HIV Worksheet Key

A Lead-in

1 Do you know what the letters HIV stand for?

2 Human immune system: lymphocytes (B Cells, CD4+, T Cells)

3 An online quiz: [http://www.medicinenet.com/hiv-aids_quiz/quiz.htm](http://www.medicinenet.com/hiv-aids_quiz/quiz.htm)

B Listening [https://www.youtube.com/watch?v=l0kmRQ0Gkr4](https://www.youtube.com/watch?v=l0kmRQ0Gkr4)

1 Pre-teach. Match the following terms.
- a Viral 1 relating to viruses
- b Eradicate/Eliminate 2 get rid of
- c Molecular 3 relating to molecules
- d Cultured (human cells) 4 grown in laboratory conditions
- e Findings 5 information that is discovered during research
- f Clinical 6 relating to the examination and treatment of patients
- g Protection 7 the act of protecting sb
- h Strand 8 a single thin piece of sth
- j Genome 9 a complete set of genes in a cell
- k Cure 10 a medicine that cures a disease

2 Watch and choose the correct answer.

1 The aim of the research team is to
A stop HIV  B cure AIDS  C cure more patients  D stop HIV from spreading

2 33 million people in the world
A die of AIDS  B get HIV  C cure of HIV  D develop AIDS

3 In the USA, there are 50000 new cases
A every 2 years  B every year  C every six months  D every month

4 The research team developed a molecular tool which permits to eradicate
A HIV  B AIDS  C HIV D all three

5 The new molecular tool provides also protection against future infection: true/false/not stated

6 When the cell is free of the virus, it must be helped in order to recover: true/false/not stated

7 The new cure could be used also for other diseases caused by viruses: true/false/not stated

8 Research into the HIV is well financed: true/false/not stated

B Reading

HOW HIV INFECTS CELLS

In general, viruses have very small genomes, which means they can encode a very limited number of their own proteins. For this reason, most viruses must use the proteins provided by their host in order to reproduce (make more viruses). In a way, viruses are parasitic, they bring very little with them and steal what they need from the host cell. Because they cannot reproduce on their own, viruses are not considered living organisms, they are simply genetic information, either DNA or RNA packaged within a protein coat.

The Structure of HIV

The HIV (human immunodeficiency virus) has a lipid membrane similar to the cell membranes of other organisms. Attached to the membrane are several envelope proteins which are used to attach to the host cell. Within the membrane is another layer of proteins that comprise the capsule. The most important part of
the virus is its genome, which is two strands of RNA. On the picture, there are several instances of the viral RNA, make sure they are all colored pink. Also important to the virus are the enzymes that will convert the RNA to DNA - reverse transcriptase, an enzyme that is unique to viruses. Because the HIV virus uses the reverse transcriptase and RNA method, it is known as a retrovirus. Influenza is another example of a retrovirus. Because it is single stranded genetic material, it develops mutations more frequently than DNA viruses - this changing nature of a retrovirus makes it particularly difficult to develop vaccines for them - hence why you must get a flu shot every year but only need a polio vaccine once in your life.

HIV Infection

HIV infects a particular type of immune system cell, the CD4 + T Helper cell, or just plainly, the T Helper Cell. Once infected, the T-Helper cell turns into an HIV replicating cell. There are typically 1 million T-cells per one milliliter of blood. HIV will slowly reduce the number of these cells until the person develops the disease AIDS.

Step 1 - HIV enters the host by attaching to specific host receptors. It is as if the virus has a specific key that only works on the host cell with the right lock. In the case of HIV, the lock is the CD4 cell-surface antigen located on the surface of T Helper cells. CD4 antigens are located on the cell membranes of the cell. At this point, the virus and the cell membrane fuse and the virion core enters the cell. The core contains the viral genes.

Step 2 - The viral RNA and core proteins are released into the cytoplasm where reverse transcriptase converts the viral RNA to DNA.

Step 3 - Viral DNA, now doublestranded is transported into the nucleus and the nuclear membrane. In the nucleus, the enzyme called integrase fuses it with the host cell's normal DNA. Viral DNA can persist within the cell's DNA for many years in a latent state, which further complicates efforts to treat or cure the disease. Using the cellular enzyme RNA polymerase, the viral DNA is transcribed into two splices of RNA, a shorter splice and a longer splice which are destined for two different things.

Step 4 - The short spliced RNAs are transported to the cytoplasm and the Golgi apparatus where their message is used to create viral proteins which will become part of the completed virus. The longer splices are the full length viral RNA and will become the core of new viruses. Another enzyme, called protease is needed to assemble the proteins into their final functional forms. Protease inhibitors are another drug used to combat AIDS.

Step 5 - Using the proteins assembled from the Golgi apparatus and the completed viral RNA from the long strands, the mature virus buds off from its host cell. The process of budding destroys the host cell.

Questions
1. Explain the role of each of the following in HIV infection
   --protease
   --reverse transcriptase
   --CD4 receptors
   -- RNA polymerase
   --integrase
   - ribosomes and golgi apparatus

2. What is a retrovirus? How is it different from a normal virus? Why is it more difficult to develop a vaccine for a retrovirus?

C Final quiz
http://www.medindia.net/medical-quiz/quiz-on-aids.asp
D Further resources
http://www.mayoclinic.org/diseases-conditions/hiv-aids/basics/definition/con-20013732