Answer on Question#41007 – Physics - Mechanics

Which of the following situations is impossible?
A) An object has zero velocity but non-zero acceleration.
B) An object has velocity directed east and acceleration directed east.
C) An object has constant non-zero acceleration and changing velocity.
D) An object has velocity directed east and acceleration directed west.
E) An object has constant non-zero velocity and changing 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 zero velocity but nonzero acceleration
> Car at rest, step on accelerator.
>
> B) an object has constant nonzero acceleration and changing velocity
> Object in freefall
>
> C) an ocject has constant nonzero velocity and changing acceleration
> Car cruising at 55mph; step on brakes or gas.
>
> D) an object has velocity directed east and acceleration directed west
> Car traveling east, step on brakes.
>
> E) an object has velocity directed east and acceleration directed east
> Car traveling east, step on 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 zero velocity but nonzero acceleration
> Not possible: non-zero acceleration will eventually produce a velocity:
>
> B) an object has constant nonzero acceleration and changing velocity
> Possible: object in freefall
>
> C) an object has constant nonzero velocity and changing acceleration
> Not possible: velocity cannot be constant in the presence of a non-zero acceleration.
>
> D) an object has velocity directed east and acceleration directed west
> Possible: car moving east hits the brakes.

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

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

Answer: impossible situations:
A) An object has zero velocity but non-zero acceleration.
C) An object has constant non-zero acceleration and changing velocity.