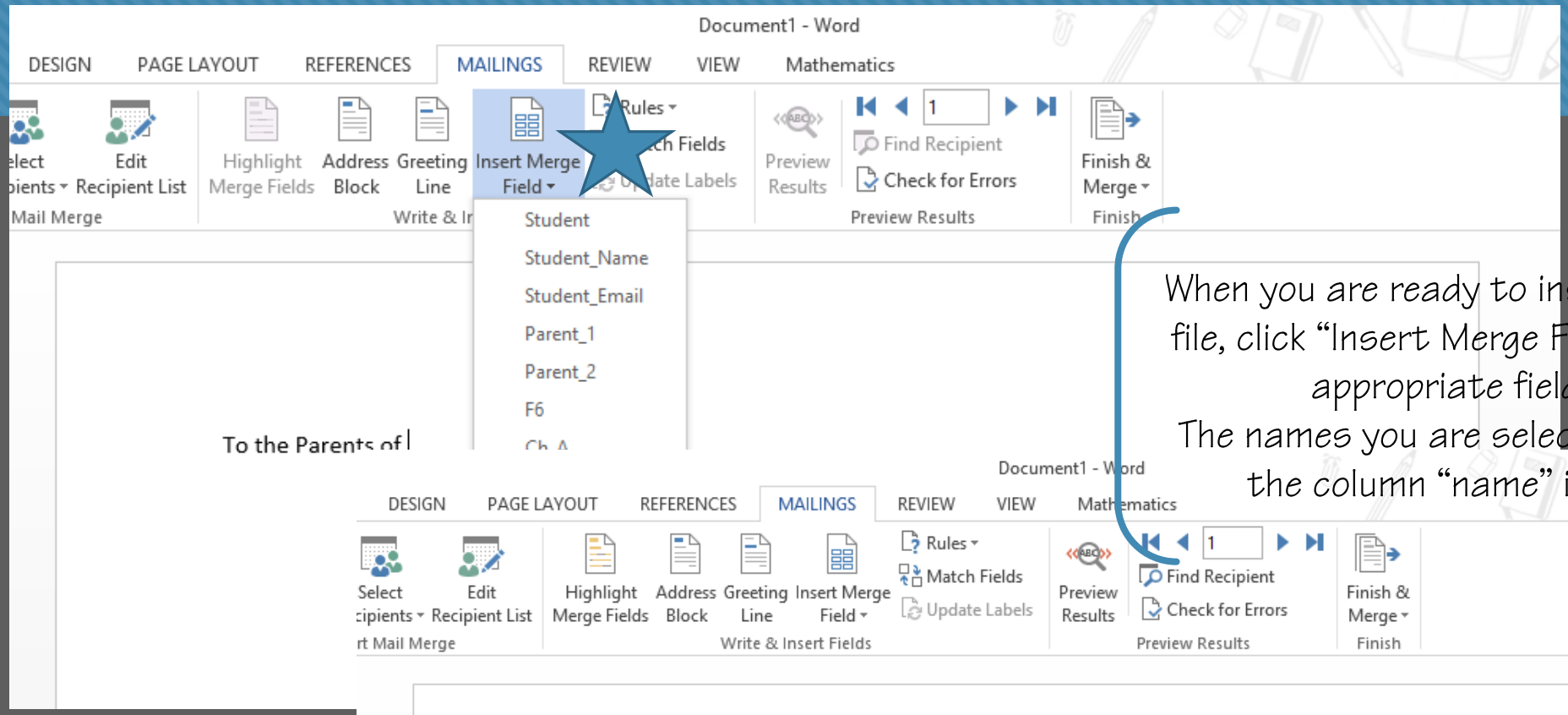
c. Select type Mail Merge
(I use letters for all my Mail Merges)

Step 6: Select excel file for merge

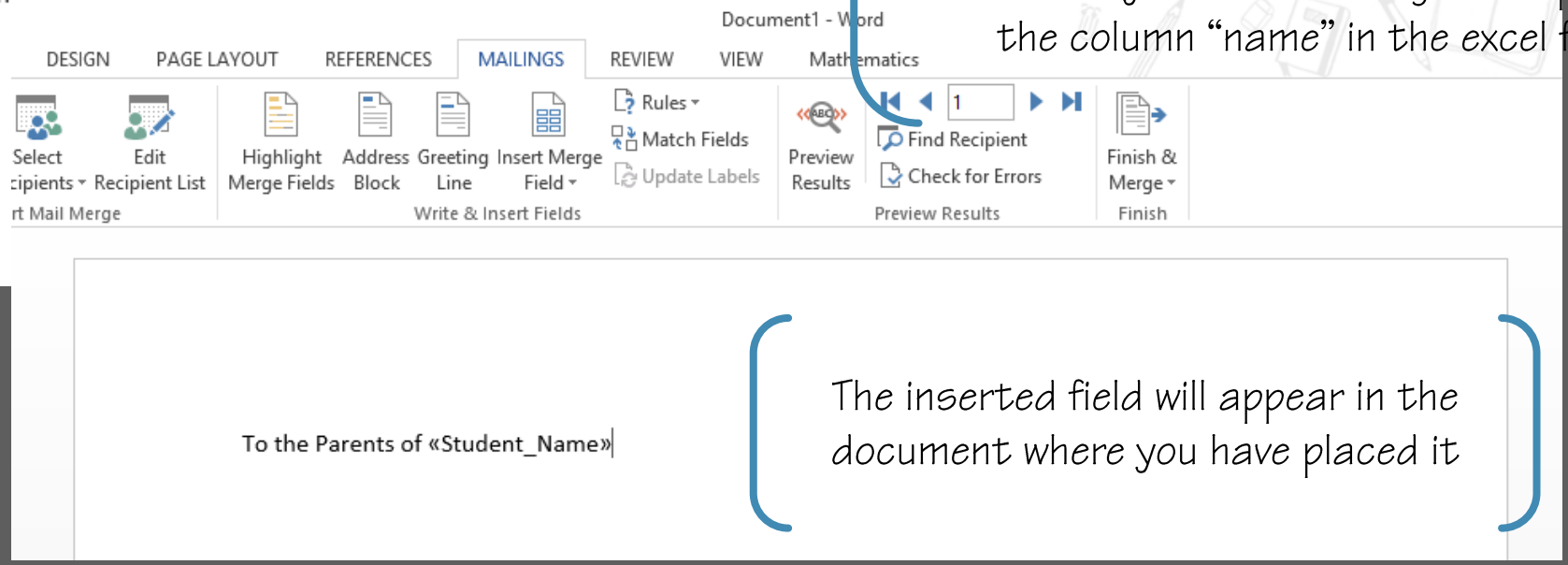


a. Click "Select Recipients"
b. Click "Use and Existing List"
c. Open your Mail Merge document
d. Select the sheet from the Excel file you want to use

Step 7: Type your document

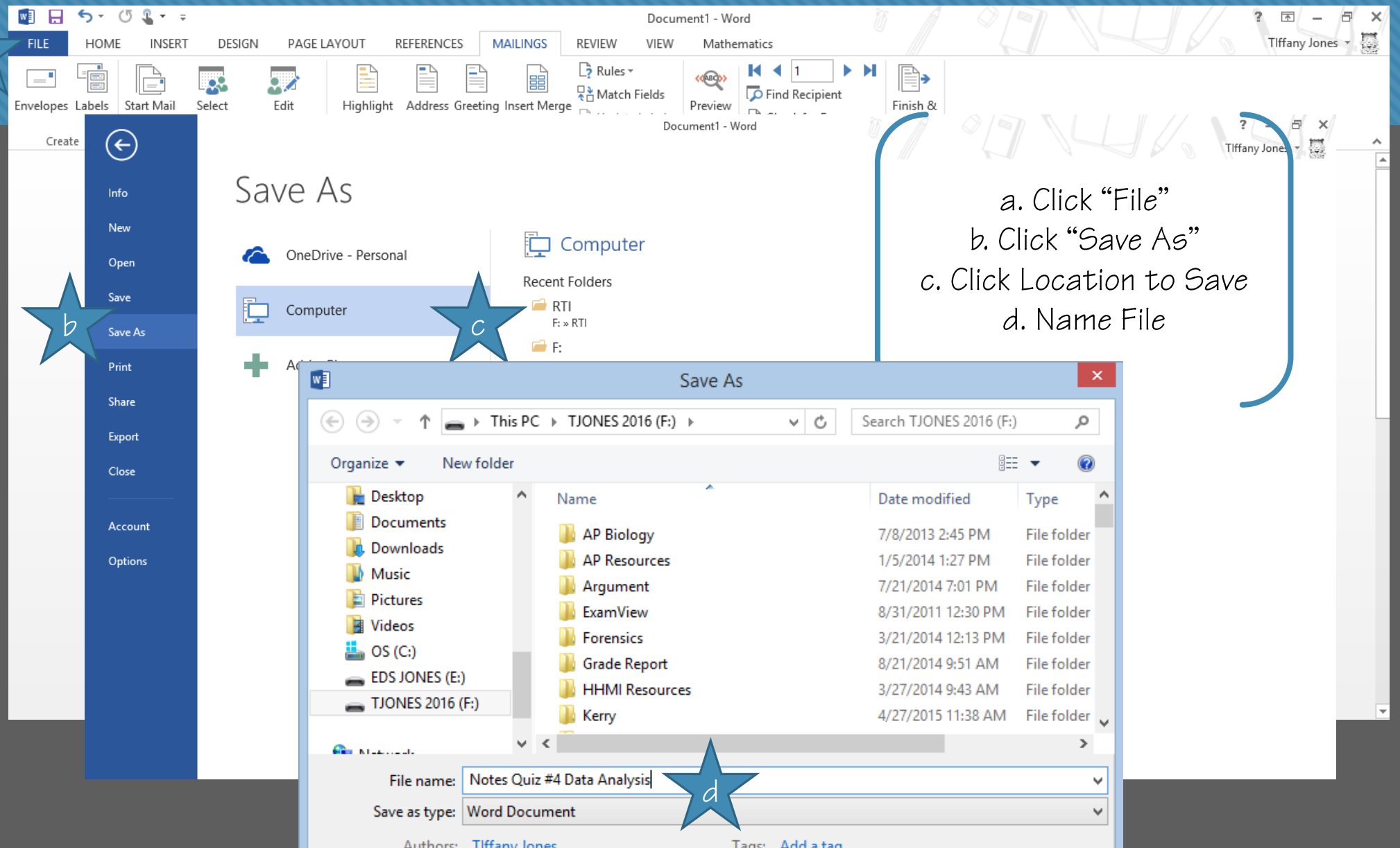


When you are ready to insert from your excel file, click "Insert Merge Field" and select the appropriate field to insert.
The names you are selecting correspond to the column "name" in the excel file.

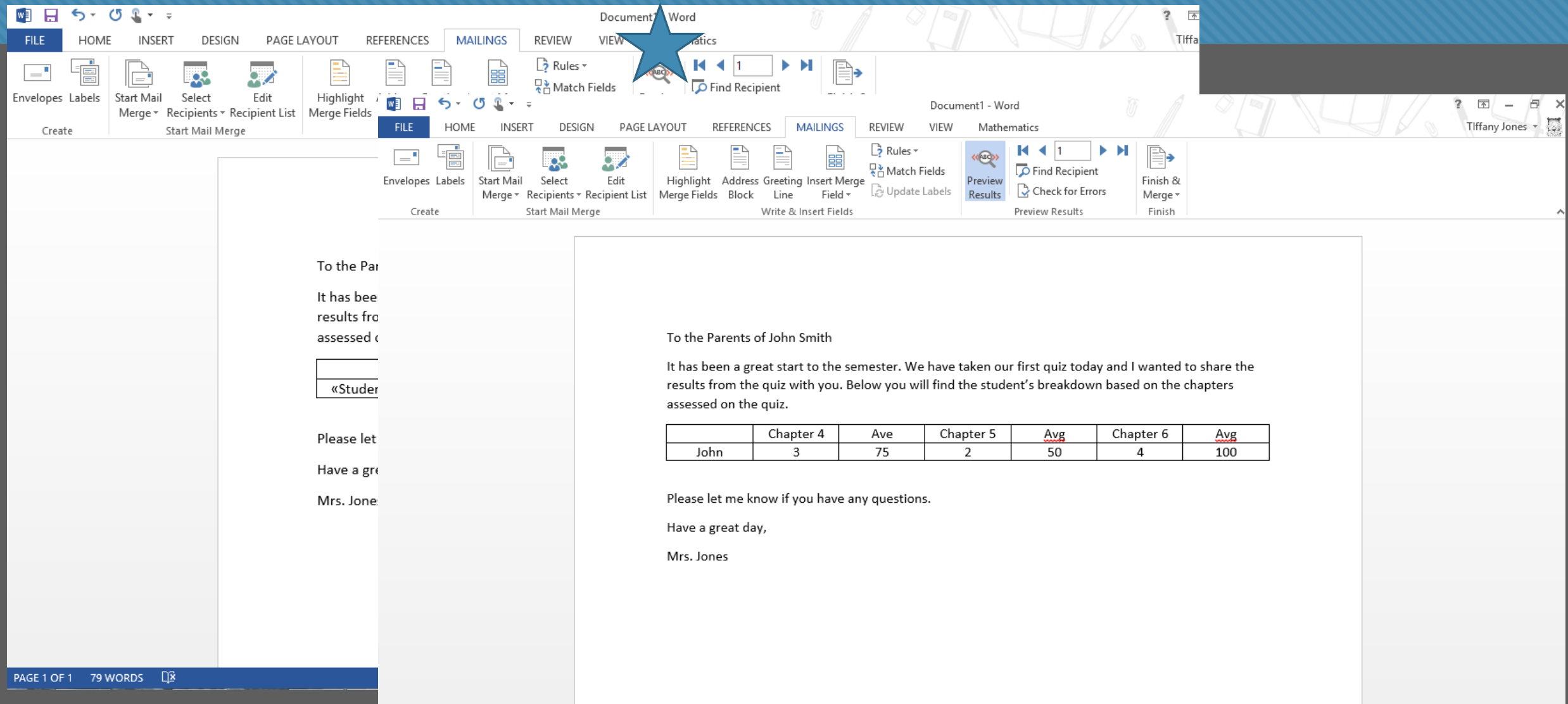


The inserted field will appear in the document where you have placed it

Step 8: Save Document for future

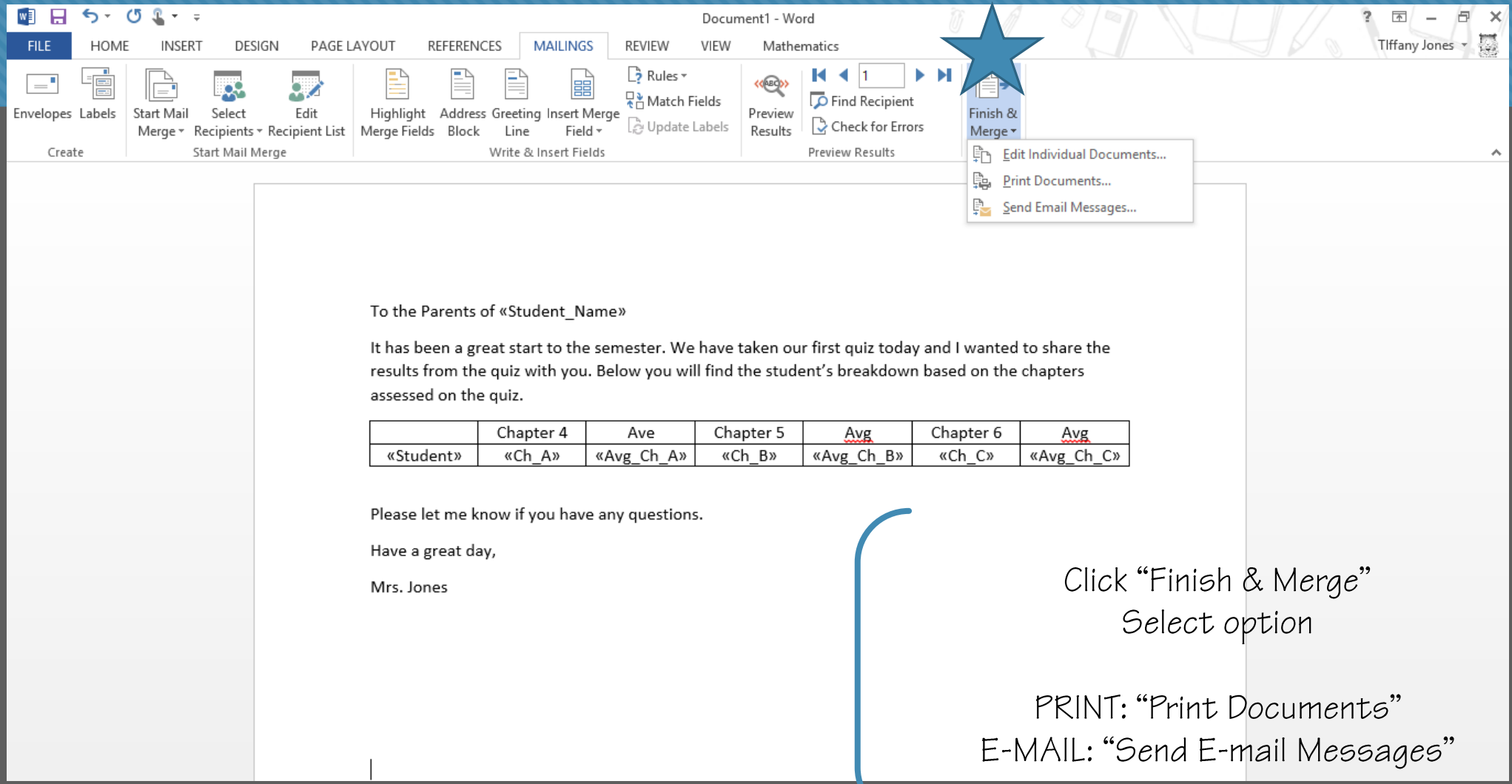


Step 9: Preview document to check for errors



	Chapter 4	Ave	Chapter 5	Avg	Chapter 6	Avg
John	3	75	2	50	4	100

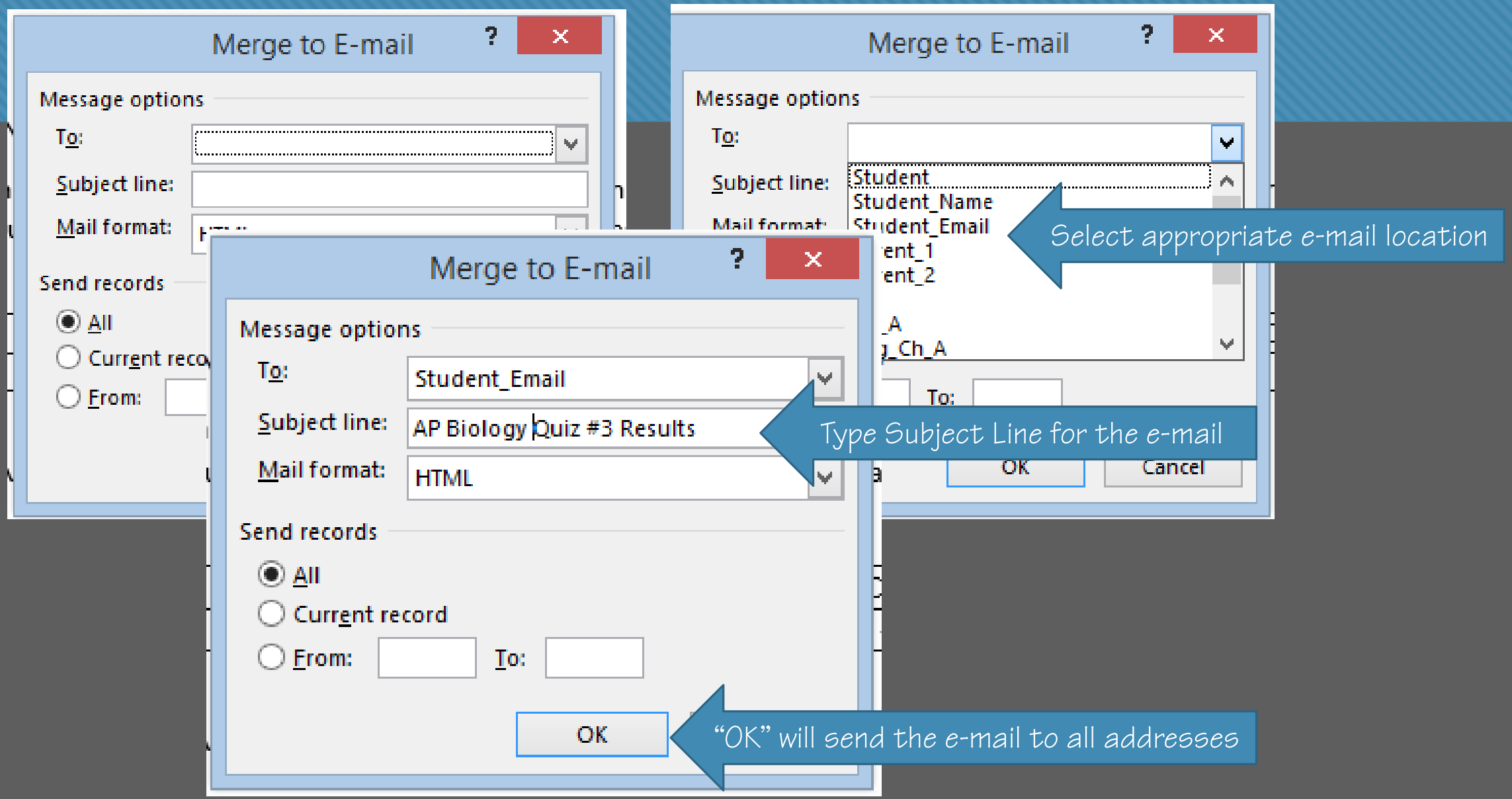
Step 10: E-mail or Print Document



Click "Finish & Merge"
Select option

PRINT: "Print Documents"
E-MAIL: "Send E-mail Messages"

Step 10: E-mail or Print Document



Example of the E-mail Sent

Reply Reply All Forward

Tue 7/12/2016 11:50 PM

Tiffany Jones - Magnet School

AP Biology Quiz #3 Results

To 'parent1john@gmail.com'

To the Parents of John Smith

It has been a great start to the semester. We have taken our first quiz today and I wanted to share the results from the quiz with you. Below you will find the student's breakdown based on the chapters assessed on the quiz.

	Chapter 4	Ave	Chapter 5	Avg	Chapter 6	Avg
John	3	75	2	50	4	100

Please let me know if you have any questions.

Have a great day,

Mrs. Jones

Unable to log in to: SharePoint.

HHMI Population Genetics Activity

Hardy-Weinberg Lab Quick Tips

Starting Population

(Parent Population)

A = red S = white

- 15 individuals that are AA
  - 30 red beads
- 30 individuals that are AS
  - 30 red beads & 30 white beads
- 15 individuals that are SS
  - 30 white beads

Total:

- 60 red beads
- 60 white beads

Simulation 1

A = red S = white

- All offspring will survive
- Draw two beads from the parent population
  - Record these in your chart
    - For example:
      - Two red beads → AA
      - One red and one white bead → AS
      - Two white beads → SS
  - RETURN THESE BEADS TO THE PARENT POPULATION BEFORE DRAWING AGAIN!
- Continue drawing two beads at a time and recording until you have made 60 tally marks (aka 60 offspring)

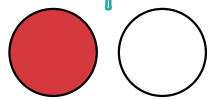
Example Simulation 1

A = red S = white

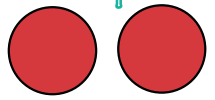
Parent Population

AA	‖
AS	‖
SS	|

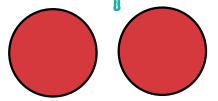
1st Offspring AS



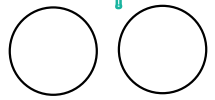
2nd Offspring AA



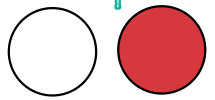
3rd Offspring AA



4th Offspring SS



5th Offspring AS



Example Math

A = red S = white

AA	||
AS	||
SS	|

Genotype	Tally Marks for Offspring	Number of Individuals	Total Number of Individuals in the First Offspring Population	Genotype Frequency
AA	||	2	5	0.4
AS	||	2	5	0.4
SS	|	1	5	0.2

AA Genotype Freq
AA / total
2 / 5
0.4

AS Genotype Freq
AS / total
2 / 5
0.4

SS Genotype Freq
SS / total
1 / 5
0.2

Example Math

A = red S = white

AA	
AS	
SS	

Allele	Number of Alleles	Total Number of Alleles in the Offspring Population	Allele Frequency
A	6	10	0.6
S	4	10	0.4

Number of A Allele
#AA x 2 + #AS x 1
2 x 2 + 2 x 1
4 + 2
6

Number of S Allele
#SS x 2 + #AS x 1
1 x 2 + 2 x 1
2 + 2
4

A Allele Freq
A / total
6 / 10
0.6

S Allele Freq
S / total
4 / 10
0.4

Simulation 2

A = red S = white

- Set-Up as Starting Population (60 red, 60 white)
- Assume SS has sickle cell and DIES
  - THERE WILL BE NO SS IN THIS SIMULATION!
- Draw two beads from the parent population
  - Record these in your chart
    - For example:
      - Two red beads → AA
      - One red and one white bead → AS
      - Two white beads → Dead – do not record
  - RETURN THESE BEADS TO THE PARENT POPULATION BEFORE DRAWING AGAIN!
- Continue drawing two beads at a time and recording until you have made 60 tally marks (aka 60 offspring)

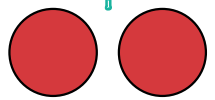
Example Simulation 2

A = red S = white

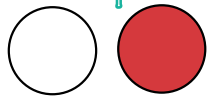
AA	
AS	
SS	

Parent Population

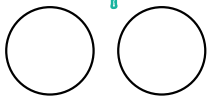
1st Offspring AA



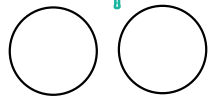
2nd Offspring AS



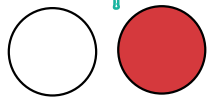
3rd Offspring SS



3rd Offspring SS



3rd Offspring AS



Example Math

A = red S = white

AA	|
AS	||
SS	

Genotype	Tally Marks for Offspring	Number of Individuals	Total Number of Individuals in the First Offspring Population	Genotype Frequency
AA	|	1	3	0.33
AS	||	2	3	0.67
SS		0	3	0

AA Genotype Freq
AA / total
1 / 3
0.33

AS Genotype Freq
AS / total
2 / 3
0.67

SS Genotype Freq
SS / total
0 / 3
0

Example Math

A = red S = white

AA	
AS	
SS	

Allele	Number of Alleles	Total Number of Alleles in the Offspring Population	Allele Frequency
A	4	6	0.67
S	2	6	0.33

Number of A Allele
#AA x 2 + #AS x 1
1 x 2 + 2 x 1
2 + 2
4

Number of S Allele
#SS x 2 + #AS x 1
0 x 2 + 2 x 1
0 + 2
2

A Allele Freq
A / total
4 / 6
0.67

S Allele Freq
S / total
2 / 6
0.33

Simulation 2 Second Generation

A = red S = white

- Assume SS has sickle cell and DIES
  - THERE WILL BE NO SS IN THIS SIMULATION!

Set-Up Instructions

- Adjust the parent population to match your first generation outcome
  - Example from previous slide:
    - Add 4 red beads
    - Add 2 white beads

Allele	Number of Alleles
A	4
S	2

- Follow the same rules as Simulation 2 First Generation

Simulation 3

A = red S = white

- Set-Up as Starting Population (60 red, 60 white)
- Assume SS has sickle cell and DIES
  - THERE WILL BE NO SS IN THIS SIMULATION!
- Assume AA can be infected by malaria and DIES HALF of the time
- Draw two beads from the parent population
  - Record these in your chart
    - For example:
      - Two red beads → 50% AA or 50% Dead – do not record dead
      - One red and one white bead → AS
      - Two white beads → Dead – do not record
  - RETURN THESE BEADS TO THE PARENT POPULATION BEFORE DRAWING AGAIN!
- Continue drawing two beads at a time and recording until you have made 60 tally marks (aka 60 offspring)

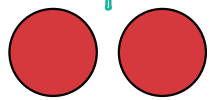
Example Simulation 3

A = red S = white

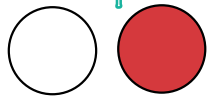
AA	‖
AS	|
SS	☠

Parent Population

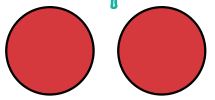
1st Offspring AA



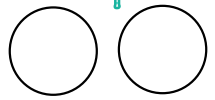
2nd Offspring AS



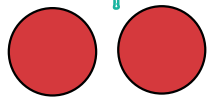
3rd Offspring AA



3rd Offspring SS



3rd Offspring AA



Example Math

A = red S = white

AA	||
AS	|
SS	

Genotype	Tally Marks for Offspring	Number of Individuals	Total Number of Individuals in the First Offspring Population	Genotype Frequency
AA	||	2	3	0.67
AS	|	1	3	0.33
SS		0	3	0

AA Genotype Freq
AA / total
2 / 3
0.67

AS Genotype Freq
AS / total
1 / 3
0.33

SS Genotype Freq
SS / total
0 / 3
0

Example Math

A = red S = white

AA	‖
AS	|
SS	

Allele	Number of Alleles	Total Number of Alleles in the Offspring Population	Allele Frequency
A	5	6	0.83
S	1	6	0.17

Number of A Allele
#AA x 2 + #AS x 1
2 x 2 + 1 x 1
4 + 1
5

Number of S Allele
#SS x 2 + #AS x 1
0 x 2 + 1 x 1
0 + 1
1

A Allele Freq
A / total
5 / 6
0.83

S Allele Freq
S / total
1 / 6
0.17

Simulation 3 Second Generation

A = red S = white

- Assume SS has sickle cell and DIES
  - THERE WILL BE NO SS IN THIS SIMULATION!
- Assume AA can be infected by malaria and DIES HALF of the time

Set-Up Instructions

- Adjust the parent population to match your first generation outcome
  - Example from previous slide:
    - Add 5 red beads
    - Add 1 white beads

Allele	Number of Alleles
A	5
S	1

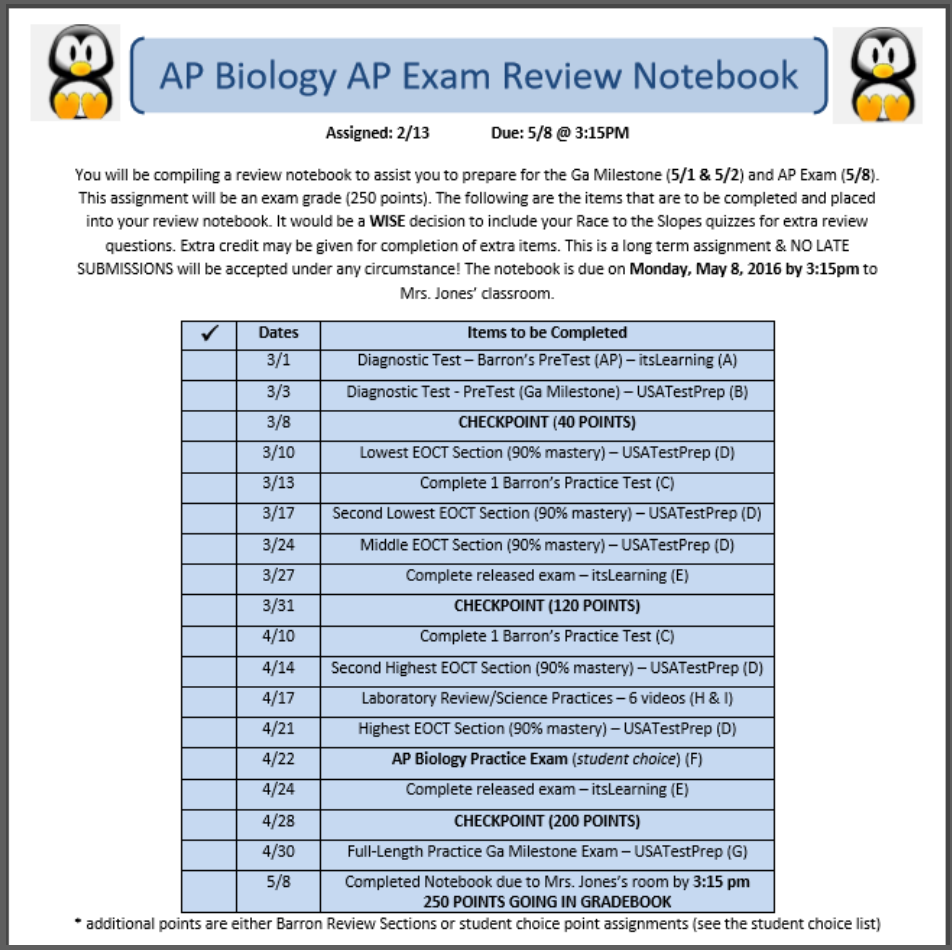
- Follow the same rules as Simulation 3 First Generation

HHMI Prizes & Goodie Bags

Strategies from my Classroom

AP Review Notebook

- Practice Questions/Exams
- Review Books
- Videos/Animations
- Inquiry/Applications



AP Biology AP Exam Review Notebook

Assigned: 2/13 **Due: 5/8 @ 3:15PM**

You will be compiling a review notebook to assist you to prepare for the Ga Milestone (**5/1 & 5/2**) and AP Exam (**5/8**). This assignment will be an exam grade (250 points). The following are the items that are to be completed and placed into your review notebook. It would be a **WISE** decision to include your Race to the Slopes quizzes for extra review questions. Extra credit may be given for completion of extra items. This is a long term assignment & NO LATE SUBMISSIONS will be accepted under any circumstance! The notebook is due on **Monday, May 8, 2016 by 3:15pm** to Mrs. Jones' classroom.

✓	Dates	Items to be Completed
	3/1	Diagnostic Test – Barron's PreTest (AP) – itsLearning (A)
	3/3	Diagnostic Test - PreTest (Ga Milestone) – USATestPrep (B)
	3/8	**CHECKPOINT (40 POINTS)**
	3/10	Lowest EOCT Section (90% mastery) – USATestPrep (D)
	3/13	Complete 1 Barron's Practice Test (C)
	3/17	Second Lowest EOCT Section (90% mastery) – USATestPrep (D)
	3/24	Middle EOCT Section (90% mastery) – USATestPrep (D)
	3/27	Complete released exam – itsLearning (E)
	3/31	**CHECKPOINT (120 POINTS)**
	4/10	Complete 1 Barron's Practice Test (C)
	4/14	Second Highest EOCT Section (90% mastery) – USATestPrep (D)
	4/17	Laboratory Review/Science Practices – 6 videos (H & I)
	4/21	Highest EOCT Section (90% mastery) – USATestPrep (D)
	4/22	**AP Biology Practice Exam** (*student choice*) (F)
	4/24	Complete released exam – itsLearning (E)
	4/28	**CHECKPOINT (200 POINTS)**
	4/30	Full-Length Practice Ga Milestone Exam – USATestPrep (G)
	5/8	Completed Notebook due to Mrs. Jones's room by **3:15 pm** **250 POINTS GOING IN GRADEBOOK**

* additional points are either Barron Review Sections or student choice point assignments (see the student choice list)

Questions?

Contact Information

- E-mail: tjones1@rockdale.k12.ga.us
- E-mail: tjones1.rmsst@gmail.com
- Resource Weebly: apbiopenguins.weebly.com
- Twitter: tjones1rmsst
- Instagram: tjones1.rmsst

Evaluation and Dismissal

Please complete the following evaluation

http://bit.ly/2kjV50A

Thank you!