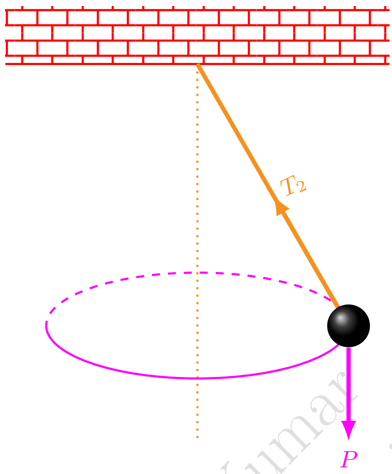

Figure 4.4: Motion of a ball in circle

. Now I understand that *the same set of forces can cause motions of different nature and therefore data on the nature of the motion of a body cannot serve as a starting point in determining the forces applied to the body.* ■

4.13. You have stated the matter very precisely. There is no need, however, to go to the extremes. Though different kinds of motion may be caused by the same set of forces (as in Fig. 4.3 and Fig. 4.4), the numerical relations between the acting forces differ for the different kinds of motion. This means that there will be a different resultant applied force for each motion. Thus, for instance, in uniform motion of a body in a circle, the resultant force should be the *centripetal* one; in oscillation in a plane, the resultant force should be the *restoring force*. From this it follows that even though data on the kind of motion of a body cannot serve as the basis for determining the applied forces, they are far from superfluous.

In this connection, let us return to the example illustrated in Fig. 4.3 and Fig. 4.4. Assume that the angle α, between the vertical and the direction of the string is known and so is the weight P of the body. Find the tension T in the string when

(1) the oscillating body is in its extreme position, and

(2) when the body is traveling uniformly in a circle.

In the first case, the resultant force is the restoring force and it is perpendicular to the string. Therefore, the weight P of the body is resolved into two components, with one component along the resultant force and the other perpendicular to it (i.e. directed along the string). Then the forces perpendicular to the resultant force, i.e. those acting in the direction along the string, are equated to each other (see fig:21a).

$$\therefore T_1 = P\cos\alpha$$