Student Section

- Khan Academy video and question worksheet
  - Question worksheet created

    j. Inflammation WebQuest*
    k. QUIZ 3: Innate Immunity and Inflammation
    l. Overview of the Adaptive Immune System Review
    m. Adaptive Immunity flow charts
    n. QUIZ 4: Adaptive Immunity
    o. Create Your Own Antibodies! (Activity)
    p. Humoral and Cell-Mediated flow charts
    q. QUIZ 5: Humoral and Cell-Mediated Specifics
    r. AIDS Simutest (Lab)
2. Khan Academy EdPuzzle
    a. Use provided guide to create an EdPuzzle at www.edpuzzle.com for students to complete
3. Create Your Own Antibodies
    a. Photocopy an antibody for each student from the kit
    b. Photocopy several pages of the antigens (you do not need one for each student as there are 8 antigens on each sheet)
    c. Set up paper, scissors, and multiple rolls of tape for students to use when cutting out the pieces
4. AIDS Simutest
    a. Organize the samples, chromogen, and conjugate vials so groups have easy access
    b. You may want to label the plates the students will be running the tests in so that you can save time on day of the lab

Materials and Equipment

1. Paper for student copies
2. Computers with Internet access
    a. We had access to Chromebooks for student use, allowing 1:1 use of technology, but students may work in groups on the assignments
    b. Approximate cost = $10,000.00 for a charging cart and 30 Chromebooks
    c. Possible alternatives include:
        i. Use of a computer lab on days that you will need computer access
        ii. Allowing students to use personal devices, such as their own laptops or their cell phones
3. Create Your Own Antibodies!
    a. Antibody Function – Student Laboratory Kit from Flinn Scientific (item #FB1967)
    b. Cost = $18.60 per class set
    c. The kit was used as a base to create the paper activity. You may use the lab directly or make the photocopies as suggested above.
4. AIDS Simutest
    a. AIDS Simutest Kit from Carolina Biological (item #700472)
    b. Cost = $136.95 per class set

Student Prior Knowledge and Skills

Students should be knowledgeable about basic cell structure and function. Students should have a basic knowledge of the systems of the body, but a previous anatomy and physiology course is not required. Finally, students need an understanding of different types of pathogens (bacteria, viruses, fungi, parasitic worms, and protozoans). This understanding should include basic characteristics as well as life cycles and how these organisms can cause disease.

Daily Unit Plans

Below are the daily plans for this unit. Note the length of time. Due to the intense nature of this material, students were instructed to be reviewing daily, so even if there was no assigned homework for the night the expectation was set. For reference materials, please see the list in Section I: Science Background. Note that material often pulled from all of the references listed there, and did not directly come from just one of those resources at a time.

DAY 1: Introduction to Immunology	
Materials:	• Computers for student use • Create the EdPuzzle as shown in provided documents
Procedure:	1. Students will complete a created EdPuzzle on an overview of the immune system. 2. EdPuzzle works by adding students into the class and having them answer questions during a video (which can be selected through the EdPuzzle website). EdPuzzle will then grade the student's answers and provide results to you the teacher. a. Students may rewind portions of the video as needed to help them with the assigned questions, but cannot go back to questions once they have answered them. 3. As students watch the video, they should also be recreating the flow chart that is being drawn by the instructor on the video. a. Students are instructed to color code the information similarly to how it is being

DAY3: Game Review Preparation	
Materials:	• GameReview Instruction Sheet
Procedure:	[redacted]

[redacted]

DAY6: Cells of the Immune System

Materials:

- Presentation
-

DAY9: Non-cellular immune components	
Materials:	• Presentation • Immune System Quiz 2 Review

Procedure:

	round receptors on the macrophage to encourage phagocytosis.
Homework:	Review

DAY12: Game Review Preparation	
Materials:	• Game Review Instruction Sheet

ork:

DAY 15: Inflammation	
Materials:	• Presentation • Chromebooks
Procedure:	1. Notes on inflammation will be done differently than previous notes. Students will listen to the discussion and follow along with the presentation available to them online. During this time they are allowed to ask clarification questions, but should not be taking notes. Once the discussion is finished, students will then go back to the beginning of the inflammation presentation and fill in their note packet. a. When discussing the characteristics of inflammation, note why each characteristic will occur (focused on in the next slide). b. The overview of inflammation is a brief description of the steps that will be further discussed. 2. When finished with their notes, students should go back and write down clarifying statements and ask questions as needed. The rest of the time may be used for review.
Homework:	Review

DAY 16: Inflammation	
Materials:	• Chromebooks • Inflammation WebQuest
Procedure:	1. Students will complete an inflammation question sheet (web

c. When discussing the constant region, the idea of different subtypes of immunoglobulin can be brought up. IgM is the first types that is created and is a

Procedure:

1. Allow students to work on their game, adding in the new information discussed in class.

Homework: Edit game proposal, adding in more information

DAY27: Cell-Mediated Immunity

Materials:

- Presentation
- Highlighters or colored pens/markers

Procedure:

1. Discussion of cell-mediated immunity will begin once again with a flow chart that has most of i faded out, highlighting the portion that is being focused on in this discussion. All cell-mediated notes will be discussed, and the discussion will end with an overview of humoral and cell-mediated responses working together.
   a. This discussion once again differs from previous ones because at this point I edited the presentation to indicate to the students what they should be highlighting. This allowed students to be able to focus more on the discussion and ask questions.
   b. Note during the discussion of helper and regulatory T cells that there are lots of types of helper T cells (or CD4+ T cells). Th1, Th2, Th17, etc. and that even sources I used to create this unit differ in the number of helper T cell types only because some were more recent publications than others and this is a currently developing area.
   c. The discussion will end with a flow chart of T and B cells. This animates in the presentation that was created. Different styles of numbers are used for B, helper T, and cytotoxic T cells. Students were told to color code the different sections and note the overlap of the different parts of the adaptive immune response in addition to filling in the information.
2. When the discussion is concluded, students will go back through all the notes that have been discussed about adaptive immunity. On a separate sheet of paper, they should rephrase the notes and write out the key points that were discussed, using this time to ask clarifying ques

Homework: Finish going back through the notes.

DAY28: Adaptive Immunity Specifics Review

Materials:

- Colored pencils or markers

Procedure:

1. Class will be dedicated to students creating their own flow charts from the details of humoral cell-

DAY33: ELISA Test for HIV	
Materials:	• AIDS Simutest Kit and noted supplies (see previous section)
Procedure:	1. Discuss the lab once again. This is an activity that will have students following ELISA proced screen various "patients" for HIV infection. There are questions about the procedure and how it relates to what has been learned in this unit. The procedure will be addressed/mentioned again during another unit in my elective. An additional bonus is that this lab provides delicate pipette training to students. 2. Students will use the time to set up the lab. This class period will not be sufficient to complete the lab, but students need to set up in a way that they are ready to start the minute they arrive in class the next day. 3. If there is time, students may start to get results going one patient at a time, but will have to rinse their materials before they leave class.
Homework:	Review

DAY34: ELISA Test for HIV	
Materials:	• AIDS Simutest Kit and noted supplies (see previous section) • Chromebooks
Procedure:	1. Students will complete the ELISA lab according to provided instructions. 2. Once clean-up is completed, students will be required to begin their post-lab questions (due tomorrow online).
Homework:	Finish the post-lab questions and submit the whole lab to turnitin.com

DAY35: Game Review Preparation	
Materials:	• Game Review Instruction Sheet
Procedure:	1. Allow students to work on their game, adding in the new information discussed in class.
Homework:	Edit game proposal, adding in more information

DAY36: Game Review Preparation	
Materials:	• Game Review Instruction Sheet • Game supplies
Procedure:	1. Allow students to work on their game, adding in the new information discussed in class. 2. Practice the game, making changes and additions as needed
Homework:	Work on finalizing game

DAY37: Game Review Preparation	
Materials:	• Game Review Instruction Sheet • Game supplies
Procedure:	1. Allow students to work on their game, adding in the new information discussed in class. 2. Practice the game, making changes and additions as needed
Homework:	Work on finalizing game

DAY38: Game Review Preparation and Practice

Materials:

-

Name: ______________________________________ Date: ____________________ Pd:________
Allied Health Potts

P pt ea) 1 Multiple Choic

Please choose the correct response from the options given. There will only be ONE answer for each question. Please write your answer choice on the line provided.

1. Which of the following is FALSE about histamine?
   a. It is released from granules of cells
   b. It causes itching and pain by stimulating nerve endings
   c. It is released as part of the adaptive immune response
   d. It may be released as part of the allergic response

2. Which of the following cells can be found as tissue residents, meaning they do not have to exit the blood in order to be a part of the immune response?
   a. o2-0.7(f)-6.8(th)[(W)-1.4(h)-2./TT0 10.7(f)-5stc 0.006 Tw 1.705 0 Tdd1.1(a)-3.3(s 16 Td [16 Td [e)-7(-3.3(n)-2

23. Granules contain histamine	23a) ________________

24.

24. Will respond to PAMPs

1. Adaptive immune cells will interact mainly at the ________________________ in the body.
    a.

1. Adaptive immune cells will interact mainly at the ___lymph nodes______ in the

7. Why do B cells usually require signaling from helper T cells?
    a. In order to tell them which pathogen to react to
    b. So they don’t produce too many antibodies
    c. To protect you so B cells don’t react against self
    d. So that the B cells can then activate the cytotoxic T cells
    e. To be able to react to and kill cancer cells

8. Which of the following is FALSE about cytotoxic T cells?
    a. By forcing helper T cells to undergo apoptosis, they activate the cell mediateete [(m)11.9(e)-5(d)-.003 Tc3(m)11.9(
        e.

LONG ANSWER

12. HIV specifically infects CD4 helper T cells. These cells will then be destroyed as a result of the viral infection. Expla using what you know about CD4 helper T cell functioning, how this will negatively impact the immune functioning of a patient infected with HIV. I am expectin

EXTRA CREDIT:

You may do both of the extra credit questions.

13. What is "herd immunity"? Why is it important?____

14. Describe ***UP TO*** three of the following (in terms of the effect on the immune system or the immune system's effect on the body):
    a. Graft-versus-host disease (GvHD)
    b. Autoimmune hemolytic anemia
    c. Multiple sclerosis
    d. Chronic granulomatous disease
    e. DiGeorge syndrome
    f. Severe combined immunodeficiency disease (SCID)

7. Why do B cells usually require signaling from helper T cells?
    a. In order to tell them which pathogen to react to
    b. So they don't produce too many antibodies
    c. To protect you so B cells don't react against self
    d. So that the B cells can then activate the cytotoxic T cells
    e. To be able to react to and kill cancer cells

8. Which of the following is FALSE about cytotoxic T cells?
    a. By forcing helper T cells to undergo apoptosis, they activate the [illegible]

LONG ANSWER

12. HIV specifically infects CD4 helper T cells. These cells will then be destroyed as a result of the viral infection. Expla using what you know about CD4 helper T cell functioning, how this will negatively impact the immune functioning of a patient infected with HIV. I am expecting a good amount of detail in your response, and you must indicate all ways discussed in class that Th functioning will be impacted. Note that you do NOT need to discuss HIV in particular; this is just the lens through which you're describing what T helper cells do.
Use the image to help.

What T helper cells do:	***Loss will lead to:***
Activate B cells [2 pts]	[1 pt] No plasma cells making antibodies against infective agent
Activate Tc cells [2 pts]	[1 pt]

Antigen presenting cells are...

Immune

specific/adaptive

Which of the following are white blood cells associated with?

☐ Neither innate nor adaptive

White blood

☐ The specific immune response (adaptive immunity)

☑ Both innate and adaptive immunity

from, but they have different

☐ The nonspecific immune response (innate immunity).

Continue

Lymphocytes first ... created?

Where

nonspecific

☐ Thymus

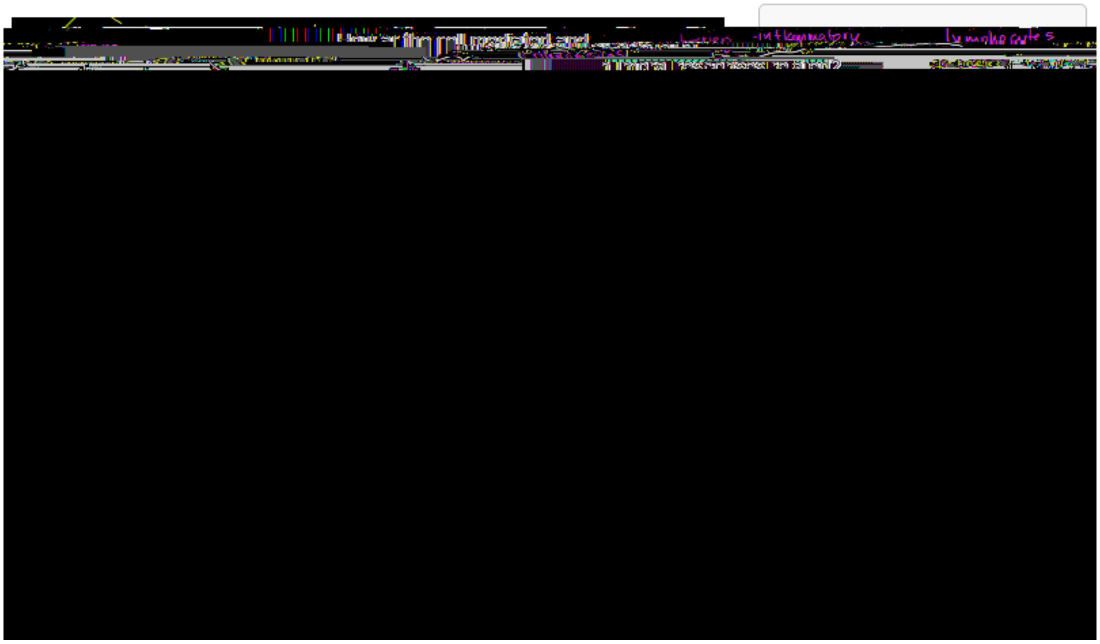
B lymphocytes

T lymphocytes

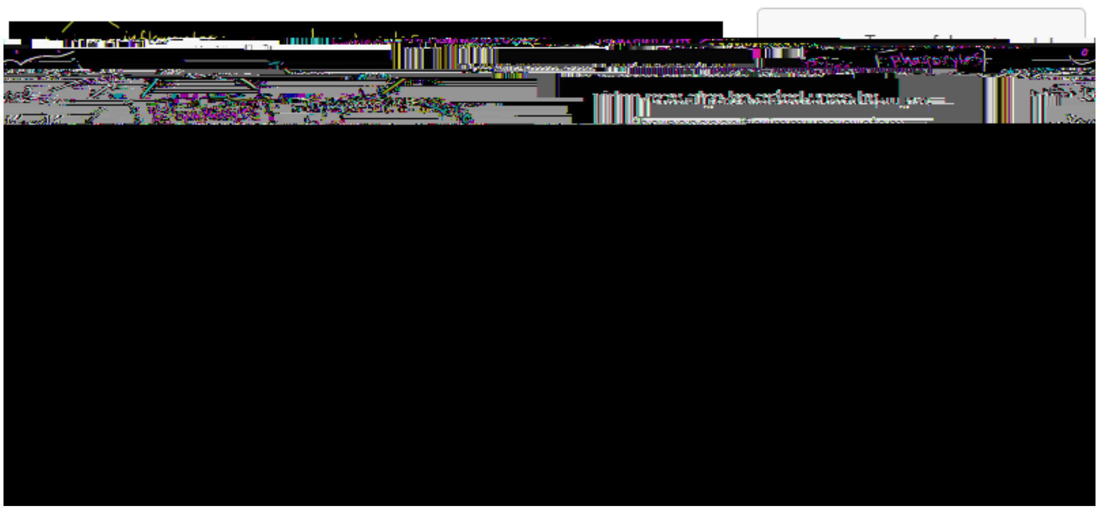
Thymus

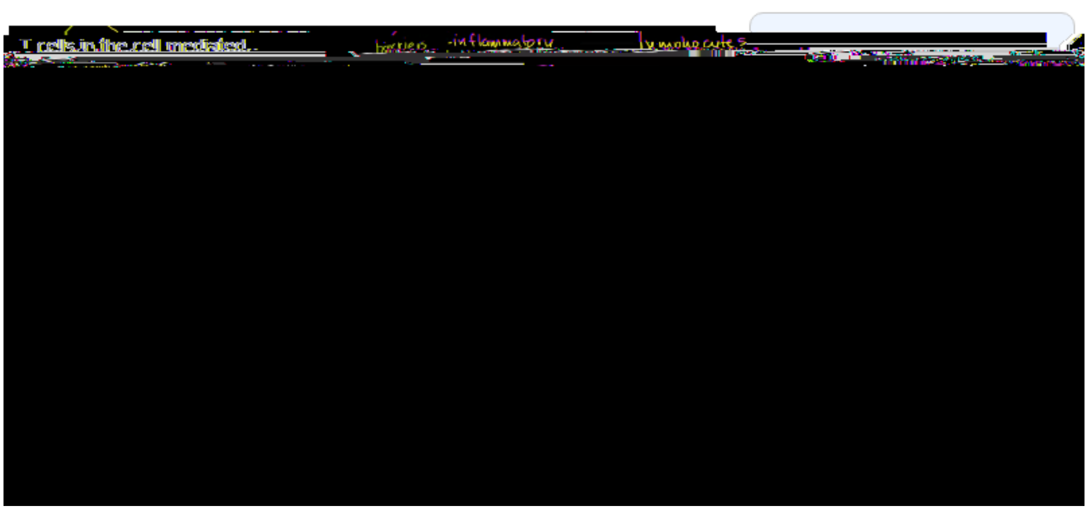
leukocyte...

☐ Neither



Types of immune responses: Innate and adaptive, humoral vs. cell-mediated | NCLEX-RN | Khan Academy





Student: ___________________________________

Game:_____________________________________

Directions					
Directions are clear and to the point. Handouts provided for all participants in the game. Sections of directions are well organized and labeled.	Directions should be edited slightly for clarity. Other parts (see 5) present.	Directions provided but require more organization and/or edits for clarity.	Directions provided, but they are not very clear or are not organized in a way that makes them easy to follow.	Directions provided, but they are unclear and unable to be used to play the created game.	NOT DONE
Pieces					
Pieces required to play the game are well-made (sturdy, clear, etc) and clearly different from other portions of the game.	Pieces may need to be more clearly different from other pieces or may need to be edited a little.	Pieces are given, but they are made rather flimsy or are messy.	Pieces provided, but are not made in a way that makes the game able to be easily played multiple times	Pieces provided but are messy, not reusable, and hard to differentiate from each other	NOT DONE

Addresses each of the following topics:

5. Describe how skin and mucous membranes are similar and different when defending against pathogens.

   Both are physical barriers, but while skin is tightly packed, dry, and thick, mucous membranes are thin, Name: ____________________________________

16. Recognize antigen from dendritic cells. _______T cell_______________________________________

17. Cell that travels and matures in the thymus. ___T cell_______________________________________

18. Look like lymphocytes (because also from a common lymphoid progenitor), but are part of the innate immune response. ___NK cell____

19. Function in antigen presentation (as an APC: antigen-presenting cell). ______________________________ __________Dendritic cell, macrophage, B cell

6. Explain why PRRs are important for the innate immune response but not the adaptive.

13. List the five types of cytokines discussed in class. Describe two of them.

ChemokinesÆattract cells to an area

InterleukinsÆSignals between WBCs

InterferonsÆNonspecific antiviral proteins

Name: ______________________________ Date: ____________ Pd:______

Allied Health Potts

1. What is the purpose of opsonization? What are opsonins (generally) and what can act as an opsonin?

Purpose = Increases the ability of phagocytes to bind to and therefore ingest microorganism. This is because opsonization increases the number of places on the microbe the phagocytic cell can bind to.

Opsonins = Proteins that coat the microbes.

Complement and antibodies can act as opsonins.

2. Why is fever not always bad (what beneficial effects does it have on the body)?

Increases neutrophils from bone marrow

Environment is too hot for microbes to survive

Increased temperature acts as a catalyst for immune reactions

3. List the major cytokine functions discussed in class (5).

Activate immune cells

Increase macrophage and neutrophil phagocytosis

Activate complement

Set up antiviral defenses (interferons)

Signal to adaptive immune cells to start differentiating

4. How are interferons beneficial to infections by more than one type of virus? How are interferons harmful to us?

Beneficial: act generally/nonspecifically, so one virus can activate and it will act against other

Harmful: causes the negative feelings/symptoms associaausid1.3(o)66801 sce

12. What are perforin and granzymes? Where do they come from and what do they do?

Enzymes released in the granules from NK cells

Perforin: poke holes in the membrane

Granzyme: digest the cell and trigger it to kill itself so that it limits damage and inflammation

13. How are mast cells related to the overall inflammatory response? Explain both the effects they have on parts of the body and also how they will communicate with other cells (which ones?) and what this does for you.

Mast cells release histamine.

Histamine increases permeability of blood vessels (like macrophages) to let cells squeeze through more easily

Call to basophils and eosinophils, which contribute to inflammation or directly kill certain types of pathogens

14. Contrast acute and chronic inflammation.

Acute is fast and generally beneficial

Chronic is long-lasting and results in disease/damage to tissues. It's generally a result of loss of control of the inflammatory response (could be because of autoimmune disease due to improper functioning of the adaptive immune response)

15. What are the four "classic" characteristics of inflammation? Explain on a cellular level how they occur.

Redness – due to vasodilation

Swelling (edema) – due to loss of fluid from increased permeability of blood vessels

Heat – due to vasodilation

Pain – due to chemicals made by immune cells called to the area that stimulates nerves

16. How and why do cells in blood vessels move out into infected tissue?

Cells move there as a result of chemokines calling them to the area in order to fight the pathogens that have infected the tissue. They get here because they squeeze through blood vessels (following the gradient of chemokines created by other cells). They can squeeze through because chemicals increase permeability of the vessels, causing the cells of the blood vessel walls to "loosen" and let the immune cells through.

Name:

9. How does histamine relate to the inflammatory response? What general effects does it have related to how you feel during cold season?
   - FILL

10. Discuss the effect histamine has on endothelial cells. Why is this effect important to the inflammatory response?
    - FILL

11. Describe the changes in the nearby blood vessels and which of the four characteristics of inflammation that this leads to.
    - FILL

12. What role do neutrophils play? How do they know where to go?
    - FILL

13. Describe the following:
    a. Marginization - FILL
    b. Diapedesis - FILL
    c. Extravasation - FILL

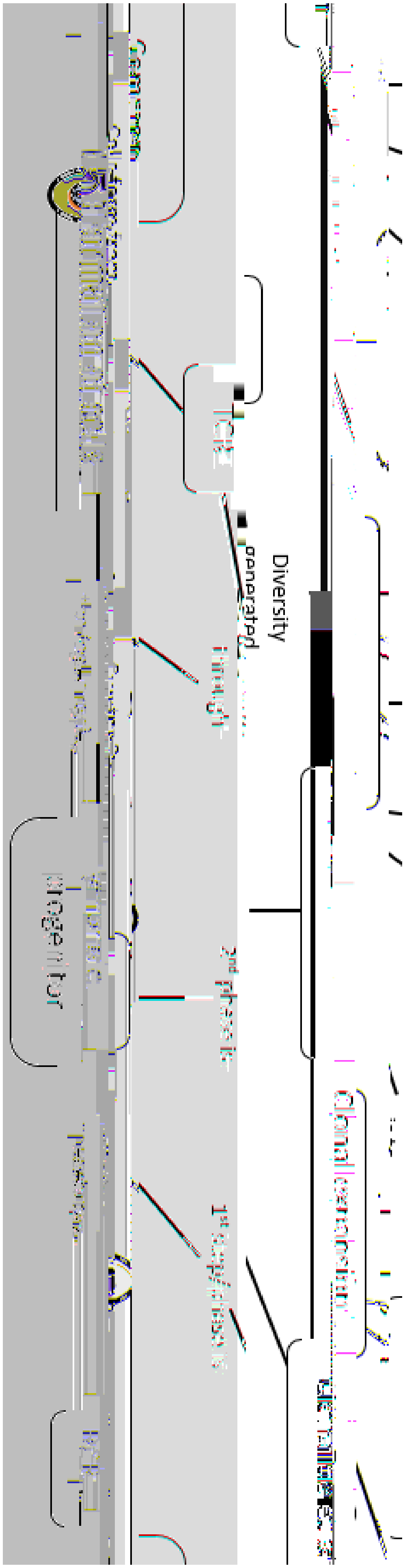
14. What other kinds of cells (other than neutrophils) will be called to the area to fight the infection?
    - FILL

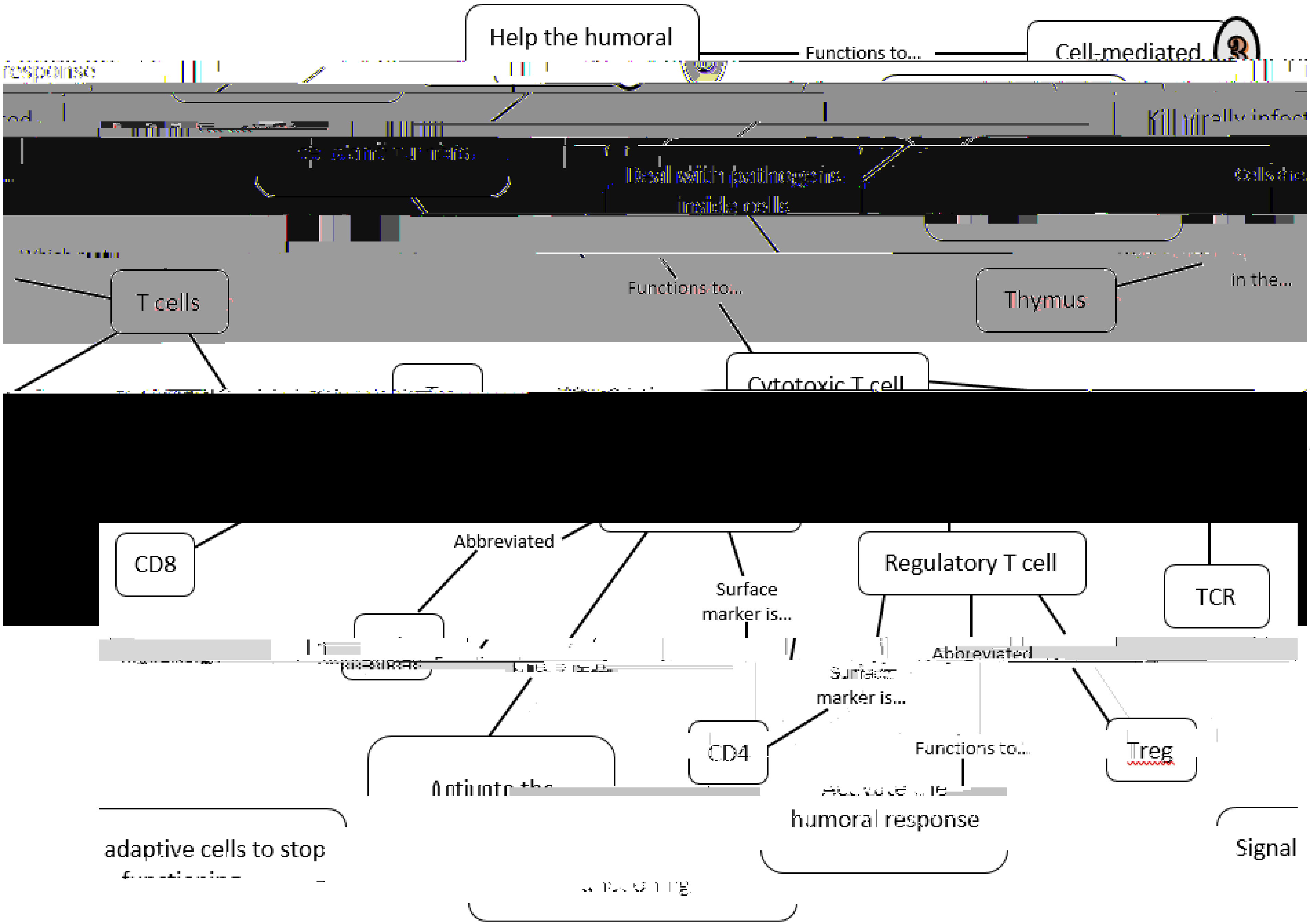
15. What fights an infection other than cells? Describe this.
    - FILL

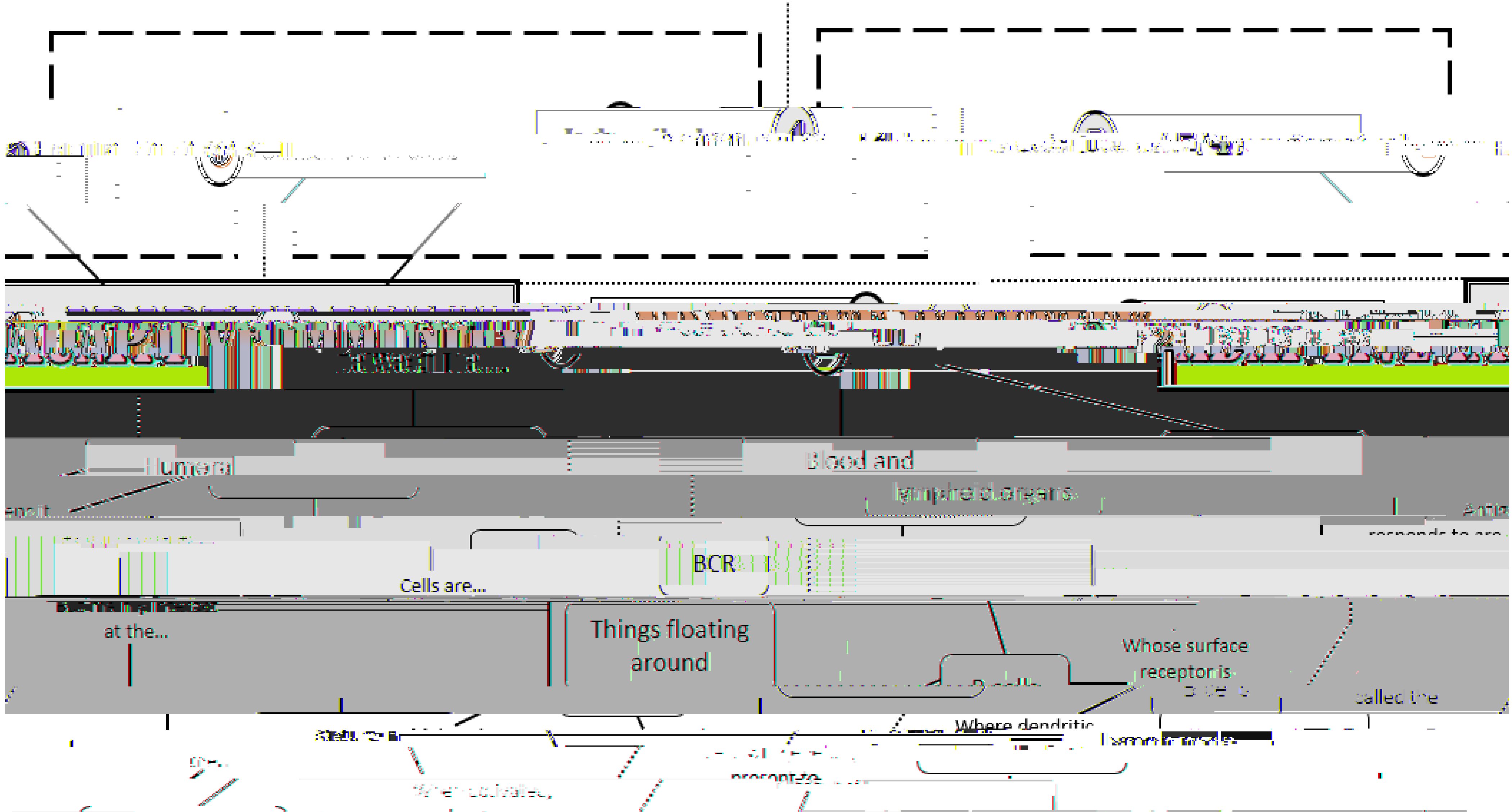
16. What is exudate? What do you see as a result of it (look at the four characteristics of inflammation!)?
    - FILL

Grading:
1 point for each question
15 points
Any 1 question left blank is okay (free question)

1.


Diversity
generated
TCR
through
2nd phase is
1st step/phase is
Clonal expansion
progenitor


Help the humoral
Functions to...
Cell-mediated
Kill virally infect
Deal with pathogens inside cells
T cells
Functions to...
Thymus
in the...
Cytotoxic T cell
CD8
Abbreviated
Surface marker is...
Regulatory T cell
TCR
Abbreviated
Surface marker is...
CD4
Functions to...
Treg
humoral response
adaptive cells to stop
Signal

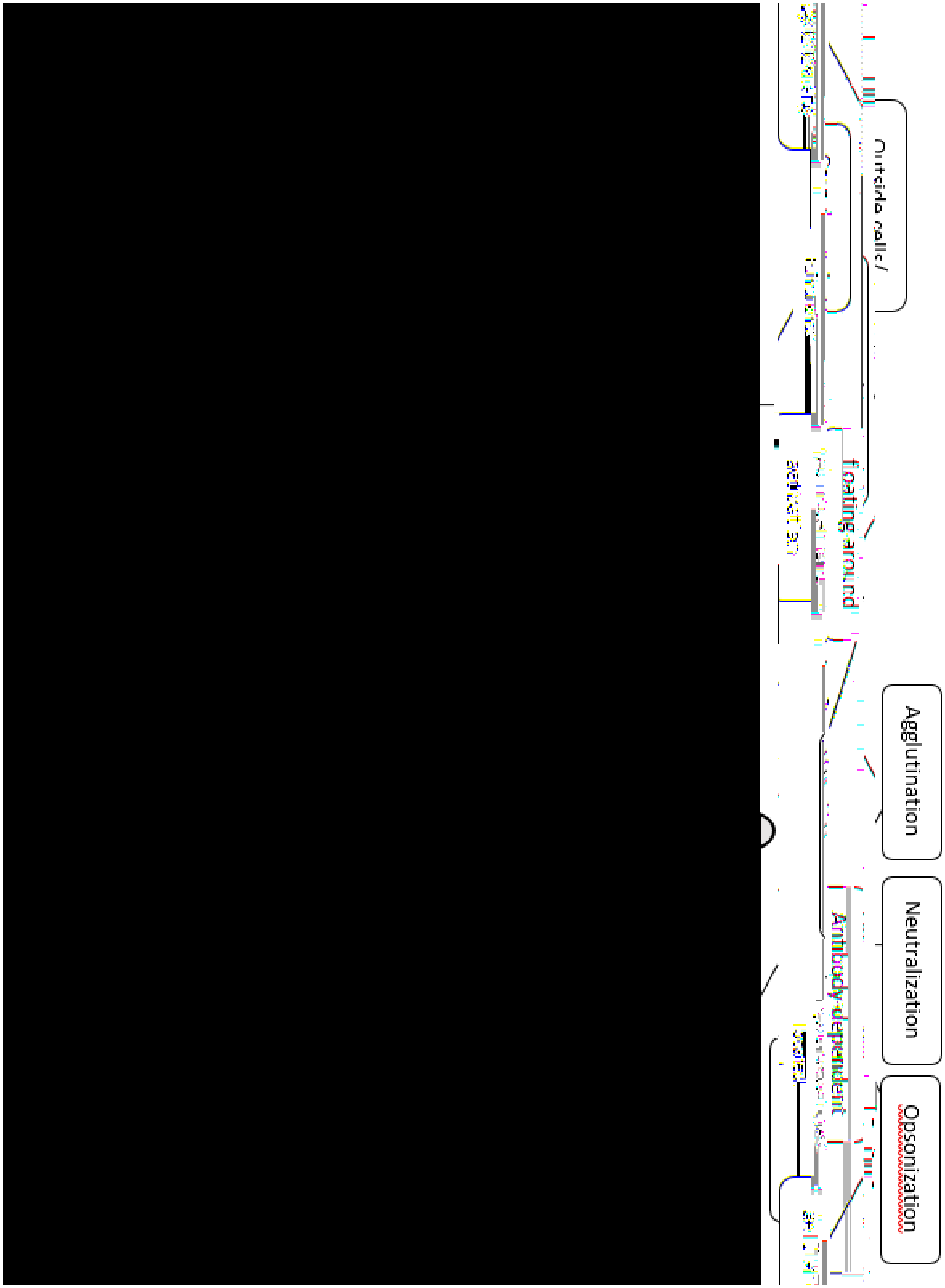

Humeral
Blood and
lymphoid organs
Cells are...
BCR
at the...
Things floating
around
Whose surface
receptor is
called the
Where dendritic

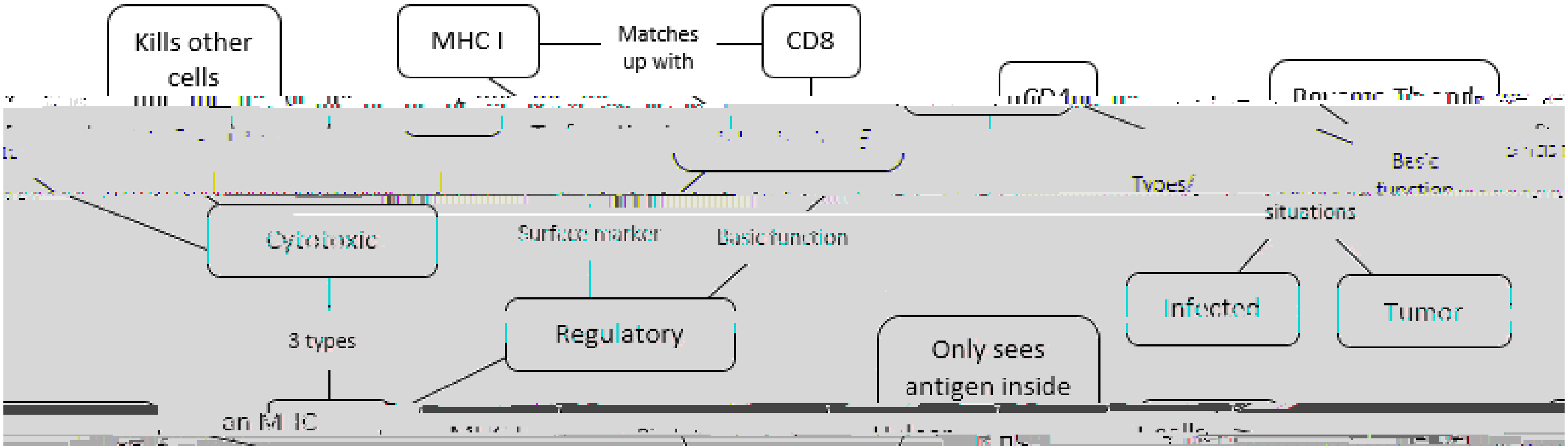
Pre-Lab Questions:

These answers will be uploaded to turnitin.com.

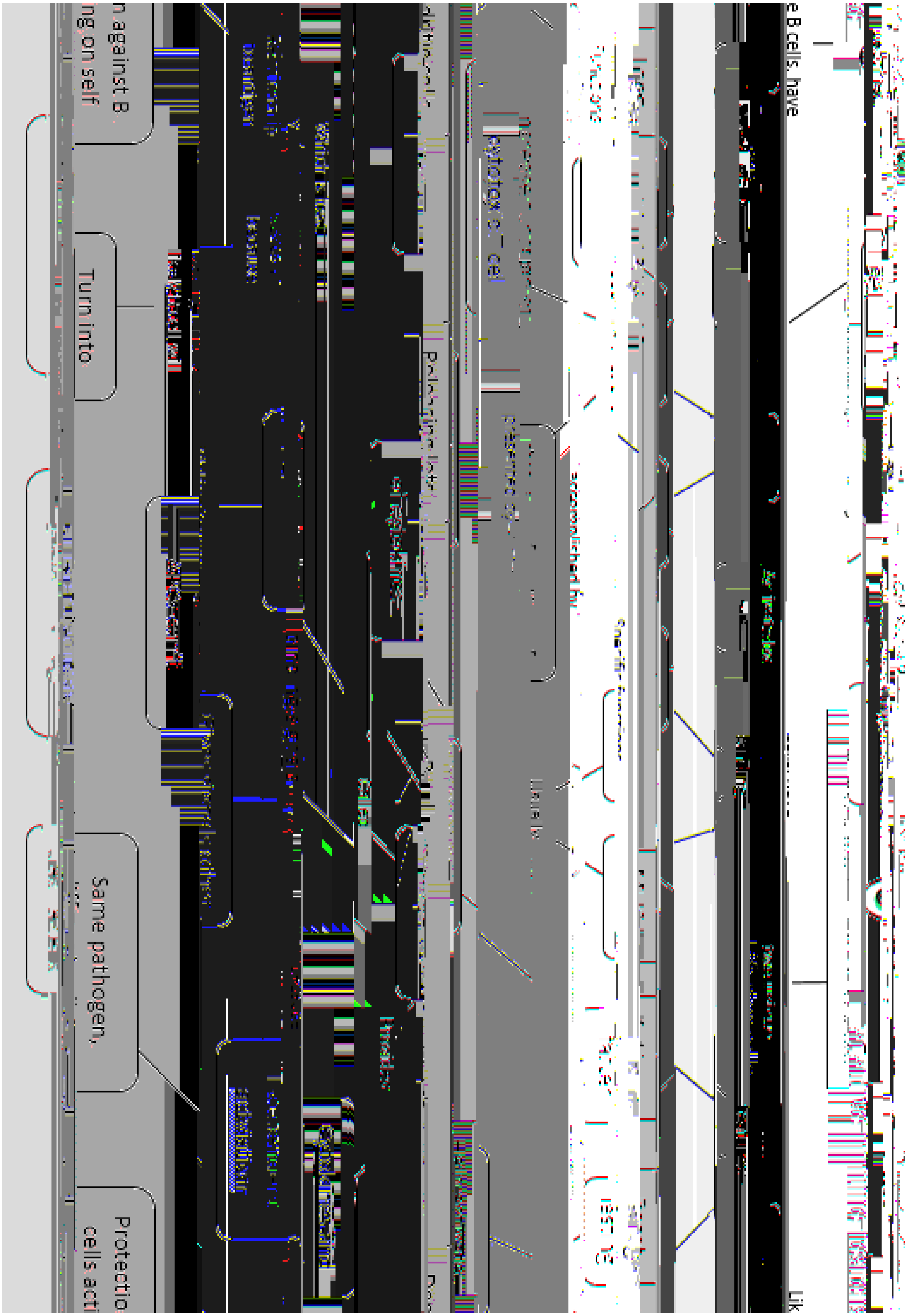
1. Define the following terms in your own words:
   a. Antibody – specific proteins produced in response to a specific antigen (various accepted) [1 pt]
   b. Antigen – any substance that can induce an immune response [1 pt]
   c. Activation – when a B cell meets up with its matching antigen [1 pt]
2. Describe the structure of an antibody. Make sure to reference the different types of chains as well as the shape and variable region.
   a. Y shape [1 pt]
   b. Changes between different antibody isotypes (constant region doesn't) [2 pts]
   c. Each antibody has 2 heavy and 2 light chains [2 pts]
3. Refer to Figures 1 and 2. Each arm shown in Figure 1 is able to bind one antigen. How many antigens can each antibody in Figure 2 bind?
   a. IGM = 10; IgG = 2; IgA = 4; IgD = 2; IgE = 2 [5 pts]

Post-Lab Questions:


Outside cells/
floating around
activation
Agglutination
Neutralization
Opsonization
Antibody-dependent


Kills other cells
MHC I
Matches up with
CD8
Cytotoxic
Surface marker
Basic function
3 types
Regulatory
Only sees antigen inside
Types/ situations
Infected
Tumor
Basic function

[redacted]


e B cells, have
Helper
Specific functions
accomplished by
Turn into
Same pathogen,

Use the reading as well as other sources to answer the questions below. These answers will be uploaded to turnitin.com.

1. Describe/define the following terms:
   a. AIDS – Acquired Immunodeficiency Syndrome; the stage of the disease when characteristic symptoms appear, and CD4+ T cell counts drop. [1 pt]
   b. HIV – Human Immunodeficiency Virus, a retrovirus (lentivirus) that causes AIDS. [1 pt]
   c. ELISA – Enzyme-Linked Immunosorbant Assay, an assay which is used to test for the presence of HIV. [1 pt]
   d. Opportunistic infection – An infection by a pathogen (virus, bacteria, fungus, etc.) to which a healthy body would normally be resistant, but a person with AIDS would be susceptible. [1 pt]

2. Name one opportunistic infection that is associated with AIDS and explain what it is.
   a. Various answers accepted. Examples include Kaposi's sarcoma or Pneumocystis pneumonia. [1 pt]
   b. Brief description required (1-2 sentences describing the infection). [2 pts]

3. In the early 1980's, who started to develop AIDS while the transmission of the disease was being investigated?
   a. Hemophiliacs, recipients of blood transfusions, intravenous drug users, heterosexuals, babies born to mothers with the syndrome. [2 pts]

4. How many people died of AIDS in the United States by 1985? How many people in the US are estimated to be living with AIDS (as of 2013)?
   a. 6,000 [1 pt]
   b. 1.1 million [1 pt]

5. Describe the incubation/latency period that occurs before HIV leads to AIDS.
   a. On average, the incubation period is 10 years. [1 pt]
   b. No visible symptoms are during this time. [1 pt]

6. Why can HIV enter immune cells? Which cells is it targeting?
   a. A glycoprotein on its surface mimics an antigen the host identifies as "self." [1 pt]
   b. Targets CD4+ T cells. [1 pt]

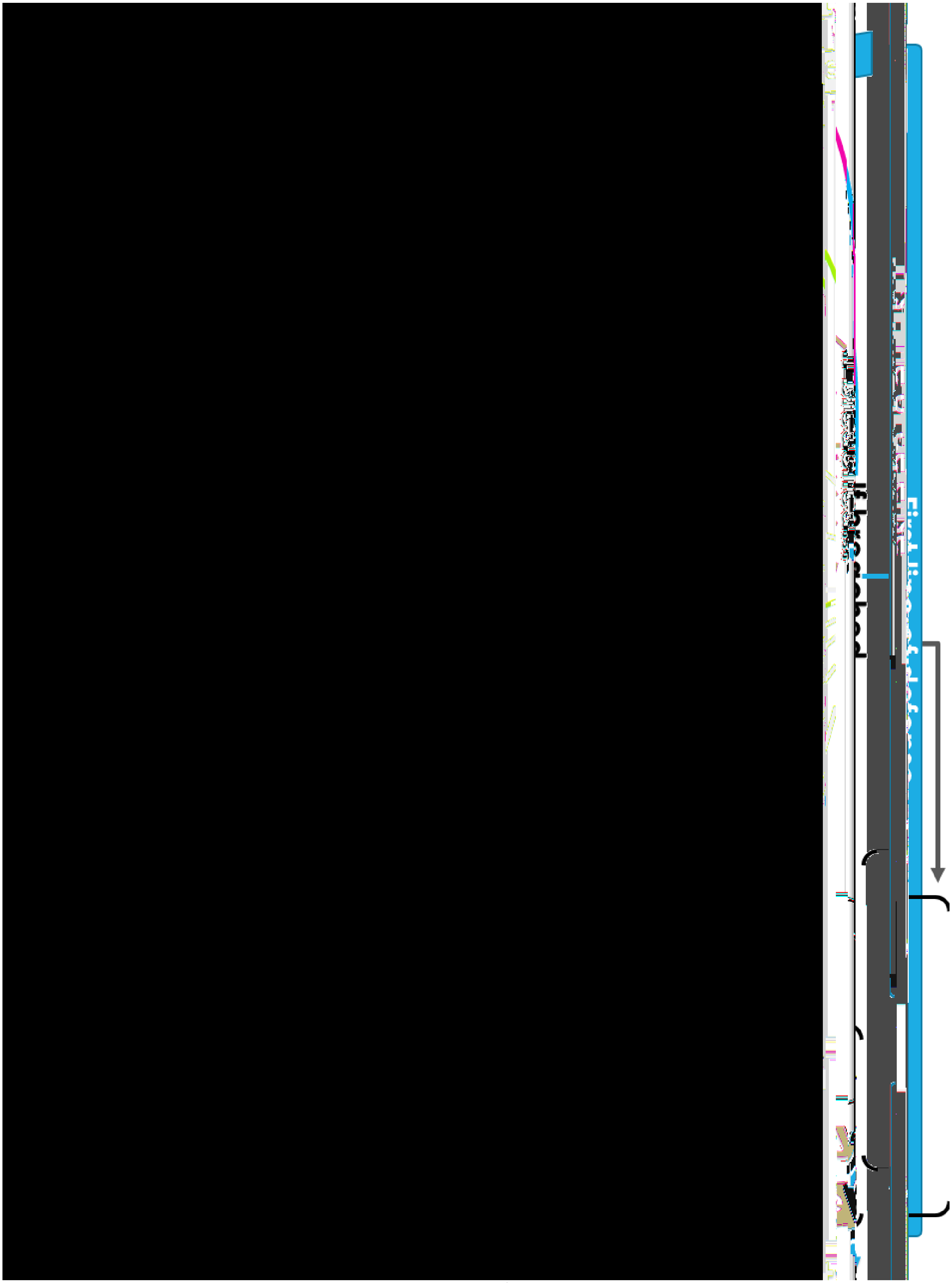
7. What trait is used to follow the progress of the disease? What marks the final phase of the illness?
   a. Amount of CD4+ T cells. [1 pt]
   b.

Student Section

Rationale

This unit is designed to be relevant to students both in terms of the material covered as well as how it is covered. The purpose of covering this material is to introduce you, as students, to how the body protects itself from disease. This unit delves deeply into material to prepare you for further study in the sciences and to give you exposure to intricate material that you may experience in your future studies (after high school). It is also relevant as brief lesson on how the immune system functions in conjunction with vaccines to develop memory and understanding of vaccine benefit and safety. Material will be presented in a variety of ways in order to expose you to different learning material after high school and develop skills for success in science lectures in the future. This includes note outlines, online notes, and lectures where the notes are given and you will have to determine what is most relevant. The last portion of the unit will utilize the given notes, and is intended to most closely mimic the type of presentation that you will be exposed to when you begin to take science classes in college.

To succeed in this unit, you must have an underlying background of basic cell biology. You probably learned most of this in your biology class, such as the basic structure and function of eukaryotic cells (membrane, surface proteins, etc.). You will also have to be familiar with the basic functions of the different systems of the human body, but a previous



[redacted]

1. What is the purpose of opsonization? What are opsonins (generally) and what can act as an opsonin?

2. Why is fever not always bad (what beneficial effects does it have on the body)?

3. List the major cytokine functions discussed in class (5).

4. How are interferons beneficial to infections by more than one type of virus? How are interferons harmful to us?

5. Relate interferons to innate immune cells. Be specific about where they come from and what they do (if it was discussed in class).

6. Describe how complement will proceed once activated (what happens to the proteins).

7. What arethe three results of complement activation? Use terms and define them!

8. Describe the three ways that neutrophils can kill microbes.

9. Explain how macrophages will “raise the alarm” when you have an infection.

10. How do macrophages relate (specifically!) to what happens during inflammation? Discuss cytokines and their effects, when applicable.

11. How are NK cells signaled to kill a cell? There is more than one way, so make sure you list both!

17. Summarize inflammation. Be pretty general, but do not just copy the flow chart (more info than that)!

Name: FILL THIS IN

- Fill in your name at the top and then save this document in a place on your Drive that you can find it again easily.
- Go to https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology/introduction-to-immunology/v/inflammatory-response
- Using headphones,scn /ne72 ( )Tw 1.035.h 1.2(t)-6.e onviop 1.2(t)-1.2(y) /T.6(i)2.6(n y)8.9(our)an2.6(s6.6(w)

Name: ________________________________ Date:______________ Pd:________

Allied Health Potts

1. Describe the movement of cells of the adaptive immune throughout the body (where are they circulating?).

2. How is the lymph node structured to encourage a successful adaptive immune response?

3. What is the purpose (or result) of dendritic cells processing self antigen (parts of our own cells)?

4. What does a humoral response react to in the body? What kinds of cells are associated with humoral immunity

5. What does a cell-

9. Where are the two types of MHC found? What are they each recognized by?

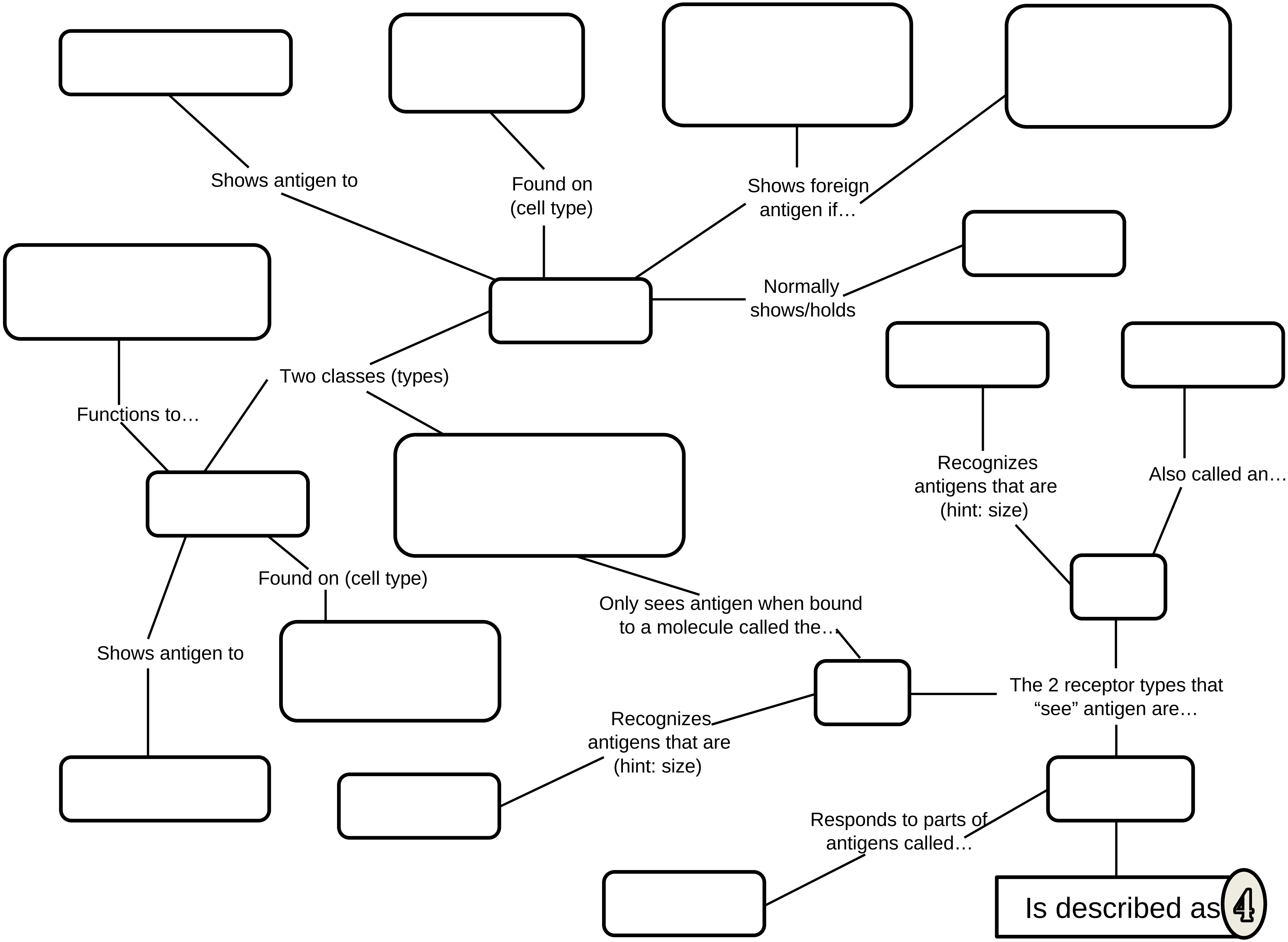
10. How does the MHC relate to how T cells respond to antigen? Why are they necessary?

11. What process allows there to be such a large amount of diversity in the TCR and BCR that will be created in ou immune system?

12. What is the purpose of clonal deletion?

13. How does the MHC affect clonal deletion of T cells?

Is described as…


Shows antigen to
Found on
(cell type)
Shows foreign
antigen if…
Normally
shows/holds
Two classes (types)
Functions to…
Recognizes
antigens that are
(hint: size)
Also called an…
Found on (cell type)
Only sees antigen when bound
to a molecule called the…
Shows antigen to
The 2 receptor types that
“see” antigen are…
Recognizes
antigens that are
(hint: size)
Responds to parts of
antigens called…
Is described as
4

Because

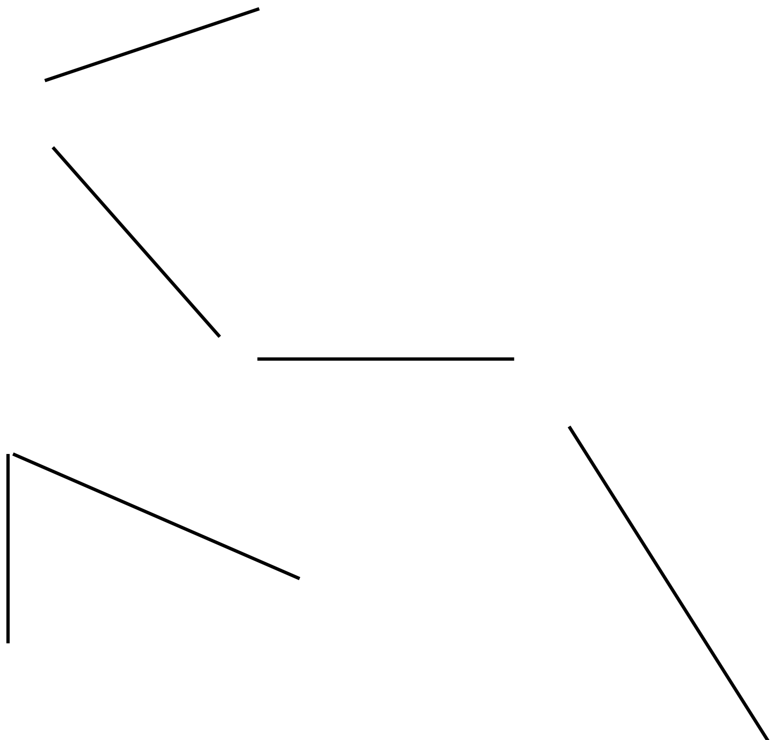
No reaction
results in

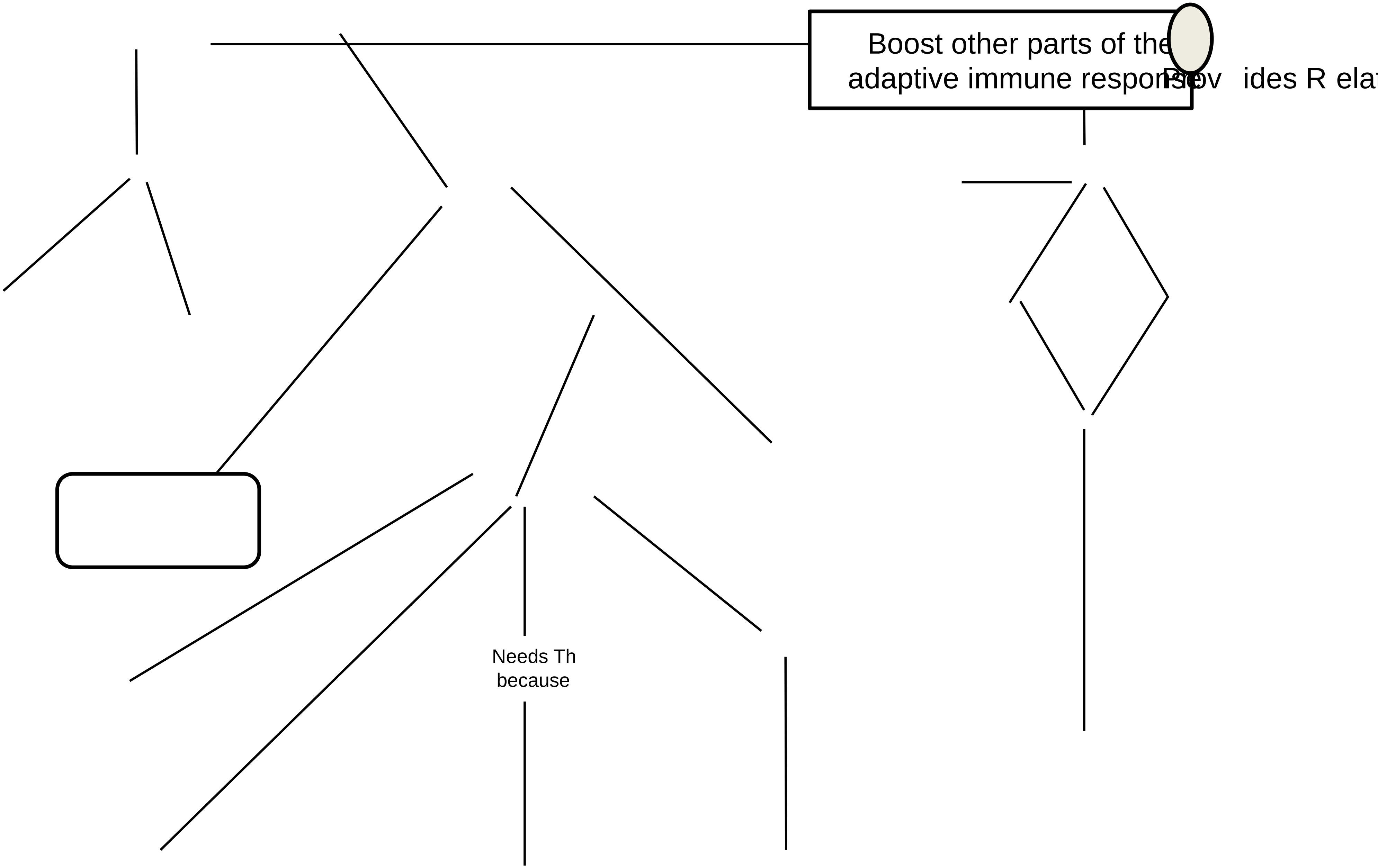
More complex in T
cells because of the

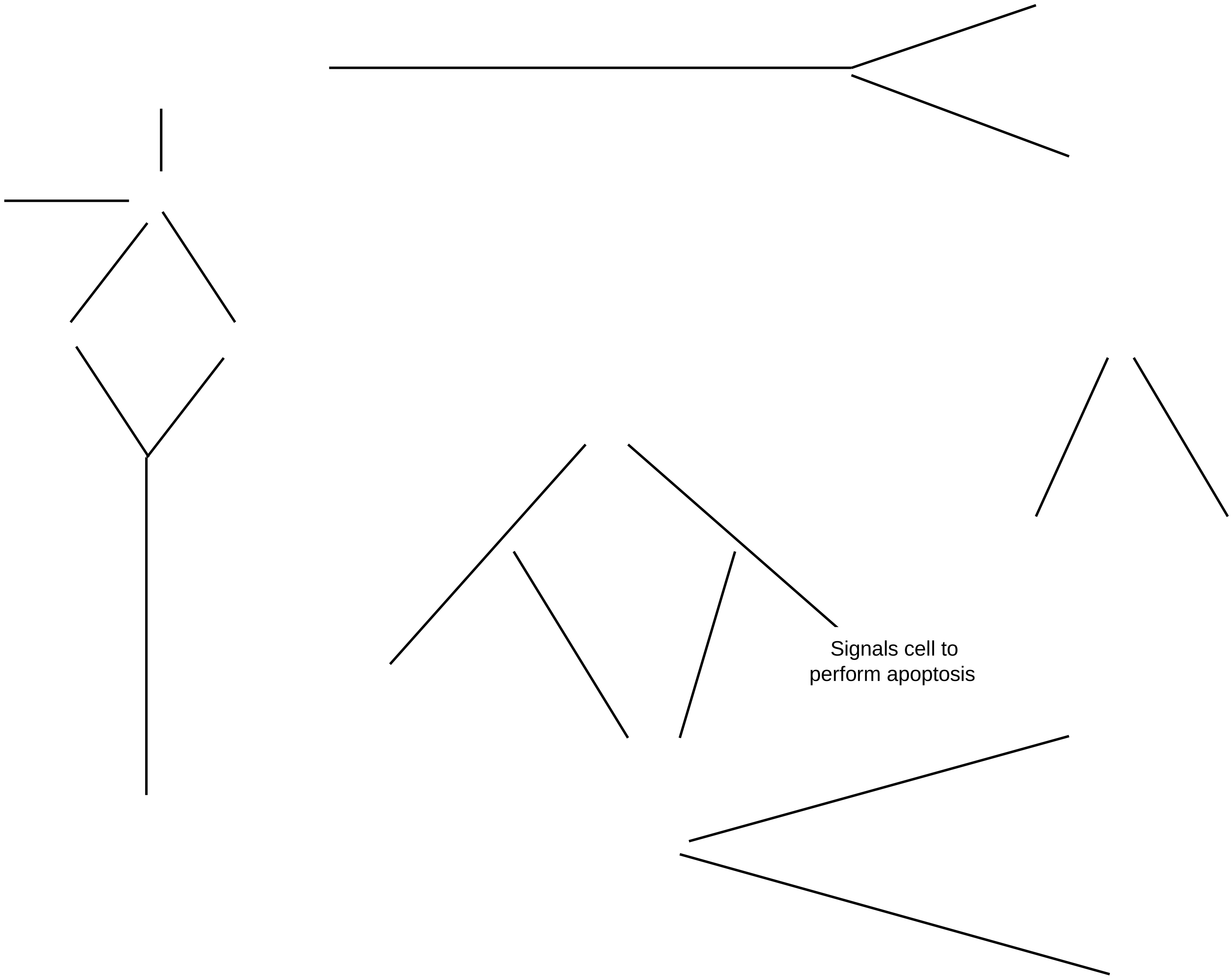
Name: ____________________________________ Date: __________________ Pd:________
Allied Health Potts

Objectives:

- Describe the basic structure




Boost other parts of the
adaptive immune response
ides R ela
Needs Th
because


Signals cell to
perform apoptosis

Name: ___________________________________ Date: _________________ Pd:________
Allied Health Potts

Modified from AIDS Simutest Kemtec Kit #403 (from Carolina Biological)

Students will be able to…

- Differentiate between HIV and AIDS.
- Learn how HIV is contracted.
- Learn how a person can avoid contracting HIV.
- Experience using an ELISA to detect HIV antigens and determine if a patient is HIV positive.

History

Early in 1981, doctors and medical researchers in the U.S. began to see a significant number of homosexual men with rare forms of infectious diseases and cancers, such Pneumocystis carinii pneumonia and Kaposi's sarcoma, to which the body is normally resistant. Scientists and physicians realized these men would succumb to these diseases because they had damaged immune system. As scientists began searching for the origin of the problem, hemophiliacs and other recipients of blood transfusions from infected individuals began to show similar symptoms. As the epidemic spread further, intravenous drug users, heterosexuals, and babies born to mothers who had the syndrome also developed the same immunodeficiency.

By the middle of 1985, 12,000 cases of the disease had been reported in the U.S., and half of these cases had resulted in death. The disease became known as Acquired Immunodeficiency Syndrome, or AIDS; a primarily sexually transmitted disease, which inactivates the body's defense system. At the same time that AIDS was detected in the U.S., it was rapidly spreading throughout the rest of the world as well.

The AIDS Simutest

In this kit you will perform a simulation of an HIV ELISA. This kit contains no actual blood or blood products, so it is free of contamination by HIV or other infectious agents. As with any chemical kit, care should be taken when handl

Use the reading as well as other sources to answer the questions below. These answers will be uploaded to turnitin.com.

1. Describe/define the following terms:
    a. AIDS
    b. HIV
    c. ELISA
    d. Opportunistic infection
2. Name one opportunistic infection that is associated with AIDS and explain what it is.
3. In the early 1980’s, who started to develop AIDS while the transmission of the disease was being investigated?
4. How many people died of AIDS in the United States by 1985? How many people in the US are estimated to be living with AIDS (as of 2013)?
5. Describe the incubation/latency period that occurs before HIV leads to AIDS.
6. Why can HIV enter immune cells? Which cells is it targeting?
7. What trait is used to follow the progress of the disease? What marks the final phase of the illness?
8. What does the body’s immune system produce in response to viral infections? How is this product used in the AIDS test? Briefly describe the ELISA test in order to adequately answer this question.

6. Using the pipette labeled A, mix the sample in the second well of row A. Do this by very gently sucking up the solution in that well into the stem of the pipet and releasing it back into the well. Do not blow bubbles in the solution with the pipet.

7. Again, use the pipets to suck up the contents of the second well and carefully transfer 8 drops into the next well; well 3 of row A. Return the remaining solution in the pipet to the well you took it from; the second well of row A.

8. Mix the contents of well 3 and transfer 8 drops to well 4. Return the remaining solution to well 3.

9. Continue making dilutions this way across row A. After you have diluted serum from well 6 to well 7, mix as before, then discard 8 drops into well 8. Return the remaining solution to well 7.

10. Repeat steps 5-8 to make dilutions for rows B-H, using the appropriately labeled pipet that you used before when placing the serum into the wells.

11. Wait 10 minutes for the antibodies to bind to the HIV antigen. While you are waiting, work on questions for this activity.

12. Using the pipet labeled “Conj” (for conjugate), add 2 drops of conjugate to each of the wells 1-7 in rows A-H. (In the actual test, the wells would be rinsed with buffer before adding conjugate, but this step is not required for this simulation.)

13. Wait 5 minutes for the antibody-enzyme conjugate to bind to the serum antibodies. While you are waiting, read the biographical sketches for each of the serum don donors and predict who you think is most likely to test positive for HIV. Indicate why you believe they will be most likely to test positive. Note that anywhere from 0-3 serum donors may test positive.

14. Use the pipette labeled “Chro” (for chromogen) and add 3 drops of chromogen to each well 1-7 in rows A-H. (In the actual test, the wells would once again be rinsed with buffer before adding chromogen, but this isn’t required for this simulation).

15. <u>ANALYZE RESULTS:</u> A light yellow or colorless result is a negative result. A reddish color (from very dark to light red) indicates a positive test for HIV.

[illegible]:

1. When the tests are complete, dispose of the chemicals in the wells by pouring them down the drain followed by a large volume of water. We can use these plates again if they are cleaned properly!

2. Rinse the microplates under a GENTLE stream of tap water to flood the wells.

3. Invert the plate and shake gently to empty the wells of water

4. Repeat two more times and allow the plate to air dry over a paper towel.

5. ***<u>DO NOT wipe anything inside the plate. DO NOT use any cleaner/soap. Either of these things will remove the special antigen bound in the wells!</u>***

R :

This tablewill need tobe recreated and uploaded to turnitin.com.

Table 1: ELISA Results

Use (+) to represent a result that is a shade of red.