Problem General Info

Team Members

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Problem Topic(s)

Copy from topic list, Focus Highlighted

Topic #	Suggestion
3	Composite kinematics graphs (eg object travels down a ramp onto a level surface)
23	Simple Conservation of Energy (Ug to K) and Ug reference points
7	Relative motion (VAB=VAC+VCB)

Prior Knowledge

- Kinematic Equations
- Rectilinear Motion
- Conservation of Energy

Common Misconceptions

- Initial velocity “at rest”
- The frame of reference is often confused in relative motion problems
- The use of direction rather than indicating that through the sign of the number.

Reference Problems

- N/A

Preliminary Problem Statement

[Problem statement submitted for peer review]
[Supporting Images]

a)  c) 

In Mission Impossible 6, Ethan Hunt, who has a mass of 75 kilograms, has to fall out of an aircraft at an altitude of 4,000 meters as a part of his mission, should he choose to accept it. Assume no drag force or terminal velocity

a) Draw a graph of his acceleration and sketch a graph of his velocity after he jumps out of the aircraft. (Positive direction is downwards).
b) Calculate his potential energy at the moment he jumps out of the aircraft. Assuming he was landing in a lake and did not pull his parachute, calculate his velocity at the moment he touches the water. If he reaches terminal velocity (134 meters/second), state so and justify.
c) While skydiving, Agent Hunt sees his partner fly past him at 27 meters/second relative to him. If Agent Hunt is flying at twice that velocity relative to the ground, then what is his partner's velocity relative to the ground at that moment?
d) At 3000 ft from the ground, Agent Hunt pulls his parachute. Hunts acceleration is now 9.65 meters/seconds^2 in the upward direction. Will Agent hunt survive the impact? (Max Velocity for survival upon impact with water is 14 meters/second)

Your Preliminary Solution

[Image(s) of handwritten solution or typed solution]

Answers

a) The acceleration graph would have a straight line at 9.81 meters/second^2. The velocity graph would show a linear function, ideally, until terminal velocity is reached. Then velocity would flatten.

b) Potential Energy = U = mass x gravity x height = 75 x 9.81 x 4000 = 294300 Joules. $U_i + K_i = U_f + K_f$, $U_f = 0$ and $K_i = 0$ so $U_i = K_f$, $mgh = 0.5mv^2$, $gh = v^2/2$, v = sqrt(2gh). V = 280 m/s.

c) A is Agent hunt, B is his partner and C is the ground. V_{BA} = 27 m/s. V_{AC} = 54 m/s. $V_{BC} = V_{BA} + V_{AC}$ = 27 + 54 = 81 meters/second

d) d) Potential energy is 294300 joules. So Ui = Uf+Kf. (75 x 9.81 x 4000 - 75 x 9.81 x 3000)/(.5 x 75) would = v^2 at 3000 meters. V would = 140 m/s so using vf^2 = vi^2 + 2ax vf = (140)^2 - 2(9.65)(1000). Vf = 17.32 m/s. Since 17.32 is greater than 14 m/s Agent hunt dies on impact with the surface water.

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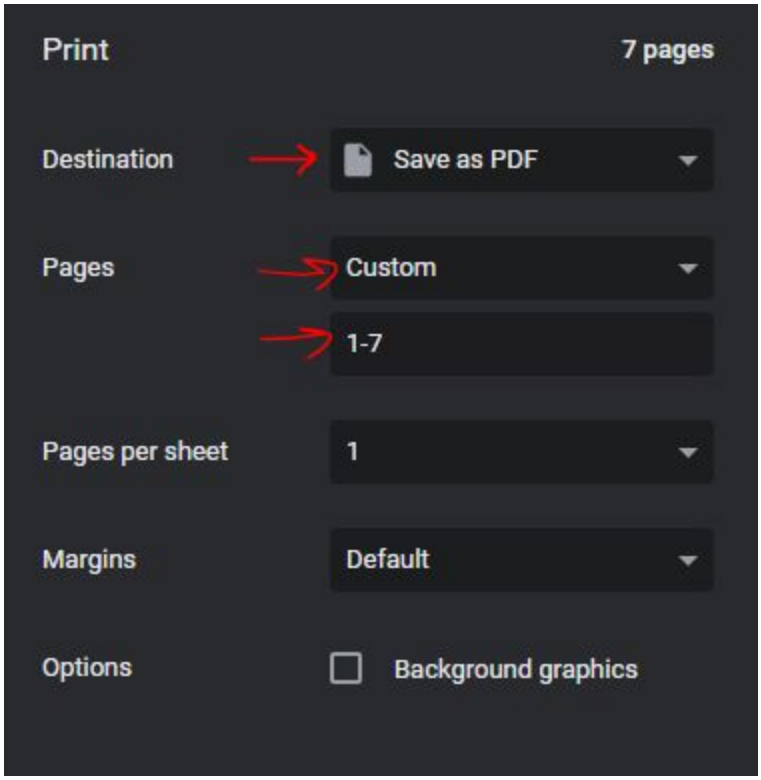
- 

Peer Review Solution

[Peer Reviewer Name]
[Peer reviewer notes]
[Time to Complete]
[Image(s) of handwritten solution]

Final Problem Statement

[Revised Problem statement]
[Supporting Images]

Your Final Solution

[Image(s) of new / updated handwritten solution or typed solution]