Part I

1. If the radius of the path of a body in uniform circular motion is doubled and the speed is kept the same the force needed must be

    (a) half as great as before.

    (b) the same as before.

    (c) twice as large as before.

    (d) four times the size as before.

2. The angular velocity of the minute hand of a clock is
    (a) $\frac{1}{30}\pi$ rad/s.    (b) $\frac{1}{1800}\pi$ rad/s.    (c) $2\pi$ rad/min.    (d) 60 rad/min.

3. A heavy ball of mass 1.00 kg is whirled at a constant speed of 2.00 ms$^{-1}$ on the end of a string in a horizontal circle of radius 1.50 m. The work done by the tension in the string during exactly one revolution is

    (a) 0 J        (b) 2.67 J        (c) 8.01 J        (d) 25.1 J.

4. A body which is traveling around a circle at constant speed

    (a) is not accelerated.

    (b) has constant acceleration.

    (c) is accelerated in the direction of motion.
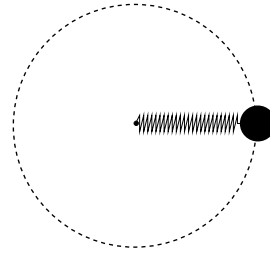
    (d) none of the above.

5. On a rainy day the coefficient of friction between the tires of a car and a level road surface is reduced to half its usual value. The maximum safe velocity for rounding a curve is

    (a) reduced to 71% of its original value.

    (b) reduced to 50% of its original value.

    (c) reduced to 25% of its original value.

    (d) unchanged.

6. A 3.0 kg stone at the end of a 0.50 m long string is whirled in a vertical circle with constant velocity. If the tension in the string is 10 N at the top of the circle the tension at the bottom is

   (a) 10 N      (b) 30 N      (c) 40 N      (d) 70 N

7. A truck with a ball free to roll around in the back takes a a sharp turn to the right. Which of the following forces cause the ball to move to the left side of the truck?

   (a) gravity.

   (b) normal force.

   (c) centripetal force.

   (d) the absence of a force.

Part II

1. A 50 kg pilot performs a vertical loop of radius 250 m in her plane.

   (a) Find her speed if she feels weightless at the top of the loop.

   (b) If the maximum normal force she can withstand without fainting is 2000 N find her maximum safe speed at the bottom of the loop.

   (c) In passing from the top of the loop to the bottom of the loop her plane speeds up due to the action of gravity. Will she need to brake in order to avoid fainting at the bottom of the loop?

2. A massless spring with spring constant 4.0 N m$^{-1}$ is fixed at one end and a 100 g disk is connected to the other end. The disk moves horizontally on a frictionless surface in uniform circular motion with a period of 2.6 s and radius 0.16 m.

(a) Find

    (i) the angular velocity of the disk.

    (ii) the centripetal acceleration of the disk.

    (iii) the extension of the spring and hence its original length

(b) The rate of revolution of the disk is increased and the spring stretches until the radius becomes 0.20 m. Find

    (i) the force the spring now exerts on the disk.

    (ii) the new period.