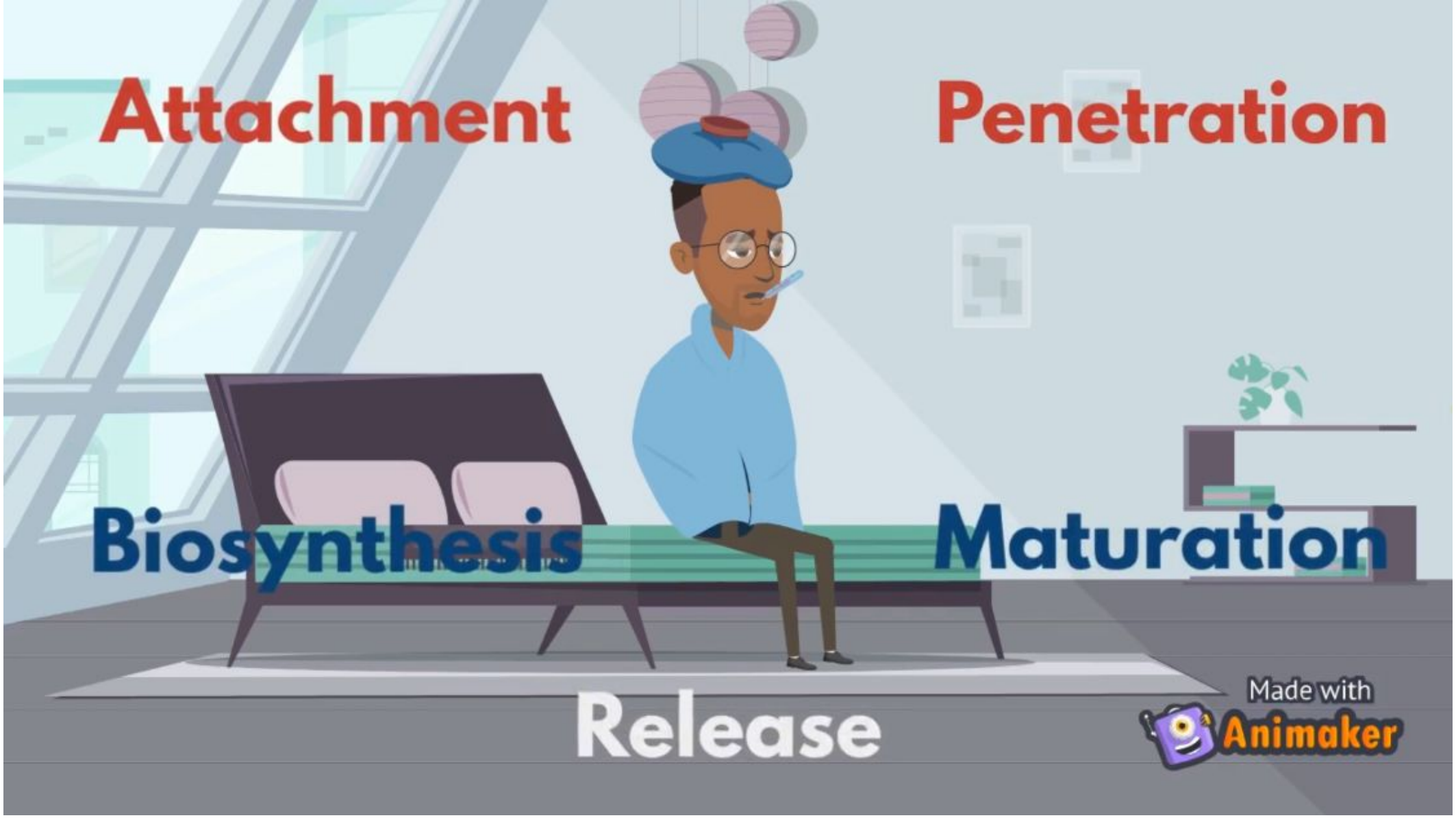
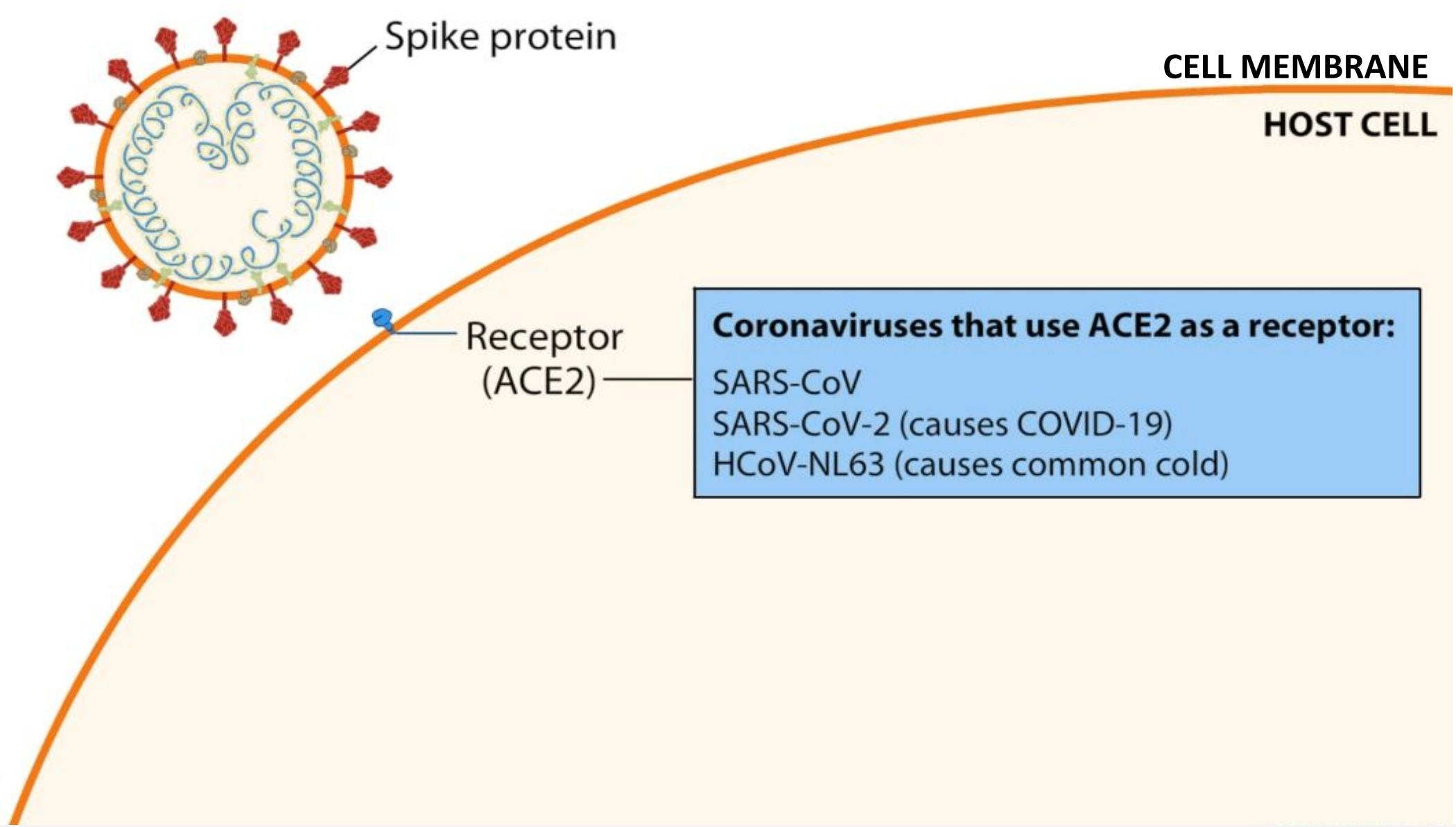


FIVE STEPS OF THE SARS-CoV-2 VIRUS REPLICATION CYCLE:

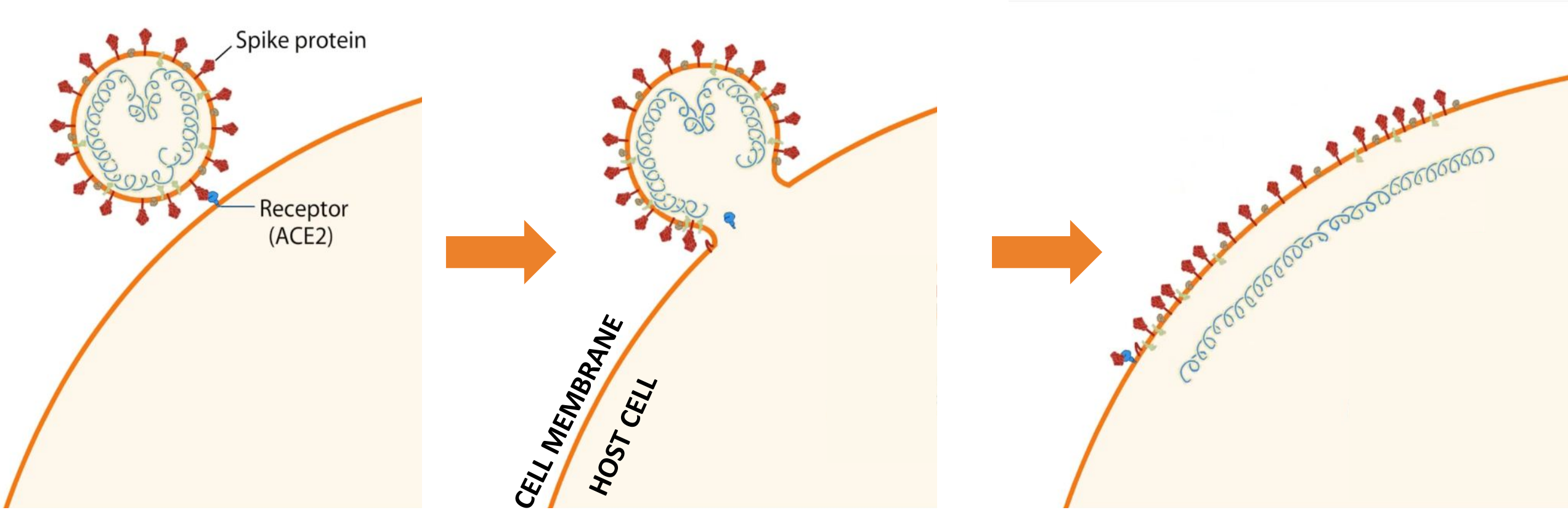
After infection, the life cycle of SARS-Cov-2 follows five steps

Attachment, Penetration, Biosynthesis, Maturation, and Release.



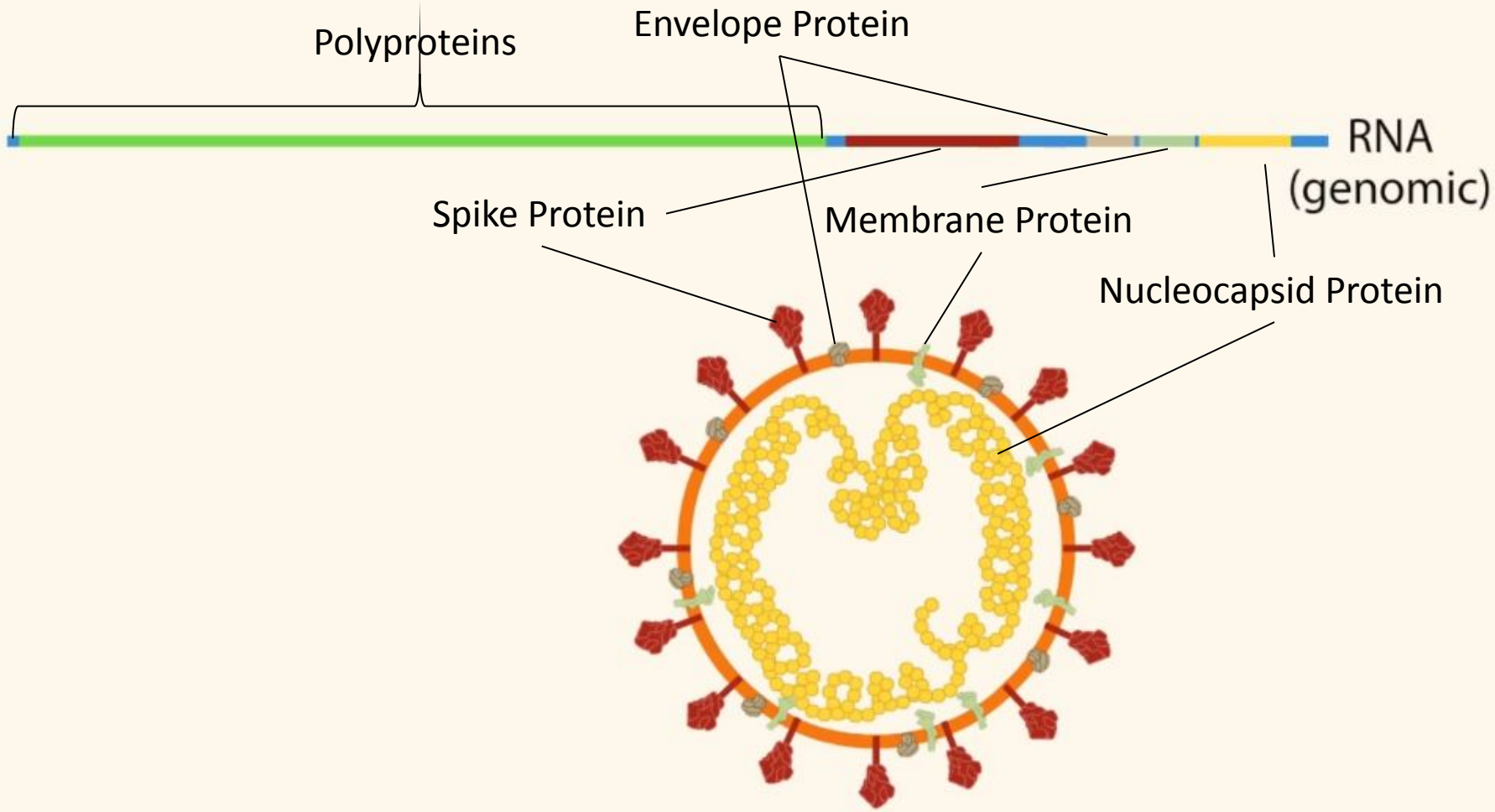
ATTACHMENT STEP:

This step involves specific binding of the coronavirus S protein to the cellular entry receptor angiotensin converting enzyme 2 (ACE2). In addition to receptor binding, successful fusion requires a proteolytic cleavage of the S protein to S1 and S2 subunits by host cell derived proteases. The S1 subunit is responsible for viral attachment to an extracellular part of S2, and S2 is responsible for fusion with the host cell membrane.



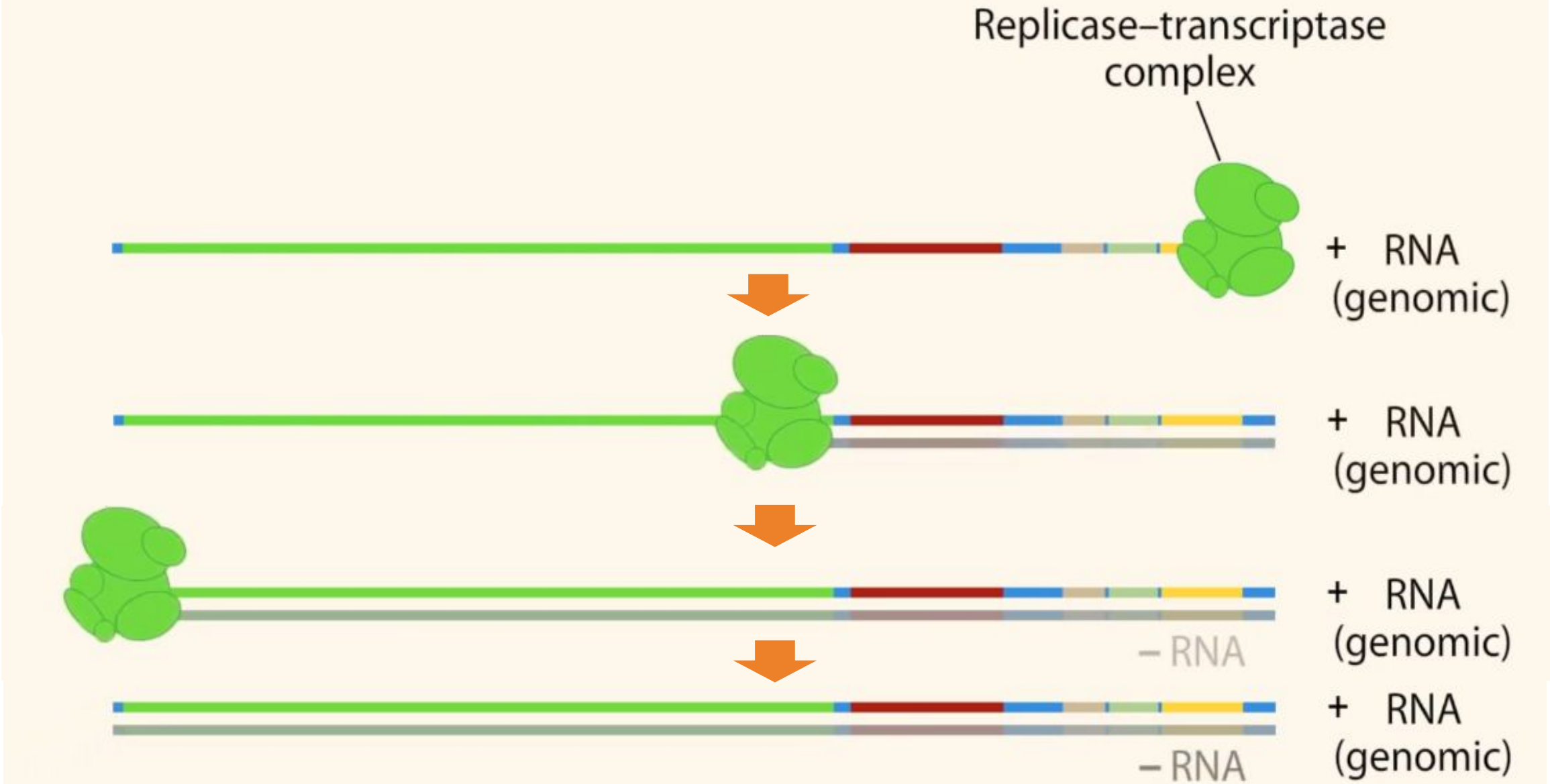
PENETRATION STEP:

The next step is penetration by disruption of the cell lipid membrane through the lipids of the viral envelope fusing with those of the cell membrane. Once inside the cell, the envelope fuses with the endosomal membrane and releases the viral genome into the cytoplasm where the replication and assembly of new viral particles occur.



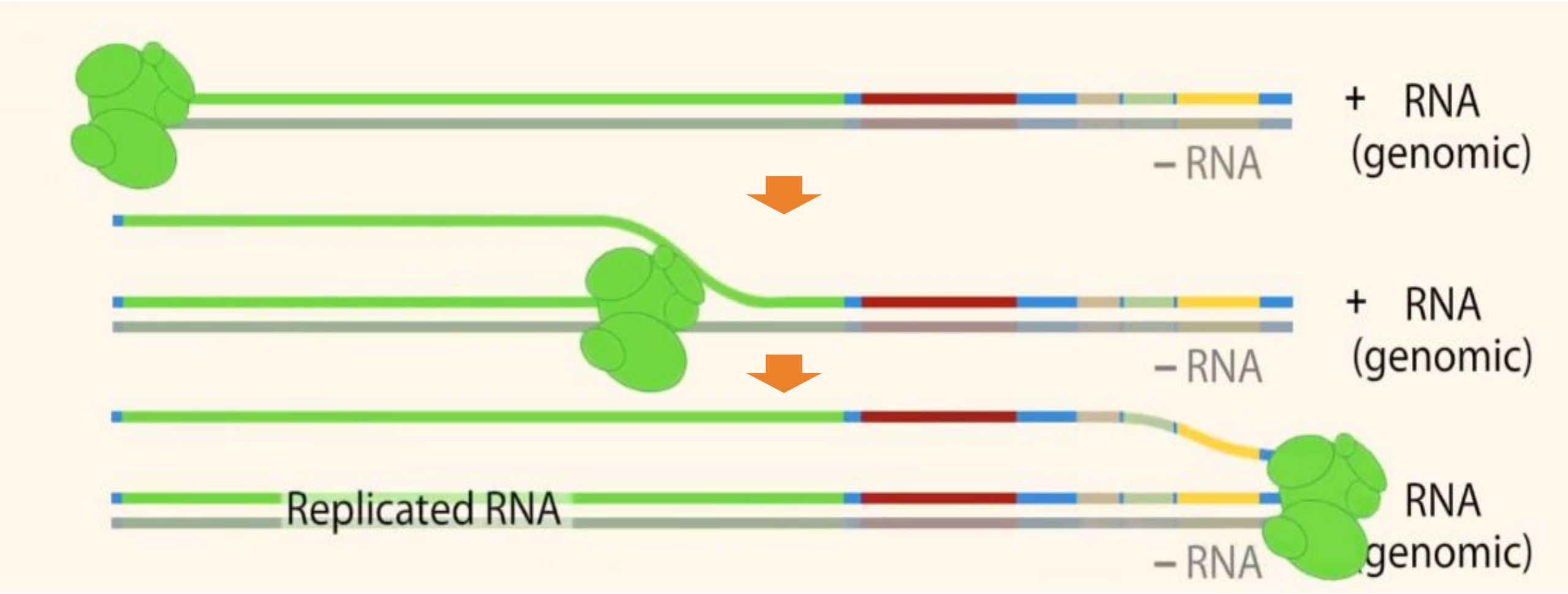
BIOSYNTHESIS STEP:

The start of the viral biosynthesis stage comes following the entry of the viral genome and its release into the cell cytoplasm.



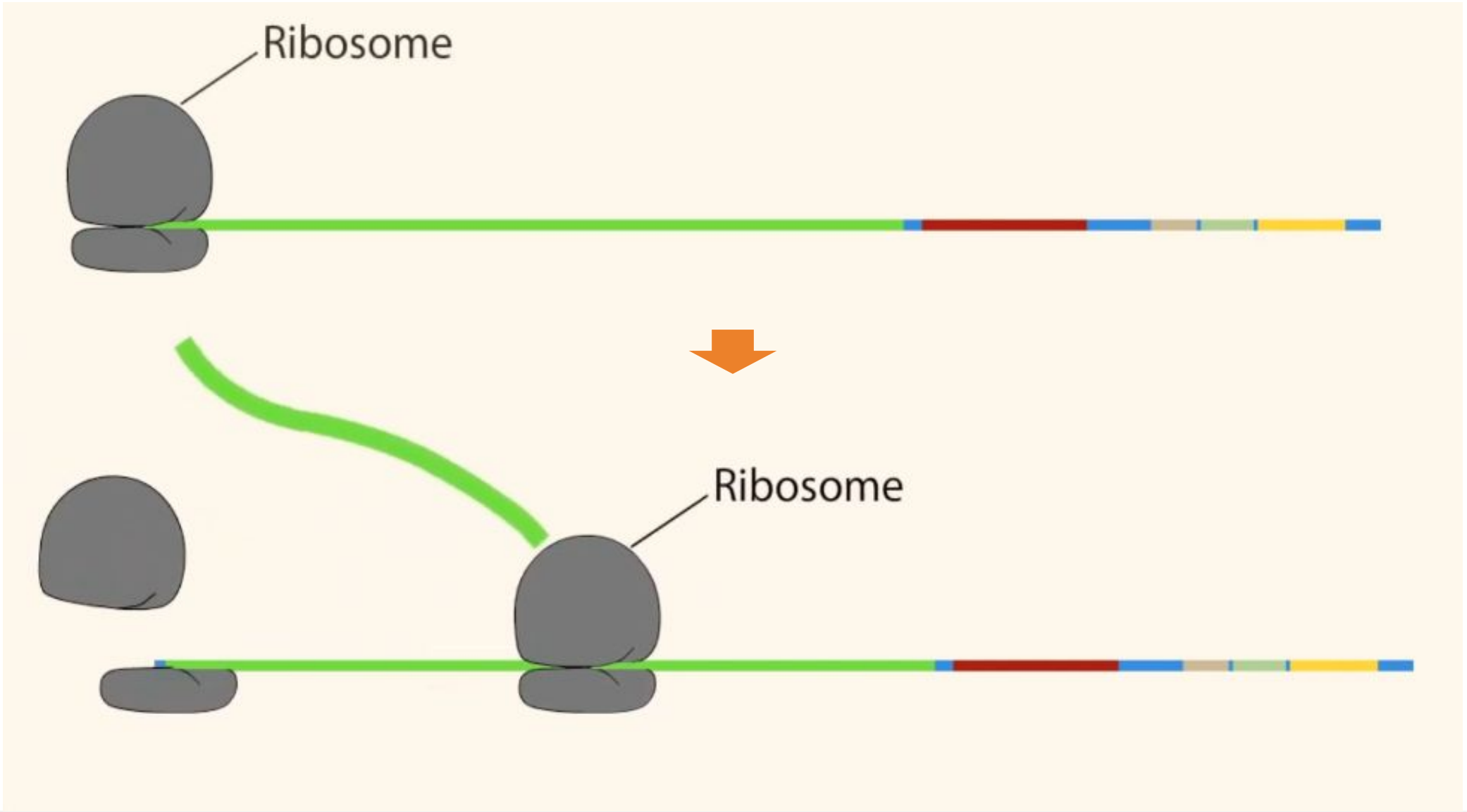
THE BIOSYNTHESIS STEP:

The RNA positive strand is first replicated to an RNA negative strand



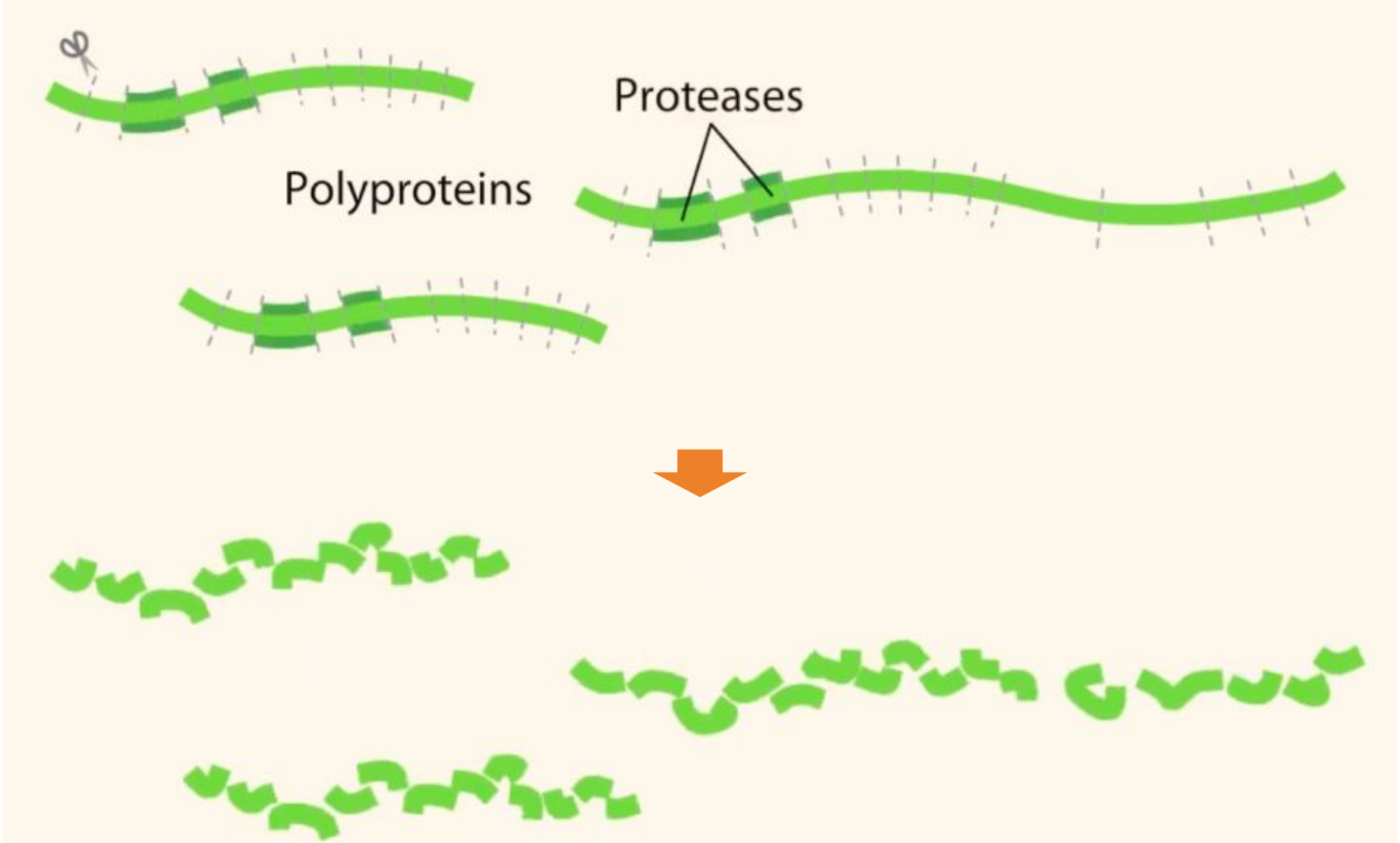
THE BIOSYNTHESIS STEP:

One of the things the RNA negative strand is used for, is the replication to another RNA positive strand for new virion assembly.



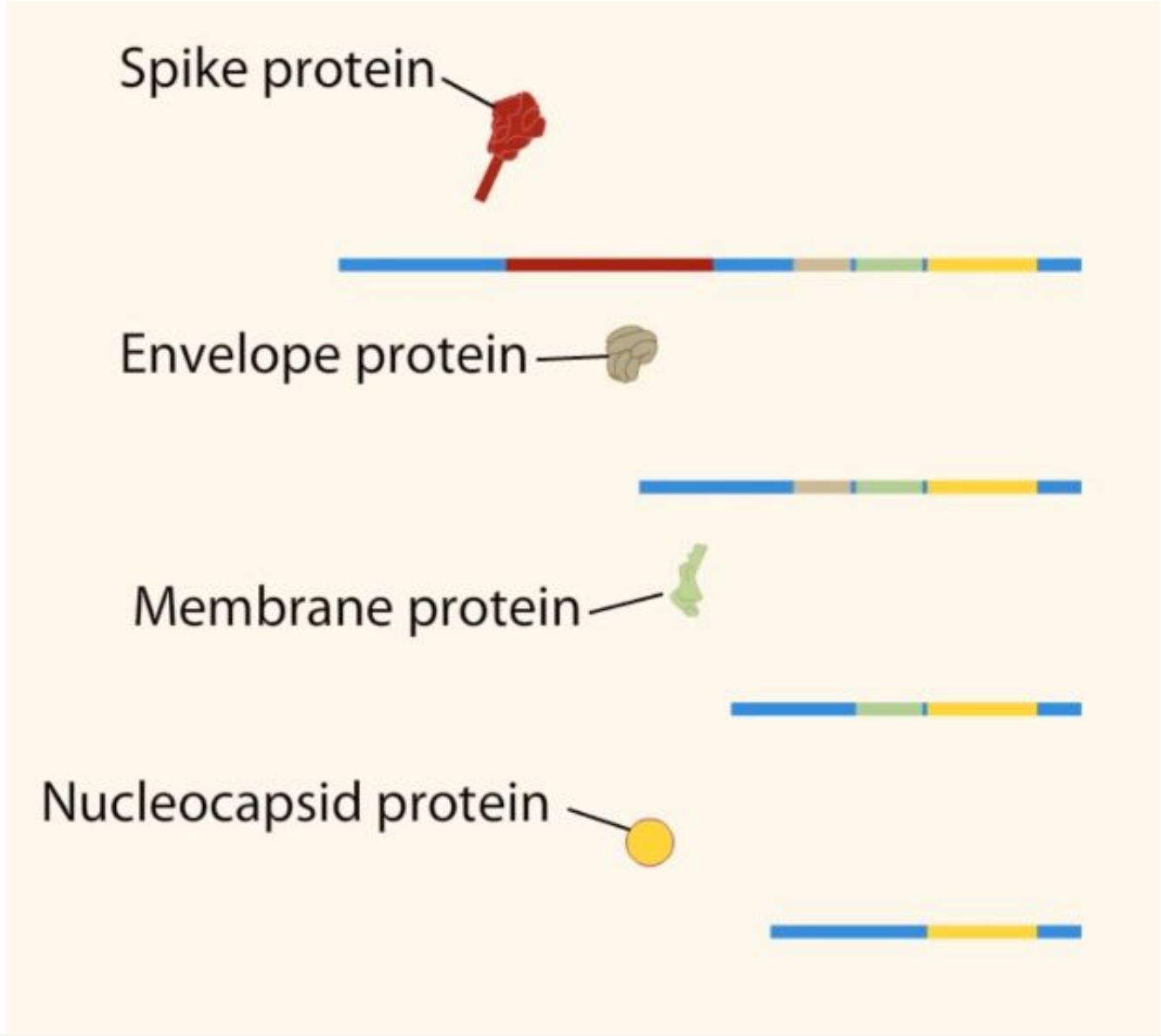
THE BIOSYNTHESIS STEP:

The RNA positive strand is also used for transcription of sub-genomic mRNA, which can be translated into a variety of viral proteins



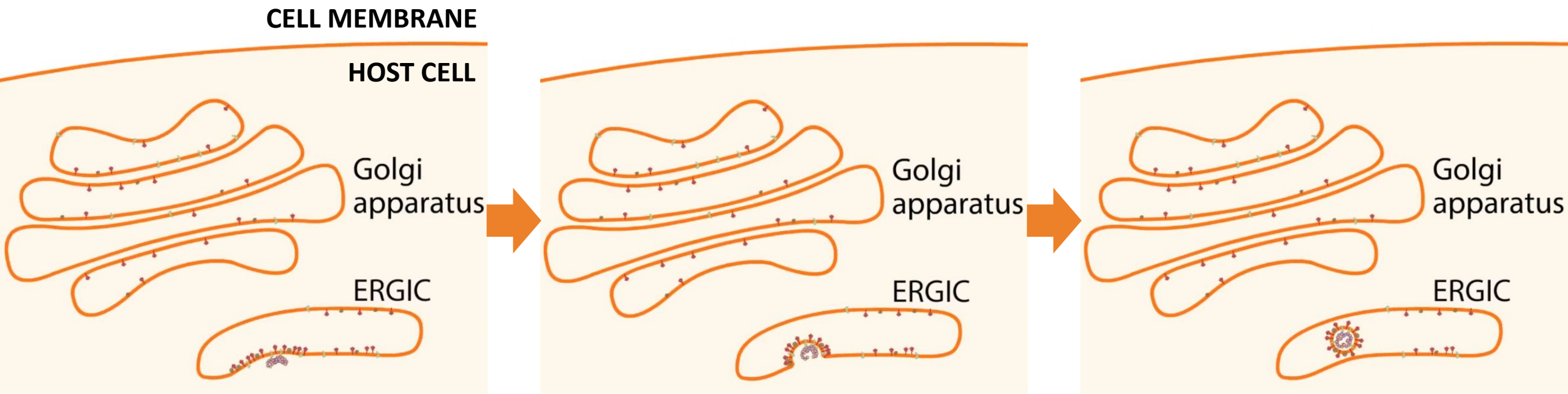
THE BIOSYNTHESIS STEP:

Two thirds of the SARS-COV2 genome is occupied by two large open reading frames, which are responsible for producing two polyproteins replicas, Polyprotein 1a and Polyprotein 1ab.



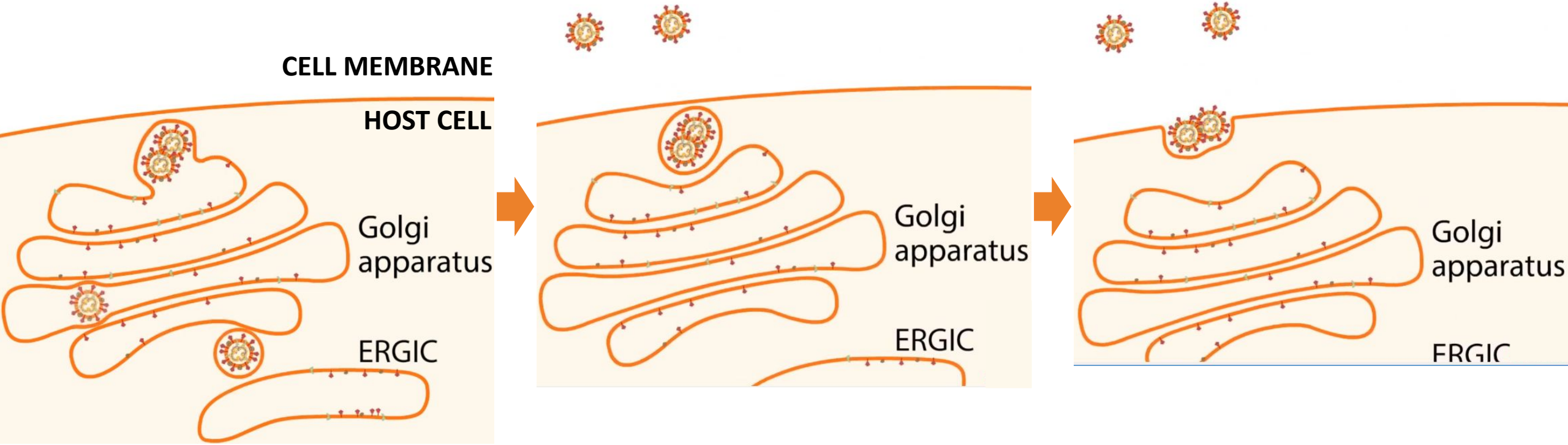
THE BIOSYNTHESIS STEP:

The remaining one third of the genome at the 3’ end contains overlapping open reading frames encoding four major structural proteins which act as the components of the mature virus. These are the spike, membrane, envelope, and nucleocapsid proteins, as well as various accessory proteins.



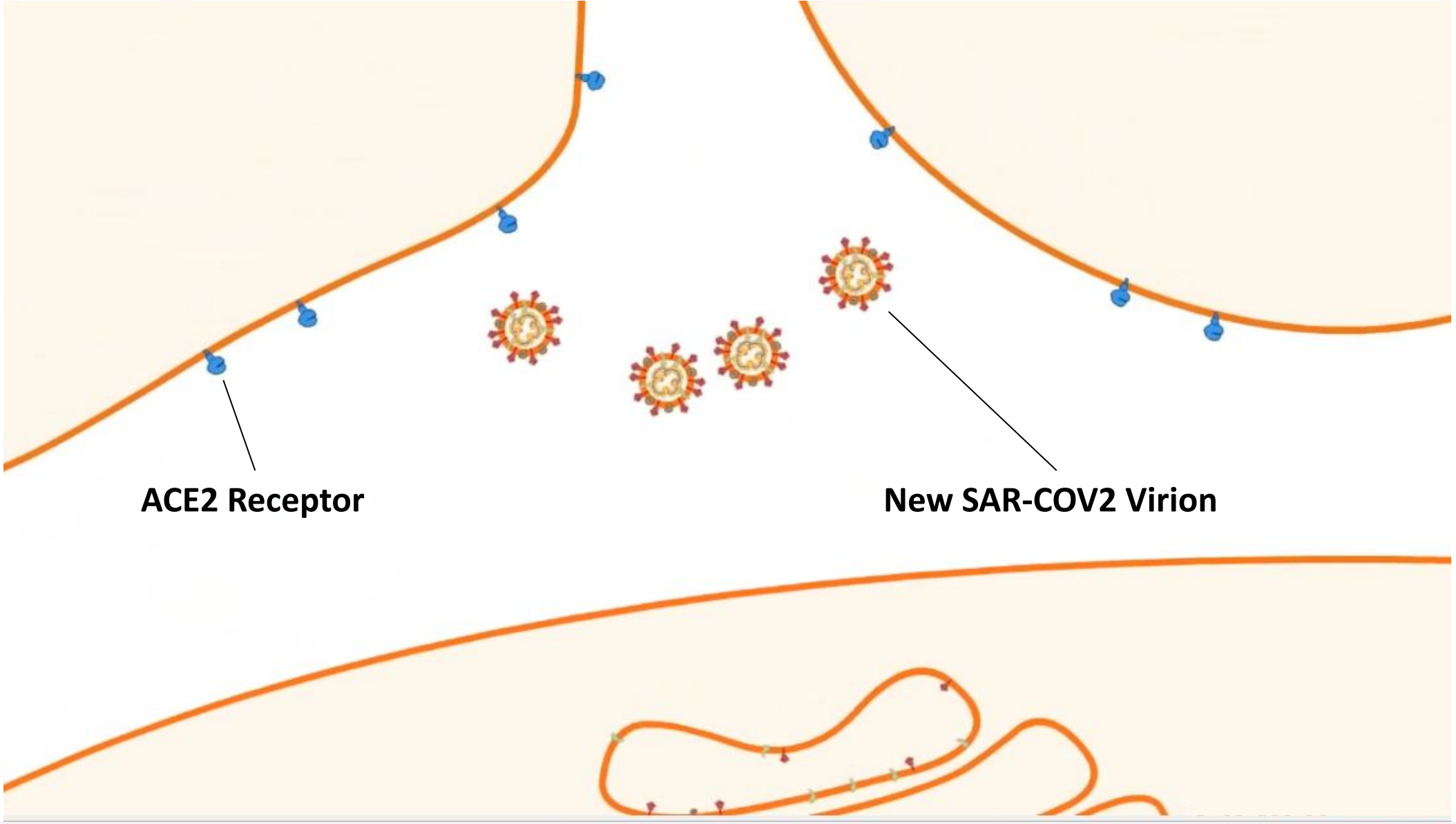
THE MATURATION STEP:

This step starts with the translation of RNA encoding the nucleocapsid protein, taking place in the cytoplasm, while mature forms of the membrane, envelope, and spike proteins are formed in the rough endoplasmic reticulum or ER. The nucleocapsid protein then surrounds the newly synthesized RNA positive strand, forming the nucleocapsid.



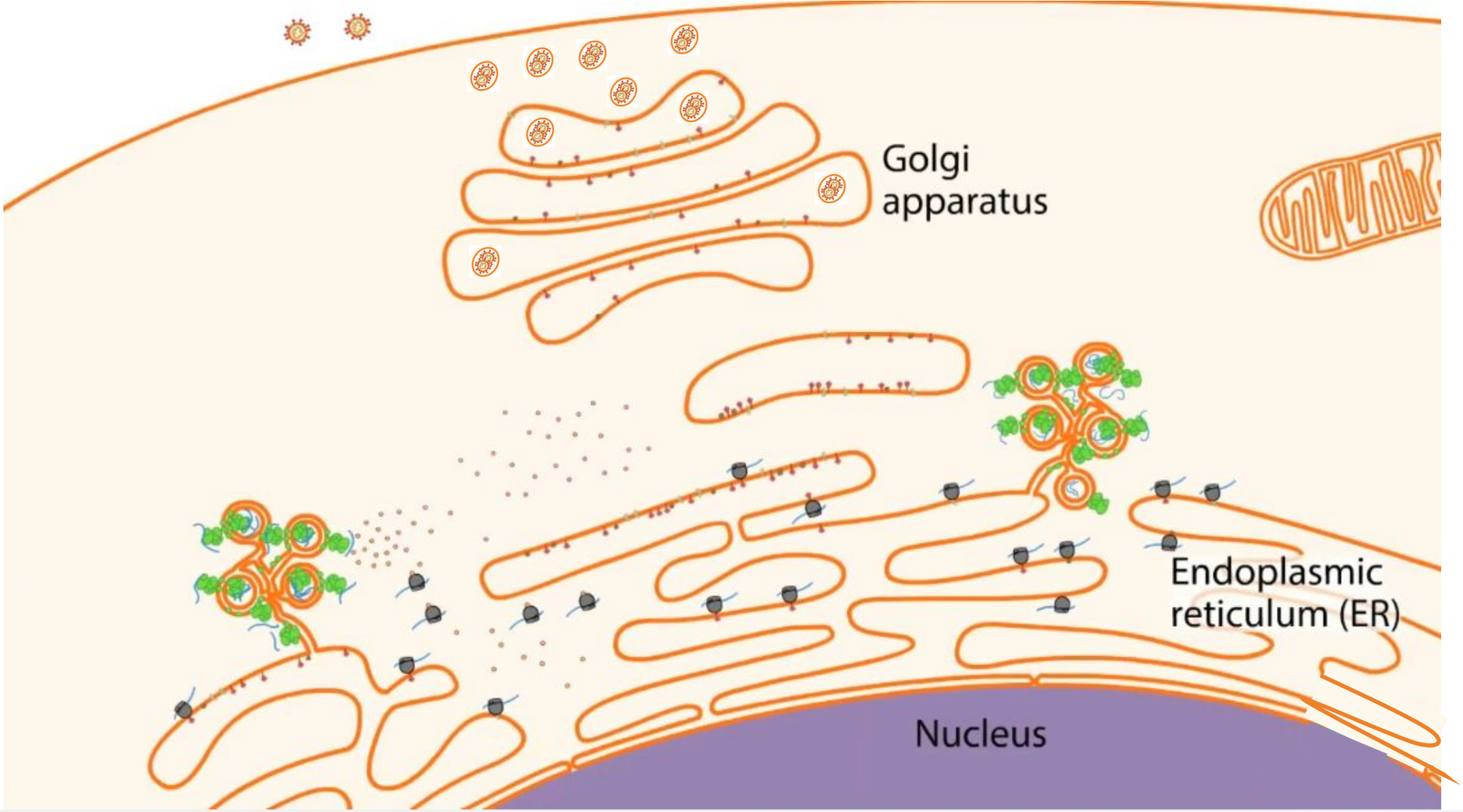
THE RELEASE STEP:

The release of the new virions starts with viral structures and nucleic acids subsequently assembling in the Er to Golgi intermediate compartment or ERGIC.



THE RELEASE STEP:

These new virions are packed in Golgi vesicles, fused with the plasma membrane, and are released from the infected cell via exocytosis to further infect other cells.



END OF REPLICATION CYCLE

This thus ends the life cycle of the SARS-Cov 2 virus. We hope this video was helpful and we will see you again soon.