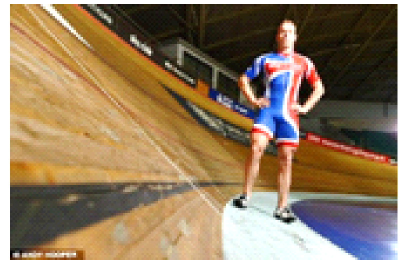
HIP 06

COMMENTS:

- Problem 1 will be graded based off of the HIP rubric.
- Problem 2 is a list of suggested Student Workbook Volume 1 problems to practice in your spare time. You do not need to turn these in, they will not be graded.



1. During lab on Tuesday and in class on Wednesday we talked about circular motion. Let's look at one more real world example. You might or might not have seen a video about bike racing at indoor tracks. Here is the most amazing rescue from a crash I have seen: (https://www.youtube.com/watch?v=Y-z0Kh0pvNM).

   Velodromes are the setting for short track bike racing. Typically they are 250 m long ovals with circular ends whose radii are 22 m. Because the tires on these types of performance bikes aren't great at handling lateral forces the curves are steeply banked so that very little friction is required at race speeds. For a feeling to check the reasonableness of your answer, check out the picture above. A typical race speed is 18 m/s. Make sure you solve both problems using parameters first, only plug in numbers at the very end. Practice drawing a good FBD including a coordinate system with a radial direction. You can safely assume the bicyclist stays at the same height on the track during the race.

   (a) Using our ideas of circular motion and physics, design the bank of the circular ends of the oval (e.g. determine the angle of the track relative to the horizontal) so no friction would be needed for a race speed of 18 m/s.

   (b) I read about the static friction coefficient between bike tires and a race track to be $\mu_s = 0.10$. What is the slowest speed a cyclist can go on this track without sliding down the track in the turn? (If you did not successfully solve for the angle of the bank in part (a) of the question, you can use a bank angle of 60 degrees.)

   (c) Enhancement.

(2) CH 3: 41, 42, 43
CH 5: 20, 21
CH 6: 1, 2, 3, 4, 5, 7, 8
CH 7: 1, 2, 3, 4, 5, 6, 10