The purpose of this checklist

You are on the way to become a professional scientist. An important part of a scientist's life is to present and exchange knowledge. You want others to understand why your research topic is important, you want them to understand what are the challenges and what problems you have solved. This will lead to collaborations, to interdisciplinary knowledge exchange. To achieve that you have to be able to present your work in an interesting and informative manner. This little overview will give you some guidance in this regard and points out the do's and don'ts for preparing and giving a scientific talk.

The purpose of a scientific talk

What is the idea behind a scientific talk? Presenting complex information on a sometimes very specific topic to an audience, to inform them, make them curious to know more. Don't bore the audience.

General remarks

Know your subject! If you are a scientist, you are familiar with your own work, so this point should be no problem. But as a student, where you are confronted with a presentation of a subject you are new to, this gets important. Your audience will notice that you have no idea about what you are talking. Of course you cannot know all the details at this point but each talk about any topic given to you has some important points and you have to be familiar with them.
A speaker always knows more then he or she says in a talk.

Everyone is nervous! Its ok to be nervous, no one will judge you for that. It's natural. Some people never get used to speak in front of an audience. If you know that you are very nervous and you feel insecure, a more extensive preparation is helpful. Practice your talk, perhaps even in front of a mirror. When you know what you want to say, it gets easier, you become more confident.
Being nervous doesn't mean your talk will be bad.

How to prepare a talk

You can start to prepare the talk, as soon as you feel confident with your knowledge of the subject. If you struggle, do some research on the basics first, or ask for help. When you start preparing your talk without the required knowledge you may discover new things that can cause you to overthrow your entire preparation so far. A waste of time and effort.

Structuring

Chaos in your talk - chaos in your head! A good talk has a structure. This should be the first point to take care of. Guide your audience on their way to new knowledge. What basic knowledge is necessary? How are the single points connected. Is there a question above everything, a problem to solve? Introduce the problem and then follow a path to the solution. Sometimes it's not so easy when you have to give a talk that only provides people with facts, but even then you can make up a meaningful structure. How are the single points you should mention connected? It can always help to have a look how books address this topic.
The structure makes or breaks the talk.

Follow the common thread! Use your structure and let it guide you. It helps you to focus on your topic. Also it simplifies it for the audience, if you don't make sudden jumps. It's generally easier to follow.
A talk tells a story - setup, problem, solution.

Introduction to the topic

Who are you speaking to? Knowing your audience is important. Not personally of course, but you need to know how much your audience knows. On a conference, you speak to fellow scientists, so you can assume a broad knowledge in your general field. But the details on your topic, even the ones you take as basic for that, are new to them as well. Do you speak to students? What was your own background in the beginning? This determines the amount of introduction you need and how deep you can dive. Also the scientific level of explanation varies. Are you speaking to scientists in your field, a nearby field, a completely different subject, school kids, students or your family?
Know your audience.

Motivation! Why are you doing this? This may be a question from a toddler but also from your audience. What is the purpose of all this? Why is this topic important? It's always good to have a larger context in mind. It can also be important when you describe a complex process of solving a problem. Why are those single steps important?
Make your audience curious. Make your problem their problem.

The complexity

The right amount of basic knowledge: When you know your audience, you have an idea of what they know. How does your topic fits in there? Is there more background needed? Do they know enough? Don't expect too much from your audience. Try to see this through their eyes. This can be tricky if you don't have much time but a very general audience. Try to find a good balance. What are the important points in the field? How could you simplify or illustrate them?
Give your audience an appropriate level of background knowledge.

How deep you dive: Does your audience need to know how exactly this parameter enters this particular equation? Usually not. Try not to lose the audience by being too complex or with a huge pile of side facts. For the very detailed points, the people have time for questions in the end. Say that this is too complex to go in detail during your talk when you skip it.
Limit the complexity to not confuse your audience.

How to end a talk

The "take home"-message The details in your talk are important for understanding it right away. They explain how you get to your solution, your conclusion at the end. But people don't remember those points. So point out your main message at the end again, emphasize it. Tell the people, this is now the point they should keep in mind. Don't include here too much. A conclusion slide at the end is good, but don't overload it.
What is the important fact the people should memorize?

Practice!

Repetition is the key to success! Practice your talk. You don't need an audience for that. It helps in many ways. The final version of your talk should be practiced at least once.
Better practice your talk several times.

Find the right transitions Imagine yourself as telling a scientific story. Going from one point to another might confuse your audience if they don't understand it or it is a really sudden turn. Make sure that you motivate those turns, introduce them with one sentence. The same for slides. You should know what the next slide is and what is the connection between the current and the next one. Also try to have a sentence in mind that takes your audience from slide to slide.
Give your talk the right flow.

Stay in time Your speaking time is always limited. If you have a complex topic or a lot of details, it is not so easy to stay in the time limit. Practice your talk to see how much time you need. If you have some time left, lucky you, you can explain something in more detailed. If you exceed the time look for all the points you want to speak about, which of those are the least important ones, where can you cut an explanation? Or it is just a matter of practice and you can speak faster and more fluently if you know your talk better?
Speaking time is always limited, make sure to not exceed it.

How to create slides?

Powerpoint or LaTeX? Powerpoint is fancy? Maybe, but it shouldn't be the first choice for a scientific talk. The first problem is compatibility. You have a .ppt or even .pptx? But when you have to run your presentation on a computer that isn't yours you never know if they have the most up-to-date MS office version, or just Libre or Open Office or maybe none of them at all. In the last case, you are completely lost. In the other cases, your slides don't look the way you made them: Text disappears, figures are shifted, and if you included the figures only as link to your presentation they completely disappear. Animations should be avoided anyway. To solve this issue you can ether export your slides as a pdf file (may change their appearance as well) or, and this is the recommended choice, make them with LaTeX in the first place. However, LaTeX needs some training, and you will have trouble including gifs and videos. So only if you need to include one of those, don't use LaTeX. But then make sure that your slides are working on the day of the presentation.
Always have a pdf version of your talk at hand to avoid compatibility issues.

General style of the slides

Widescreen slides: Which side ratio do your slides have? 4:3 or 16:9? 4:3 is still the standard. 16:9 widescreen slides are nice, you can fit a lot on them. But only a very small fraction of projectors support those slides. Most of them are build for 4:3. If you now use widescreen slides your slides are either cut at the sides or scaled down. Everything is smaller now. When you don't know the projector you are going to use, always stick with 4:3. If you know that widescreen is supported by the projector, feel free to use it.
4:3 should be preferred in most cases.

Fonts: Avoid fancy fonts and also fonts with serifs, like Times Roman, those are bad to read. Prefer fonts like Helvetica or Arial, which are much better and faster to read, so the audience is not too much occupied with reading and can listen to your words more easily. Oh, and also: No Comic Sans! Never! If you use the LaTeXbeamer class, the default font is Helvetica already. All this applies also to plot labels and equations.
Fonts without serifs should be in use.

Animations: Avoid fancy animations, they are just a distraction, cost time, and can be very annoying if you move between your slides during the questions after your talk. It is also not guaranteed that they always work.
Avoid them. Period!

Table of contents slide: The first slide after the title slide should be the table of contents where you say what are going to say later on? Wrong, if you stick to the points above and your talk has already a good flow, a natural order with good transitions between the topics, you don't need something like this. Of course, your talk should have a structure but you don't have to tell your audience about that, they will recognize it anyhow. Also you waste precious speaking time on that.
If your talk has a common thread and a good flow you don't need this.

What to put on slides? Don't write on your slides the stuff you say. Don't write sentences or even entire paragraphs. Bullet points with 5 to 6 words is what you should use. They repeat the main messages of what you say. If you put too much text on your slides the audience has to decide, either to listen or to read, they can't do both and reading in parallel is annoying and exhausting. Use your slides for diagrams, figures, and bullet points with the main statements.
Don't put up walls of text on your slide.

Blinding: The room you give your talk in is usually a bit darker to see the slides better. The audiences eyes get used to the darkness. If you now use a dark slide and a bright one right after that, for example from a dark sky image to a white slide with just some text, your audience gets blinded. They now can't see what's on your slide and they stop listen for a moment too. Try to avoid this, maybe invert dark images, or put a more mild gradient in brightness.
Try to avoid sudden and large changes in brightness

Black on white or white on black? The default is black or blue letters on white background. Some speakers prefer it the other way around. For example to avoid blinding the audience. But in this case you much stronger depend on a relatively dark room and on the contrast of the projector. If its not high enough, the words become difficult to read.
When you don't know the capabilities of the projector stay with black on white.

Colors: As before, it's the same for the use of colors. If you have a bad projector, and that is what you should assume always as long as you don't know differently, similar color are hard to separate. Red, magenta, and brown will all look the same. Same for dark blue, dark green, and black. Yellow may become invisible. If you have plots with several graphs in it try to use different plotting symbols like dashed or dash-dotted lines. Figures can cause a problem, if their intrinsic contrast is low. Increase it manually, it may not look as fancy on your screen anymore but it stays visible on a wall.
Use good distinguishable colors and different symbols as substitution.

Figures and Diagrams

Readable Labels: Sooner or later you have to put up some diagrams, spectra, or plots of various types. They contain a lot of information, or no information at all, if no one can read the axis labels. And if you have to say this for each plot you lose time and flow. The same for symbols. Always have them large enough to be distinguished even in the last row. You can scale images freely but keep their original axis ratio. Also you can scale them to the edges of your slide or even above them.
Make sure the audience can read the axis labels in diagrams.

Address all figures: This is important for a talk as well as for a written work like a thesis, a paper, or even a report. A figure you do not address in the text, does not belong there. Don't leave figures without context, especially diagrams can cause confusion in your audience. Also they take away the attention from what you say.
Figures do you not speak about, are figures you do not need.

The final slide

Summarize and Conclude: The first slide is to make the audience curios, the last one gives them the final information, the "take home"-messages. Summarize your important points there again shortly(!).
The last slide is what the listeners will remember from what you say.

No *thank you* slide: You can thank your audience for their attention, but only in spoken words. A final slide where you just write thank you or something similar, doesn't help anyone. Let your last slide be the summary and conclusion slide so that the people can still think about what you just told them after you stopped speaking.
You can say thank you, but don't write it.

While giving a talk

No notes: Scientific talks are given without any notes. As a speaker you are supposed to be familiar enough with the matter of your talk to not need something like this. Practicing helps to memorize what you want to say. Also you can use your slides as notes to remind you on what you want to say. (But their main purpose is still for the audience, not for you.) Don't read from your slides. All of this together lets you speak freely and directly to your audience and not to a piece of paper.
If you need them, put a sheet on the desk in front of you, don't hold it your hands.

Slowly uncover slides: A slide can contain a lot of information. To not overwhelm the audience, you can uncover parts of your slide piece by piece. LaTeXbeamer slides provide an easy way to do so. This slow way of showing your slides can also help you to keep the order of things you want to say during your talk.
Revealing your slides piece by piece don't overcharges the audience with information and helps you to stay on track.