**Question 19 (7 marks)**

A car of mass 2200 kg is in horizontal circular motion on a banked track. The car has a speed of 14.0 m s-1 and is relying on friction to stay at a fixed height on the banked track. The radius of the circle is 32.0 m. The track is banked at an angle of 20.0⁰ to the horizontal. Friction acts from the track onto the car parallel to the track as shown.

20⁰



Friction

Vector diagram

1. Construct a vector diagram to the right of the diagram above. Show the forces acting on the car and the net force.

(2)

1. Calculate the magnitude of friction acting on the car from the banked track.

(5)

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20⁰



Friction

X

Y

Weight

Friction

Normal

1. Construct a vector diagram to the right of the diagram above. Show the forces acting on the car and the net force.

(2)

Head to tail to show sum of forces acting to centre. ✓

Friction parallel to slope ✓

1. Calculate the magnitude of friction acting on the car from the banked track.

(5)

r = 32 m W = mg = 2200 x 9.8 = 21560 N

v = 14 m s-1  ✓

✓

✓

Friction = 5288.4 = 5.29 103 N ✓