

## Modern Physics Video ~ Project

Name: \_\_\_\_\_

### Inquiry Question

**They say a picture can be worth a thousand words. What about an video? Can you convey a complex modern physics concept clearly whilst entertaining your target audience? Let's get in touch with our artistic and creative side.**

You are to create video that showcases why you love modern physics (Quatum Mechanics and/or Special Relativity). You are to demonstrate your understanding of a given phenomena by generating an interesting storyboard that could include demonstrations, props, special effects, solid acting, cartoons etc. to help why the physics you have chosen to examine is so amazing.



## Instructions

Using a pencil, answer the following questions. The lab is marked based on clarity of responses, completeness, neatness, and accuracy. Do your best! Please ensure that any data measured (or recorded) includes the appropriate number of significant digits (only one uncertain digit).

This activity is divided into three sections:

- **Core** – this first section explores only the basic “core” ideas involved in understanding. Students must demonstrate a sound understanding with all of their answers in this section BEFORE attempting the next section.
- **Mastery** – Your instructor will NOT review this section if the Core section above shows any misconceptions. In this section students will make predictions and apply the concepts and ideas learned above. For complete mastery it is expected that data collection and scientific procedures will be as accurate as possible. All work shown should be clear with any units included. Answers should be rounded off to the correct number of significant figures based on the data collected.
- **Ace** – Once again, your instructor will only look at this section provided he/she is confident that the above Mastery criteria has been met. In this section students will demonstrate a deeper understanding of the concepts through error analysis, experimental design etc. Physics concepts from other units already covered will often be required here.

This Project will be graded according to this [Marking Rubric](#) (link).

For this project please read the criteria for Core, Mastery, and Ace as you will be choosing the appropriate level BEFORE you begin.

**Objectives:**

- Choose a Modern Physics topic (suggestions below) of interest
- Research the topic and learn as much about it as possible (remember, your grade is both a reflection of the quality of your final product AND the amount of physics that you learned)
- Demonstrate and explain physics concepts through a video.

**Rules:**

- You must have a pre-approved (by your teacher) story board or script of the concept you will be filming. All demonstrations and special effects will be presented in this initial step.
- Your video must be less than 10 minutes long and contain entirely original footage.
- Since your grade is also based on the amount of physics learned, you must somehow document all of the research and learning that was achieved.

**Suggested Topics:**

- Einstein's theory of special relativity (can focus on the topic broadly or narrowly by choosing a particular relativistic effect (time dilation, length contraction, mass increase, mass-energy, twin paradox, general relativity, simultaneity, etc)
- Real-world engineering that utilizes special relativity concepts
- Futuristic applications of special relativity
- Black holes, light, space time, wormholes, event horizons
- Quantum entanglement, teleportation
- Double slit experiment and the behaviour of matter when it is observed
- Theories for the age of the universe and the creation of space itself
- Uncertainty principle
- Schrodinger's famous cats
- Bose-Einstein condensate
- Gravitational waves
- Delayed choice quantum eraser
- YOUR CHOICE – must be related to modern physics (requires teacher approval)

### Part 1: Core

- Story board will match the final video.
- All physics learned will be well documented
- Video will clearly demonstrate the physics

### Part 2: Mastery

As above plus...

- The production value of your video will be more diverse and include multiple media forms to represent your physics concept
- The dialogue will be intriguing enough to hold the interest of the audience
- The audience will have a sound understanding of your chosen topic by the end of the video

### Part 3: Ace

As above plus...

- The video edits will be smooth and professional. Your video will be of "contest winning" quality (see below)
- The audience will want more. The "cool" factor will be high
- Humour would be a nice touch but ultimately it will come down to the clarity of your explanation.

***Physics Video Contests can be lucrative events. Many universities around the world hold contests with significant financial rewards. We suggest you look around. If you can satisfy the above criteria in addition to the contest criteria...***

***Some contests (Ctrl + Click):***

- [The Perimeter Institute](#): An amazing institute for theoretical physics. Located in Waterloo, Ontario
- [UBC](#): British Columbia's very own UBC often has science video contests. Follow the link and have a look.
- [FQXi Community](#): The Foundational Questions Institute (Physics and Astronomy) have held these contests in the past. Check them out for examples.
- [The Breakthrough Junior Challenge](#): The grand-daddy of them all. Top prize is \$400 000!! The past winners can be viewed on the site. The videos are good but certainly not out of reach. Have a look if nothing else.

The judging criteria for the Breakthrough Junior Challenge... (as copied from the site)

## Challenge

You get it. You've grasped an important scientific theory, concept or principle.

Now can you share your insight?

An inventive video can get across complex material that would take pages of text to communicate.

To take part in the Breakthrough Junior Challenge, create a short video (5 minutes max) to explain a big idea in one of these fields:

- Physics
- Mathematics
- Life Sciences

Your film can take any form you like: animation, talking head, documentary, dramatic reconstruction, whatever. It's worth keeping in mind that video is a dynamic visual medium – using diagrams, simulations, physical demonstrations etc. is a lot more effective than standing in front of a blackboard talking.

The videos will be judged according to the following criteria:

- Engagement
- Illumination
- Creativity
- Difficulty

If you're looking for guidance, you can see some of last year's top-scoring entries [here](#). But remember, to show 'creativity' your film should be as original as possible.