

Answer on Question #40928 – Physics - Mechanics | Kinematics | Dynamics

Of the following situations, which one is impossible?

- A. A body having velocity east and acceleration east
- B. A body having velocity east and acceleration west
- C. A body having zero velocity and non-zero acceleration
- D. A body having constant acceleration and variable velocity
- E. A body having constant velocity and variable acceleration

Solution:

All situations are possible instantaneous initial states, but only (a,c) are not possible quasi-steady final states.

Instantaneous initial state examples:

- A) an object has velocity directed east and acceleration directed east
Car traveling east, step on gas.

- B) an object has velocity directed east and acceleration directed west
Car traveling east, step on brakes.

- C) an object has zero velocity but nonzero acceleration
Car at rest, step on accelerator.

- D) an object has constant nonzero acceleration and changing velocity
Object in freefall

- E) an object has constant nonzero velocity and changing acceleration
Car cruising at 55mph; step on brakes or gas.

Thus, all situations possible.

If this question is referring to the condition/situation as a quasi-steady final state (rather than an instantaneous one) then

- A) an object has velocity directed east and acceleration directed east
Possible: car moving east hits the accelerator.

- B) an object has velocity directed east and acceleration directed west
Possible: car moving east hits the brakes.

- C) an object has zero velocity but nonzero acceleration
Not possible: non-zero acceleration will eventually produce a velocity:

- D) an object has constant nonzero acceleration and changing velocity
Possible: object in freefall

- E) an object has constant nonzero velocity and changing acceleration

Not possible: velocity cannot be constant in the presence of a non-zero acceleration.

So (C, E) are not possible quasi-steady final states.

Answer: impossible situations:

- C) an object has zero velocity but nonzero acceleration
- E) an object has constant nonzero velocity and changing acceleration

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