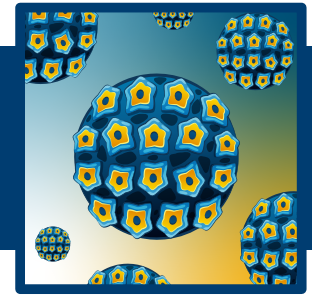


Teacher Directions

UNIT: GOING VIRAL!

LESSON 1: SILENT SABOTAGE

Activity 1A: Decoding the Virus Cycle



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Instructional Objectives

- › Students will be able to analyze a viral genome.

Activity 1A Rationale



Suggested time: ~10 min

This is an introductory activity to the viral cycle. For a more investigative student experience, refer to Activity 1B. In this activity, students will collaborate to decipher the HPV16 viral cycle, analyzing a viral genome diagram with corresponding genome descriptors. Students will use keywords in the descriptors to categorize four steps in a viral gene cycle.

NOTE: Although this activity uses HPV, it is important to convey that the cycle is similar for most viruses. Students will not require any prior knowledge of HPV16. There is no “E3” in the genome cycle shown in Table 1. It is not an error. E3 does not exist.

Education Standards

TEKS: B.5.D, B.6.C, B.7.A, B.7.C, B.7.D, B.10.D

ELPS: C.1.C, C.1.E, C.1.G, C.2.E, C.2.I, C.3.D, C.3.E, C.3.G, C.4.D, C.4.F, C.4.G, C.4.K, C.5.B, C.5.F

NGSS: MS-LS3-1

Student Materials

- › Virus Cycle Cards (1 set per group)
 - Suggestion: laminate cards for repeated use
- › Student Directions which include:
 - Graphic Organizer
 - Figure and Table
 - Suggestion: Laminate one set of Student Directions per group.



MIDDLE & HIGH SCHOOL LEVEL

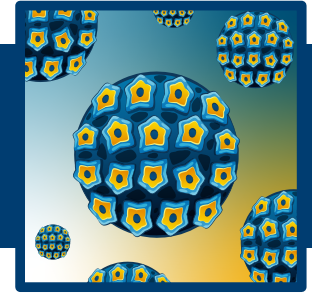
Teacher Enrichment Initiatives (TEI) | NIH SEPA | ©2026 | TxBiomed.org
NIH SEPA Project #1R25GM142021-01A1 | Some graphic elements courtesy of [Freepik](https://www.freepik.com)

Teacher Directions

UNIT: GOING VIRAL!

LESSON 1: SILENT SABOTAGE

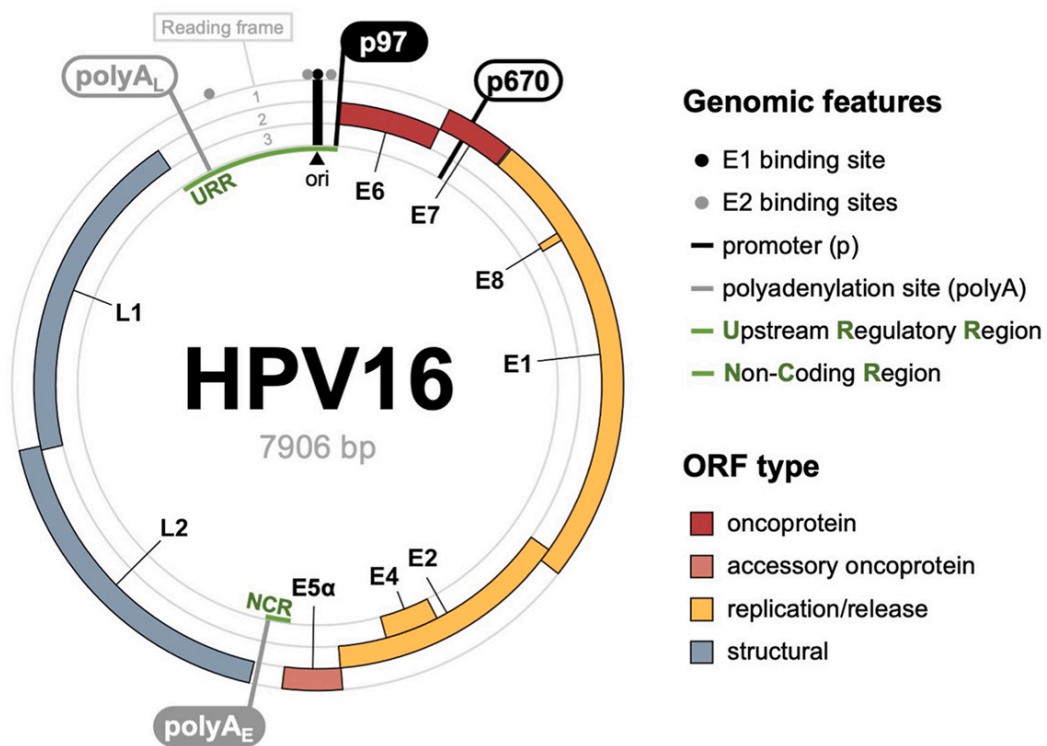
Activity 1A: Decoding the Virus Cycle



Directions

1. Precut the virus cycle cards (includes 2 sets of 8 cards per page).
Note: each card describes a protein encoded by each gene
2. Provide each group with a set of cards and a copy of the Virus Cycle table.
3. Students will discuss the descriptions on each card and reach a consensus on where they believe each card or gene fits into the virus replication cycle.
4. Class Discussion: What cards went under each category? Why did your group place that card there (keywords)? Do we have a class consensus?

Figure 2: HPV 16 Genome Diagram



MIDDLE & HIGH SCHOOL LEVEL

Teacher Directions

UNIT: GOING VIRAL!

LESSON 1: SILENT SABOTAGE

Activity 1A: Decoding the Virus Cycle

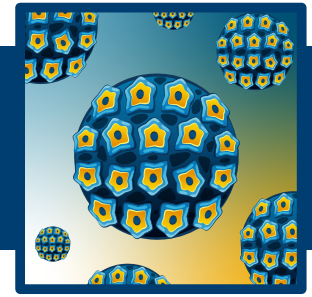


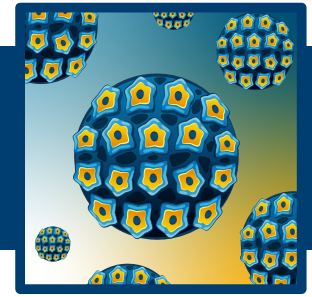
Table 1: Functions from Article Table 1 Translated into Plain Language

Expression	Functions	
Early	E1	Acts like a DNA “unzipper” to unbind DNA and recruits DNA polymerase to help the virus copy its own DNA.
	E2	Helps start viral DNA copying by supporting E1. Controls which virus genes get turned on or remain off.
	E4	Found in skin cells. Helps the virus get out of the cell after it finishes making copies.
	E5	May help start the process of cells turning cancerous. Not fully understood yet.
	E6	A cancer-causing gene. It helps shut off the p53 “guardian” protein, which normally protects cells from turning cancerous. Without p53 protein, the cells keep dividing.
	E7	Another cancer-causing gene. Pushes cells to keep dividing when they shouldn’t.
	Late	L1
L2		Also helps build the virus shell. Works with L1 but is a smaller part.

UNIT: GOING VIRAL!

LESSON 1: SILENT SABOTAGE

Activity 1A: Decoding the Virus Cycle



TEACHER KEY

INFECT	REPLICATE	ASSEMBLE	RELEASE
<p>L1</p> <p>Builds the outer shell (capsid) of the virus. The main structural protein.</p>	<p>E1</p> <p>Acts like a DNA “unzipper” to unbind DNA and recruits DNA polymerase to help the virus copy its own DNA.</p>	<p>ES</p> <p>May help start the process of cells turning cancerous. Not fully understood yet.</p>	<p>E4</p> <p>Found in skin cells. Helps the virus get out of the cell after it finishes making copies.</p>
<p>L2</p> <p>Also helps build the virus shell. Works with L1 but is a smaller part.</p>	<p>E2</p> <p>Helps start viral DNA copying by supporting E1. Controls which virus genes get turned on or remain off.</p>		
	<p>E6</p> <p>A cancer-causing gene. It helps shut off the p53 “guardian” protein, which normally protects cells from turning cancerous. Without p53 protein, the cells keep dividing.</p>		
	<p>E7</p> <p>Another cancer-causing gene. Pushes cells to keep dividing when they shouldn’t.</p>		<p>Instruct students that each card is only used once in the table. There will be blank spaces on the final table.</p>

VIRUS CYCLE CARDS

(One sheet contains cards for two groups)



 <p>E7</p> <p>Another cancer-causing gene. Pushes cells to keep dividing when they shouldn't.</p>	 <p>E1</p> <p>Acts like a DNA "unzipper" to unbind DNA and recruits DNA polymerase to help the virus copy its own DNA.</p>	 <p>E5</p> <p>May help start the process of cells turning cancerous. Not fully understood yet.</p>	 <p>E4</p> <p>Found in skin cells. Helps the virus get out of the cell after it finishes making copies.</p>
 <p>E6</p> <p>A cancer-causing gene. It helps shut off the p53 "guardian" protein, which normally protects cells from turning cancerous. Without p53 protein, the cells keep dividing.</p>	 <p>E2</p> <p>Helps start viral DNA copying by supporting E1. Controls which virus genes get turned on or remain off.</p>	 <p>L2</p> <p>Also helps build the virus shell. Works with L1 but is a smaller part.</p>	 <p>L1</p> <p>Builds the outer shell (capsid) of the virus. The main structural protein.</p>
 <p>E7</p> <p>Another cancer-causing gene. Pushes cells to keep dividing when they shouldn't.</p>	 <p>E1</p> <p>Acts like a DNA "unzipper" to unbind DNA and recruits DNA polymerase to help the virus copy its own DNA.</p>	 <p>E5</p> <p>May help start the process of cells turning cancerous. Not fully understood yet.</p>	 <p>E4</p> <p>Found in skin cells. Helps the virus get out of the cell after it finishes making copies.</p>
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MIDDLE & HIGH SCHOOL LEVEL