2019-Ph-H2-Q3

Section: Our Dynamic Universe
Topic: Collisions, Explosions and Impulse

Summary:
A footballer claims a ball can be kicked further if it is moving towards them, rather than stationary. We must comment on this using physics principles.

Solution:

- The final velocity of the ball depends on the impulse imparted: $J = \Delta p = m(v_f - u)$.

- If the ball is already moving towards the player (negative u), the change in velocity $v_f - u$ is larger compared to a stationary ball.
- This means more momentum transfer and greater kinetic energy after the kick, resulting in the ball travelling further.

Answer: The statement is correct because the relative speed of the ball and foot increases the impulse and final speed of the ball.

Guidance for Students:

- Think in terms of momentum and impulse, not just speed.
- When two objects move towards each other, relative speed is higher.

Revision Tips:

- $J = F\Delta t = \Delta p$.
- The greater the change in momentum, the greater the final kinetic energy.
- Real-life example: hitting a moving ball in sports often results in a stronger shot.