

2025 USC Invitational Tournament

Microbe Mission B

Answer Key

Tiebreakers: 49, 50, 22, 11, 39,
16, 20, 44, 32, 3

Max Score: 61

ANSWER KEY

Section 1: Microscopes, Staining, and Morphology (1 point each; all or nothing)

1.	Ⓒ	7.	Ⓒ	
2.	Ⓑ	8.	Ⓔ	
3.	Ⓔ	9.	Ⓒ	
4.	Ⓑ	Ⓓ	10.	Ⓓ
5.	Ⓔ	11.	Ⓒ	Ⓓ
6.	Ⓐ	12.	Ⓓ	

Section 2: Spoiled Milk (1 point each; all or nothing)

13.	(D)	21.	(A)	
14.	(C)	22.	(A)	
15.	(C)	23.	(D)	
16.	(A)	24.	(B)	
17.	(A)	25.	(C)	
18.	(C)	26.	(D)	
19.	(B)	27.	(A)	
20.	(A)	(C)	(D)	(E)

ANSWER KEY

Section 3: Field Work (1 point each; all or nothing)

28. Ⓐ

37. Ⓐ

29. Ⓑ

38. Ⓒ Ⓓ

30. Ⓓ

39. Ⓐ Ⓑ

31. Ⓒ

40. Ⓑ

32. Ⓑ Ⓒ

41. Ⓐ

33. Ⓓ

42. Ⓔ

34. Ⓓ

43. Ⓒ

35. Ⓐ

44. Ⓑ

36. Ⓐ

Section 4: Viruses (MCQ 1 point each; FRQ variable)

45. Ⓒ

46. Ⓓ

47. Ⓐ

48. Ⓓ

ANSWER KEY

49. Neuron cells do not express TMPRSS2 but express ACE2. However, neurons are capable of being infected by SARS-CoV-2. Explain how this is possible. [3 points]

It must be using the Endosomal Pathway (or Neuropilin) [+2], which does not require TMPRSS2 [+1]

50. You want to investigate a SARS-CoV-2 variant with mutations on its spike protein that has a heightened ability to infect cells. Suggest two hypotheses as to how mutations to the spike protein may increase virulence of SARS-CoV-2. [3 points]

For any of the following [+1.5] for a maximum of 3 points:

- **Increased binding to ACE2**
- **Increased binding or cleavage by TMPRSS2**
- **Better fusion by S2**
- **Increased binding or cleavage by furin**
- **Better immune evasion (avoid B cell antibodies or T cell presentation)**

No points for cathepsin or other proteins that are not directly related to mediating fusion.

51. A patient has a dysfunctional ACE2 protein that is unable to be expressed on the surface of cells. Will SARS-CoV-2 be able to infect them? Explain. [2 points]

No [+1], both pathways require ACE2, so neither pathway will be useable [+1]

52. SARS-CoV-2 viral particles spread from the throat to the saliva before any symptoms appear. Explain why this lack of symptoms might be beneficial for its transmissibility. [2 points]

Virus can be spread through coughs/sneezes/saliva/aerosols [+1] before the host knows they are infected/can take precautions [+1]

53. SARS-CoV-2 is an enveloped plus single stranded RNA (+ssRNA) virus. Does SARS-CoV-2 +ssRNA require any transcription before translation by ribosomes? Why or why not? [2 points]

No, it does not need any transcription [+1]

ssRNA directly codes for SARS-CoV-2 proteins since it is plus stranded [+1]

54. Does SARS-CoV-2 integrate into the host genome? Does it have a lytic or lysogenic life cycle? [1 point]

No [+0.5] lytic [+0.5]