**Multiple Choice**

1. You are doing an experiment that requires you to add the same amount of phage particles as bacterial cells to a test tube.  You have diluted the bacteria so that you have 1,000 cells in 1 mL of solution.  Your phage lysate has a concentration of 1.0 X108 pfu/mL.  How should you dilute the phage lysate so that you have 1,000 phage particles in 1 mL of solution?

A) Add 10 µL of lysate to 4,990 µL of phage buffer.  1 mL of this solution would contain 1,000 phages.

B) Add 1 µL of the lysate to 999 µL of phage buffer.  1 mL of this solution would contain 1,000 phages.

C) You would need to complete 1:10 serial dilutions from 100 to 10-3.  1 mL of the 10-3 sample would have 1,000 phages.

D) You would need to complete 1:10 serial dilutions from 100 to 10-5.  1 mL of the 10-5 sample would have 1,000 phages.

Answer: D

2. If there is 19 mL of diluent in a tube and 1 mL of sample is added, what is the dilution of the sample?

A) 1/30

B) 1/20

C) 1/19

D) 1/18

Answer: B

3. If you’ve taken 250 µL of plasma and added 750 µLof distilled water, you’ve achieved what dilution?

A) 1:3

B) 1:4

C) 1:5

D) 1:8

Answer B

4. In your first tube, you have already made a dilution that is 1:10. If you remove 100 µL from that tube and add 900 µL of distilled water, what would the total dilution be for tube 2?

A) 1:100

B) 1:10

C) 1:1,000

D) 1:10,000

Answer: D

5. How would you prepare 1 L of 1X TAE buffer if the stock solution was 50X TAE?

A) 20 mL of TAE and 980 mL of dH20

B) 980 mL of TAE and 20 mL of dH20

C) 50 mL of TAE and 950 mL of dH20

D) 950 mL of TAE and 50 mL of dH20

Answer: A

6. How would you prepare 1 L of working 1X TAE buffer if the stock solution was 10X TAE?

A) 100 mL TAE and 900 mL dH20

B) 900 mL TAE and 100 mL dH20

C) 10 mL TAE and 990 mL dH20

D) 990 mL TAE and 10 mL dH20

Answer: A

7. Elizabeth needs to prepare 250 mL of 1X TBE buffer. The stock solution in the lab is 10X TBE. How many milliliters of stock TBE does Lizzie need to prepare the working solution?

A) 10 mL

B) 25 mL

C) 5 0mL

D) 250 mL

Answer: B

8. Jacob needs to prepare 750 mL of 1X TBE buffer. The stock solution in the lab is 10X TBE. How many milliliters of stock TBE does Jacob need to prepare the working solution?

A) 1 mL TBE

B) 10 mL TBE

C) 75 mL TBE

D) 750 mL TBE

Answer: C

9. 1 mL of phage lysate was added to 9 mL of phage buffer in Tube 1. 2 mL of Tube 1 was added to 8 mL of phage buffer in Tube 2. What is the dilution of phage lysate in Tube 2?

A) 1/10

B) 1/20

C) 1/40

D) 1/50

Answer: D

10. A student labels 4 tubes: 0,1,2,3. Tube 0 contains undiluted phage lysate (also known as “neat” lysate). The student then prepared 5-fold serial dilutions in the remaining tubes. What is the dilution of phage lysate in Tube #3?

A) 1/5

B) 1/25

C) 1/125

D) 1/625

Answer: C

11. A student made an initial 1:10 dilution of serum. He then took 2 mL of the first dilution and mixed with 18 mL of buffer. What is the dilution of serum in the second tube?

A) 1/11

B) 1/90

C) 1/100

D) 1/180

Answer: C

**Open Ended Questions**

1. 2 mL of a serum sample was added to 18 mL of phosphate buffered saline (PBS) in Tube 1. 10 mL of Tube 1 was added to 40 mL of PBS in Tube 2. What is the dilution of serum in Tube 2?

To answer this, you must determine the dilution of Tubes 1 and 2.

Tube 1 has a dilution of = $\frac{2 mL}{2 mL+18 mL} = \frac{2 mL}{20 mL} = \frac{1}{10} $

Tube 2 has a dilution of $\frac{10}{40+10} = \frac{10}{50} = \frac{1}{5}$

The answer to this question = dilution of Tube 1 x dilution of Tube 2

$\frac{1}{10} x \frac{1}{5}= \frac{1}{50}$

1. Four tubes were placed in a rack. To all four tubes, 9 mL of phage buffer was added. 1 mL of a medium titer phage lysate was added to the first tube and mixed well. 1 mL of the first tube is transferred to the second tube and again mixed. The transfer of 1 mL from one tube to each subsequent tube continues until 1 mL is discarded from the last tube. What is the dilution of phage lysate in the fourth tube?

Answer: This is a serial dilution series where all tubes have a 1:10 or 1/10 dilution factor. To calculate the answer, you multiply each of the tubes dilutions to determine the final dilution of the 4th tube:

Tube 1 x Tube 2 x Tube 3 x Tube 4

$\frac{1}{10} x\frac{1}{10} x \frac{1}{10} x \frac{1}{10}=\frac{1}{10,000}$

1. A student made an initial 1:5 dilution of phage lysate. Then 2 mL of that was added to 8 mL of water. Lastly, the student made a 1:20 dilution of the second tube. What is the final dilution of phage lysate.

First determine the dilution factors for each tube:

Tube 1: $\frac{1}{5}$

Tube 2: $\frac{2}{8+2 } = \frac{2}{10} = \frac{1}{5}$

Tube 3: $\frac{1}{20}$

To solve, multiple the dilution factors together to determine the final dilution for the phage lysate:

$\frac{1}{5} x\frac{1}{5}x\frac{1}{20} = \frac{1}{500}$