



Future of Physics AI

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Objective

Ask ChatGPT 3.5 to provide step-by-step methodologies for a set of physics questions and analyze each response on its accuracy, clarity, step-by-step approach, depth, and strategy of the feedback.

Methodology

Using the ChatGPT 3.5 API:

1. The API was given a system prompt: "You are a physics teacher giving feedback to any question. Give a step-by-step methodology for solving the question without doing calculations."
2. The API was then given 1 of the 20 questions taken from the 2022 PHYS 114 (General Physics I: For Students of the Life Sciences) exams.
3. The AI responds with a step-by-step methodology that was recorded for analysis.
4. Repeated steps 2-3 for all 20 questions.
5. The responses were graded using this rubric:

Criteria	Pts	Description
Accuracy	2	0-1 Points: Solution contains significant errors or incorrect steps. 2 Points: Solution is entirely accurate with correct steps and explanation.
Clarity of Explanation	2	0-1 Points: Explanation is unclear, difficult to follow, or lacks coherence. 2 Points: Explanation is clear, concise, and effectively communicates each step.
Step-by-Step Approach	2	0-1 Points: Steps are missing or incomplete, making it hard to follow the solution. 2 Points: The solution is presented in a clear sequential manner.
Relevance and Depth	2	0-1 Points: The solution lacks depth, providing only surface-level explanation. 2 Points: The solution delves into the problem with relevant concepts and explanations.
Problem-Solving Strategy	2	0-1 Points: Lacks a coherent problem-solving strategy or logical progression. 2 Points: Demonstrates a clear and effective problem-solving strategy.

Data/Results

Question 1

A birdwatcher observes a cardinal approaching from the east, flying parallel to the ground. At the first observation, the bird is at distance of 30 m from the watcher's eyes, and the line of observation is 40 degrees above horizontal. Exactly 5 seconds later, the watcher has turned 180 degrees, and the bird is seen flying to the west at a distance of 20 m and at the observer's eye level.

ChatGPT 3.5T

According to the given scenario, the bird moves from east to west at a constant speed. From this, we could conclude that the velocity is constant, as long as there are no forces acting on the bird that could change its speed or direction. However, it's important to note that this conclusion is based on the given assumptions and it might not be the case if other factors or forces are involved in the bird's motion. Therefore, in the absence of additional information, we can conclude that the velocity has been constant between the observation points.

Question 9-10

On September 26, 2022, the DART space probe intentionally crashed into an asteroid named Dimorphos in an attempt to determine whether an asteroid heading towards Earth might be nudged from its path enough to save our planet. The DART probe had a mass of 570 kg at the time of impact and was traveling at 4 miles per second when it collided head-on with Dimorphos, which has a mass of approximately 5 billion kg and was traveling at a speed of 0.2 m/s in the opposite direction.

During the collision, which had a larger change in momentum – the asteroid or the spacecraft? Explain your reasoning.

ChatGPT 3.5T

1. Calculate the momentum of the DART probe before impact and the momentum of Dimorphos before impact.
2. Calculate the momentum of the DART probe after impact and the momentum of Dimorphos after impact.
3. Determine the change in momentum for each object by finding the difference between the after-impact momentum and the before-impact momentum.
4. Compare the magnitude of the change in momentum for the DART probe and Dimorphos.
5. Consider the implications of the change in momentum for each object and how it relates to Newton's third law of motion.

Conclusions

Limitations

- ChatGPT has limitations when answering problems with visual information.
- Inability to conduct mathematical operations (lack of math engine).
- Lack of a conscious mind means that ChatGPT can't realize if it's right or wrong. Only fine-tuning with large data sets can improve its accuracy

Tips for using ChatGPT

- Ask questions that will lead to a more open-ended response.
- The more details the better.
- Explain to the AI it's role/goal in the matter (Tutor, Coach, Mentor).
- Add constraints to your message that let the AI know where and when to stop.

References

- Stephen Wolfram. What is ChatGPT doing and why does it work, Feb 2023.
- Colin G. West. Advances in apparent conceptual physics reasoning in gpt-4, 2023