Unit 12 · Viruses, and Biotechnology in Microbiology

WORKSHEET

Full marks 39

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 39

1 Key words [4]

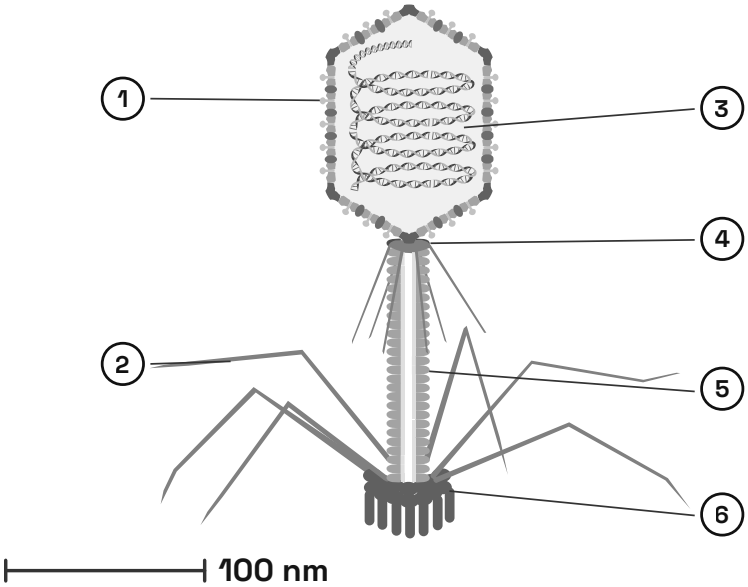
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

bacteriophages **bioremediation** **capsid** **capsomeres** **GMO** **lysogenic** **lysozyme** **lytic** **mesosome** **virion**

The protein coat of a virus is the _____, built of identical subunits called _____. A complete, infectious virus particle outside a cell is a _____. Viruses that infect bacteria are _____. The enzyme at the tip of a phage's tail that makes a hole in the bacterial wall is _____. A phage cycle that ends with the bacterium bursting open is the _____ cycle. The use of microbes to clean up pollutants such as spilled oil is _____. A crop that carries a gene from another species, such as Bt cotton, is a _____.

2 Label the diagram [3]

The diagram shows bacteriophage T4. Write the names of the parts 1 to 6. Each carries 0.5 mark.



1. _____ 2. _____

3. _____ 4. _____

5. _____ 6. _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Why are viruses considered obligate parasites? [1]

a. They require a living host to multiply.
b. They can survive independently outside a host.
c. They possess their own enzyme system.
d. They are capable of photosynthesis.

ii. Which components are typically found in viruses? [1]

a. DNA and protein
b. proteins, RNA and DNA
c. RNA and DNA
d. proteins, and RNA or DNA

iii. Why can't a virus be grown in a flask of nutrient broth, as bacteria are? [1]

a. it needs oxygen
b. it is too small
c. it has no machinery of its own to make proteins or energy, so it multiplies only inside living cells
d. the broth is too acidic

iv. Which of these is a disease caused by a virus? [1]

a. typhoid
b. tuberculosis
c. rabies
d. cholera

v. Why does a biofertilizer of *Rhizobium* help a crop of lentils? [1]

a. it kills the weeds among the lentils
b. it dissolves phosphate in the soil
c. the bacteria form root nodules and fix nitrogen from the air for the plant
d. it makes the lentils resistant to caterpillars

4 Very short answers [3]

Write very short answers to the following questions.

a. Who first crystallized the tobacco mosaic virus, and in which year? [1]

b. Name the antibiotic that was the first cure for tuberculosis, and the microbe it comes from. [1]

c. Why does washing hands with soap protect against the flu virus? [1]

5 Short answers [9]

Write short answers to the following questions.

a. Why are viruses considered neither prokaryotes nor eukaryotes? [2]

b. A patient with a cold asks for antibiotics. Explain why they won't help. [2]

c. How is a virus useful in gene therapy? Explain how it is made safe for this use. [2]

d. Describe how bacteria are made to produce human insulin. [3]

6 Numerical problems [4]

Solve the following problem. Show your working.

A poliovirus is about 30 nm across, and a bacterium about 1 μm (1,000 nm) across. One T4 phage that infects *E. coli* releases about 100 new phages when the cell bursts. i. How many polioviruses would fit side by side across one bacterium? ii. How many would fit across 1 cm? iii. A single phage infects one bacterium. If every new phage infects a fresh bacterium, how many phages are there after three rounds of the lytic cycle? iv. Why can no ordinary light microscope show a poliovirus?

Answer: _____

7 Long answers [8]

Write long answers to the following questions.

a. Discuss the characteristics of viruses that place them midway between living and non-living things. [4]

b. Nepal imports all its chemical fertilizer. Compare biofertilizers with chemical fertilizers, and say which microbes a biofertilizer for Nepal's rice and lentil fields could contain. [4]

8 Think [3]

Bt cotton carries a gene from the bacterium *Bacillus thuringiensis*. Explain how the gene protects the plant, give one benefit and one risk of growing it, and say what farmers must do to keep it working.

9 Activity: Microbes in your kitchen (not marked)

Ask at home which foods are made with the help of microbes. Write down at least five, what the microbe does, and whether it is a bacterium, a yeast or a mold.

Food	Microbe	Bacterium, yeast or mold?	What it does

Which of these is the oldest biotechnology, and why do we call it that?