5.1 Quizlette - Centripetal Force and Acceleration   Name_____

$$a = \frac{v^2}{r}$$ Velocity - radius equation

1. What is the centripetal acceleration of a skier going 23.0 m/s around a corner with a radius of 56.0 m? (9.45 m/s/s)

2. A car going around a corner with a radius of 340. m is accelerating laterally at 6.40 m/s/s. What is its speed? (46.6 m/s)

3. A car goes 23.0 m/s around a corner with a lateral acceleration of 4.50 m/s/s. What is the radius of the corner? (118 m)

$$a = \frac{4\pi^2 r}{T^2}$$ Period - radius equation

4. A centrifuge has a radius of 0.0870 m, and a period of 0.0230 s. What is its centripetal acceleration? (6493 m/s/s)

5. A centrifuge generates a centripetal acceleration of 3760 m/s/s with a period of 0.0310 s. What is the radius of the centrifuge? (0.0915 m)

6. A centrifuge generates an acceleration of 9250 m/s/s with a radius of 0.0680 m. What is its period of motion? (0.0170 s)

$$F = ma, \ \text{so} \ F = \frac{mv^2}{r} \quad \text{and} \quad F = \frac{m4\pi^2 r}{T^2}$$ Centripetal force

7. What centripetal force do you need to make a 78.0 kg skier go 39.0 m/s around a 98.0 m radius corner? (1211 N)

8. What is the maximum velocity you can twirl a 3.90 kg hammer in a 1.80 m radius circle if the string it is attached to has a tensile strength of 190. N? (9.36 m/s)

9. A centrifuge makes 0.0140 kg test tubes go in a 0.0860 m radius circle with a period of 0.0455 s. What force does it exert on the test tubes? (23.0 N)

10. A centrifuge exerts 213 N on a 0.0120 kg test tube spinning in a 0.0750 m radius circle. What is its period of motion? (0.0129 s)

Friction provides centripetal force:

$$\mu mg = \frac{mv^2}{r} \qquad \mu mg = \frac{m4\pi^2 r}{T^2}$$

11. A 1450 kg car with a coefficient of friction of 0.870 goes around a level corner at 27.0 m/s. What is the minimum radius the corner can have? (85.4 m)

12. There is a coefficient of friction of 0.930 between a 1230 kg car and the level road. What is its maximum possible velocity around a 330. m radius corner? (54.9 m/s)

13. A 0.120 kg mass is on a level turntable. If there is a coefficient of friction of 0.340 between the turntable and the mass, and the turntable has a period of 1.33 s, what is the maximum distance the mass can be from the center and not fly off? (0.149 m)

14. A 0.0110 kg eraser is on a level turntable 0.180 m from the center. If there is a coefficient of friction of 0.880 between the turntable and the eraser, what is the minimum period of motion the turntable can have for the eraser to remain without flying off? (0.907 s)