‘Space is a necessary a priori representation, which underlies all outer intuitions. We can never represent to ourselves the absence of space, though we can quite well think it as empty of objects. It must therefore be regarded as the condition of the possibility of appearances, and not as a determination dependent upon them. It is an a priori representation, which necessarily underlies outer appearances.’ (Kant, Critique of Pure Reason, A24/B39, Kemp Smith translation)

The first sentence states the conclusion to be argued for, and it is basically repeated at the end of the passage. The second sentence supplies the main premise for the argument. The last two sentences state the conclusions Kant wants to draw from his premise.

Premise 1. We can never represent to ourselves the absence of space, though we can quite well think it as empty of objects.
Conclusion 1. Space is not a determination dependent upon appearances.
Conclusion 2. Space is an a priori representation.
Conclusion 3. Space is the condition of the possibility of appearances.

When Kant is talking about ‘objects’, and talking about ‘appearances’, he is talking about the same things, namely the phenomenal objects that appear to us in space. So the above can be paraphrased more simply as follows:

Premise 1. We can never think away space, though we can easily think away the objects that appear to us.
Conclusion 1. Space is not a property of the objects that appear to us.
Conclusion 2. Space is an a priori representation.
Conclusion 3. Space is the condition of the possibility of the objects that appear to us.

Premise 1. We can never think away space, though we can easily think away the objects that appear to us.

This contains a thought experiment, challenging us to try as hard as we can to think away space, as well as thinking away objects, and expecting you to agree that you just can’t think away space. The premise could be questioned: it’s unclear just what’s going on when I try to think away space. I get an imaginary blackness, an imaginary blank, but is that blank blackness space? However, let us allow Kant his premise, and see how far he gets with it.
Conclusion 1. Space is not a property of the objects that appear to us.

This follows from Premise 1. If we still have space, but we don’t have the objects, then space can’t be a property of the objects.

Conclusion 2. Space is an a priori representation.

This should probably be taken to follow from Premise 1. The fact that we can never ‘think away’ space implies that we still have acquaintance with space independently of any experience of objects, and therefore that our representation of space is, in this sense, a priori.

Conclusion 3. Space is the condition of the possibility of the objects that appear to us.

This is the conclusion crucial for Kant to establish, namely that space is the condition of the possibility of appearances. However it is not at all obvious that it follows from what has been established so far. On the face of it, space could be an a priori representation, independent of appearances, and yet not be what makes those appearances possible. Perhaps though we could strengthen Kant’s argument by bringing in another implicit premise, something like this:

[Implicit Premise.] Either the objects that appear to us make space possible, or space makes the objects that appear to us possible.

This would be a version of the choice Kant presents us with, for example when talking about his Copernican revolution in the Introduction to the Critique. Suppose we have this premise. We know from Conclusion 1 that space is not a property of the objects that appear to us. This presumably implies that it is not the objects that appear to us which make space possible. This, together with Premise 3, would imply Conclusion 3, that space makes the objects that appear to us possible.

So while Kant does not, in the above passage, provide a valid argument for his conclusion that space is the condition of the possibility of the objects that appear to us, the argument is valid when amended in the way I have suggested, with a premise he clearly endorses elsewhere. Is this additional ‘Copernican’ premise plausible? That is a large question, which would take us beyond the scope of this exercise.