

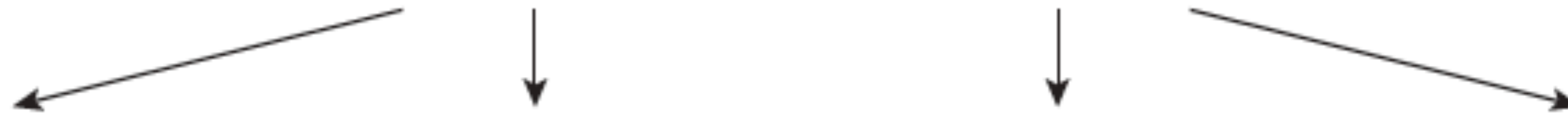
*“That isn’t dark matter, sir—you just forgot to take off the lens cap.”*

*sample task: create your own outline and complete a paragraph.*

**What if the velocity of light is suddenly no longer a constant in science?**



*1. Write phrases using present continuous tense: What is happening now?*



*2. Write phrases using future tense with going to ...*



*3. Write a final sentence using conditional tense to create a hypothesis:  
If the velocity of light were suddenly no longer a constant in science...*

## **hypothesis**

### **adjective + hypothesis**

acceptable, plausible, bold, unlikely, speculative, testable, working, scientific

*Scientists have proved a bold hypothesis.*

*These observations appear to support our working hypothesis.*

### **verb + hypothesis / hypothesis + verb**

construct, form, formulate, have, make, propose, put forward, suggest, consider,

discuss, examine, test (out), confirm, prove, support, accept, reject

concern sth, predict sth

*It is possible to make a hypothesis on the basis of this graph.*

*A number of hypotheses have been put forward*

*using these data to test her hypothesis*

*None of the hypotheses can be rejected at this stage.*

*Her hypothesis concerns the role of electromagnetic radiation.*

*The hypothesis predicts that children will perform better on task A than on task B.*

## **preposition**

on a / the ~

*Her study is based on the hypothesis that language simplification is possible.*

~ about

*She presented an interesting hypothesis about the development of language.*

~ on

*The results confirmed his hypothesis on the use of modal verbs.*

## **hypothetical**

### **verb**

be

*This is a purely hypothetical situation.*

### **adverb**

entirely, purely, totally

*The question is purely hypothetical.*

## **hypothesize**

*There's no point hypothesizing about how the accident happened, since we'll never really know.*

*The children showed a wider range of behaviour than we had hypothesized.*

*Scientists hypothesize that the dinosaurs were killed by a giant meteor.*

## FORMULATING A HYPOTHESIS

**WHY IT'S USEFUL** By formulating a hypothesis, you will be able to conduct empirical research and advance scientific knowledge.

- \* A hypothesis is a statement that proposes an explanation for a phenomenon and can be tested through observation or experimentation.
- \* A hypothesis is formulated in response to a research question and serves as the basis of an empirical research study.

*Before conducting a study, researchers begin with a tentative hypothesis that often includes a prediction of the results. After testing the hypothesis and interpreting the data, a determination is made about whether the results support, partially support, or fail to support the original hypothesis. In some cases, the data can lead to the formulation of a new hypothesis altogether.*

## CHARACTERISTICS OF AN EFFECTIVE HYPOTHESIS

- \* Hypotheses are often written in the form of an *If/then statement*. The *if* part of the sentence shows the relationship between the variables that you will test. The *then* part of the clause includes a prediction of your intended results.

If antibacterial hand sanitiser weakens the immune system by killing good bacteria the body needs to keep disease-causing bacteria away, then decreasing the amount of antibacterial hand sanitiser used will result in lowering the number of illnesses cause by a weakened immune system.

- \* Your hypothesis should include **dependent** and **independent** variables. The dependent variable is the phenomenon that is impacted by the independent variable. It is critical that your hypothesis only include one independent variable. This will enable you to determine the cause of any observed effects. There can be more than one dependent variable, depending on how many effects you decide to measure in your study.

Independent variable: antibacterial hand sanitiser (cause)  
Dependent variable: weakened immune system (effect)

# CHARACTERISTICS OF AN EFFECTIVE HYPOTHESIS

- \* Your hypothesis should include **directional predictions** that state how the independent variable affects the dependent variable(s).

Decreasing hand sanitiser used → Lowers number of illnesses

- \* Your hypothesis should be **specific**. When relevant, specify the population, material, or object you are investigating. For example, in our hypothesis, we specified that illnesses would decrease if less hand sanitiser were used. If the intent of our research were to study the effects of hand sanitiser on the immune system over time, the hypothesis could be specified further:

If early exposure to germs creates a stronger immune system as we age, then decreasing the amount of antibacterial hand sanitiser used by children will result in lowering the number of illnesses people have when they are older.



**Analyse statements a. and b. to determine whether or not they include the characteristics of an effective hypothesis. Rewrite the statements.**

sample:

The Copernican hypothesis was that the planets travel around the Sun on circular orbits. The planet velocity is the same at every point in a circular orbit. Therefore the velocity of Mars, for example, as seen from the Sun should not change.

a. If a person smokes cigarettes, then they will be at a higher risk of lung cancer than people who do not smoke.

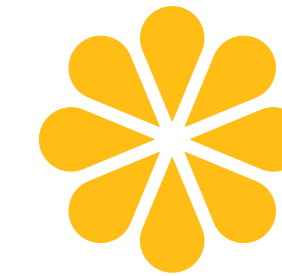
b. Car emissions cause global warming; therefore, reducing the amount that people drive cars will lower the temperature of the Earth.

# **Grammar**

## **Conditional tenses**

There are four types of conditional sentences:

Type	Function	Example
zero conditional	Expresses something as a fact	If you sleep, you dream.
first conditional	States the result of a possible future event occurring	If you get some sleep, you will feel better.
second conditional	States the result of an unlikely event occurring or an untruth being true	If you became an insomniac, you would understand. (unlikely event occurring)  If you were an insomniac, you would understand. (untruth being true)
third conditional	States how the situation would be different with a different past	If you had slept last night, you would have beaten your record.



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**if + present simple verb**

**if + *will* + present simple verb**

**if + conditional verb + would**

**if + past perfect verb + past conditional**

## REAL CONDITIONALS Which conditional tense is shown below?

<ul style="list-style-type: none"> <li>• Describe <b>general truths, facts, or repeated situations and habits</b> using the present tense.</li> <li>• Use the present tense in both the conditional and main clause.</li> <li>• Use <i>even if</i> to describe a condition that does not matter.</li> </ul>	<p>If a vaccine <b>exists</b>, the disease <b>cannot spread</b>.</p> <p>People <b>recover</b> from illnesses <b>when</b> their immune system <b>is</b> strong.</p> <p><b>Even if</b> the results <b>are</b> inconclusive, they still <b>provide</b> important information.</p>
<ul style="list-style-type: none"> <li>• Predict a <b>possible future situation</b> and the likely results. Are used to formulate <b>scientific hypotheses</b>.</li> <li>• Use the present tense in the conditional clause and the future tense (with or without a modal) in the main clause.</li> <li>• Use <i>unless</i> to describe a negative condition.</li> </ul>	<p>Diseases <b>will not spread</b> as rapidly <b>if</b> vaccines <b>are administered</b> throughout the world.</p> <p><b>If</b> the Zika virus <b>causes</b> microcephaly, then no traces of the virus <b>will be found</b> in babies born without microcephaly.</p> <p><b>Unless</b> a vaccine is found, more people will suffer.</p>

## UNREAL CONDITIONALS Which conditional tense is shown below?

<ul style="list-style-type: none"> <li>• Describe a situation that is <b>currently unreal or untrue</b> and <b>imagine the result</b> if it were true.</li> <li>• Use the past tense in the conditional clause and a modal (<i>would, could or might</i>, depending on the level of certainty) plus the base form of a verb in the main clause.</li> </ul>	<p><b>If</b> there <b>were</b> a vaccine for the Zika virus, there <b>might be</b> fewer cases of microcephaly in Brazil.</p> <p>More pregnant women <b>would visit</b> Brazil <b>if</b> the Zika virus <b>were not</b> a concern.</p> <p><b>If</b> the researcher's claim <b>were</b> true, there <b>would be</b> fewer cases of the condition.</p>
<ul style="list-style-type: none"> <li>• Describe an <b>unreal or untrue situation from the past</b> and <b>imagine the result</b> if it had been true.</li> <li>• Use the past perfect tense in the conditional clause and a modal (<i>would, could, might</i>) plus <i>have / has</i>, followed by the past participle of a verb in the main clause.</li> </ul>	<p><b>If</b> they <b>had included</b> one independent variable in their experiment instead of two, their data <b>would likely have yielded</b> more useful results.</p> <p>The doctors <b>would have been</b> able to save more people if there <b>had been</b> a vaccine.</p>

REAL CONDITIONALS Which conditional tense is shown below? CORRECT = ZERO conditional

<ul style="list-style-type: none"> <li>• Describe <b>general truths, facts, or repeated situations and habits</b> using the present tense.</li> <li>• Use the present tense in both the conditional and main clause.</li> <li>• Use <i>even if</i> to describe a condition that does not matter.</li> </ul>	<p>If a vaccine <b>exists</b>, the disease <b>cannot spread</b>.</p> <p>People <b>recover</b> from illnesses <b>when</b> their immune system <b>is</b> strong.</p> <p><b>Even if</b> the results <b>are</b> inconclusive, they still <b>provide</b> important information.</p>
<ul style="list-style-type: none"> <li>• Predict a <b>possible future situation</b> and the likely results. Are used to formulate <b>scientific hypotheses</b>.</li> <li>• Use the present tense in the conditional clause and the future tense (with or without a modal) in the main clause.</li> <li>• Use <i>unless</i> to describe a negative condition.</li> </ul>	<p>Diseases <b>will not spread</b> as rapidly <b>if</b> vaccines <b>are administered</b> throughout the world.</p> <p><b>If</b> the Zika virus <b>causes</b> microcephaly, then no traces of the virus <b>will be found</b> in babies born without microcephaly.</p> <p><b>Unless</b> a vaccine is found, more people will suffer.</p>

= FIRST conditional

UNREAL CONDITIONALS Which conditional tense is shown below? CORRECT = SECOND conditional

<ul style="list-style-type: none"> <li>• Describe a situation that is <b>currently unreal or untrue</b> and <b>imagine the result</b> if it were true.</li> <li>• Use the past tense in the conditional clause and a modal (<i>would, could or might</i>, depending on the level of certainty) plus the base form of a verb in the main clause.</li> </ul>	<p>If there <b>were</b> a vaccine for the Zika virus, there <b>might be</b> fewer cases of microcephaly in Brazil.</p> <p>More pregnant women <b>would visit</b> Brazil <b>if</b> the Zika virus <b>were not</b> a concern.</p> <p><b>If</b> the researcher's claim <b>were</b> true, there <b>would be</b> fewer cases of the condition.</p>
<ul style="list-style-type: none"> <li>• Describe an <b>unreal or untrue situation from the past</b> and <b>imagine the result</b> if it had been true.</li> <li>• Use the past perfect tense in the conditional clause and a modal (<i>would, could, might</i>) plus <i>have / has</i>, followed by the past participle of a verb in the main clause.</li> </ul>	<p><b>If</b> they <b>had included</b> one independent variable in their experiment instead of two, their data <b>would likely have yielded</b> more useful results.</p> <p>The doctors <b>would have been</b> able to save more people if there <b>had been</b> a vaccine.</p>

= THIRD conditional

If you push here, an alarm sounds.

If you push that button, an alarm will sound.

If you pushed that button, an alarm would sound.

If you would have pushed that button, an alarm would have sounded.