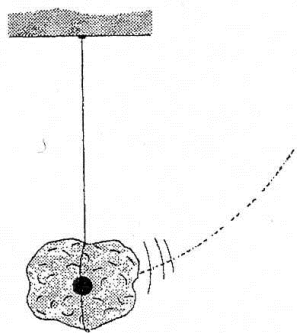
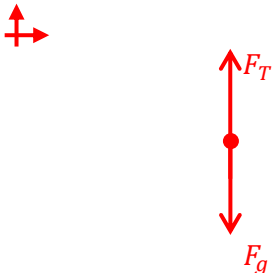

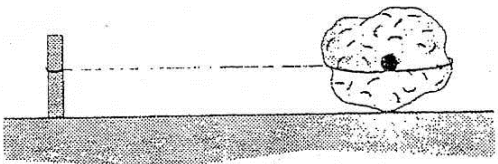
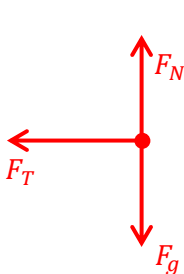
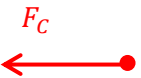
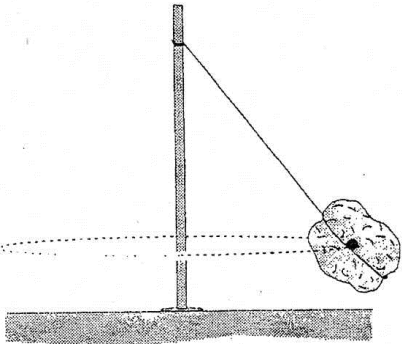
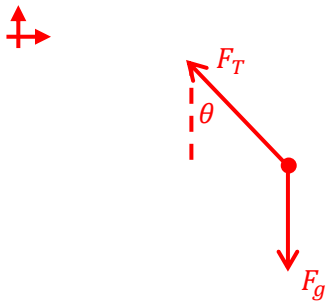
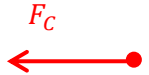
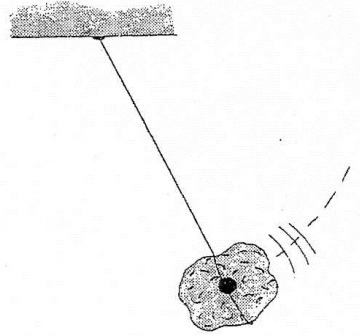
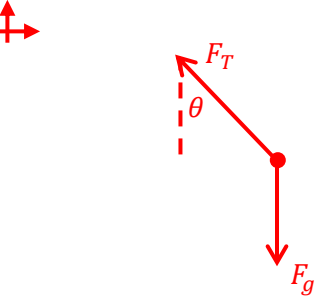
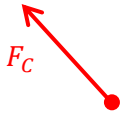
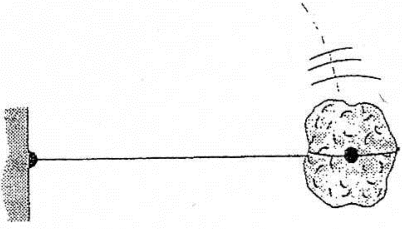
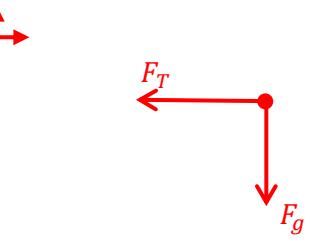



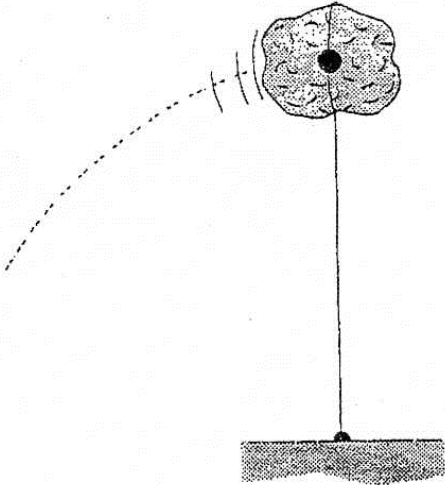
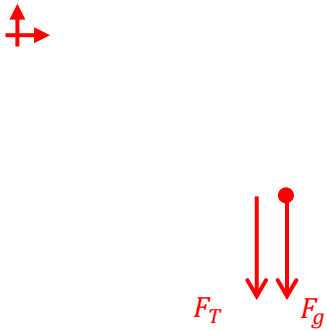

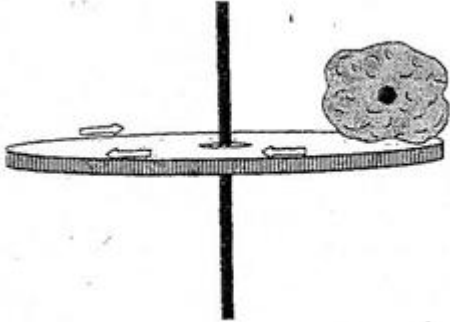
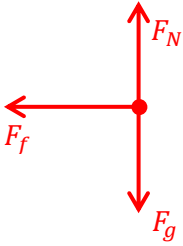

Draw free-body diagram showing all real forces acting in the rock in each example. Also include another free-body diagram that only includes the centripetal force and a dot indicating the centre of the rock's motion. Finally, create an expression that describes the centripetal force.¹

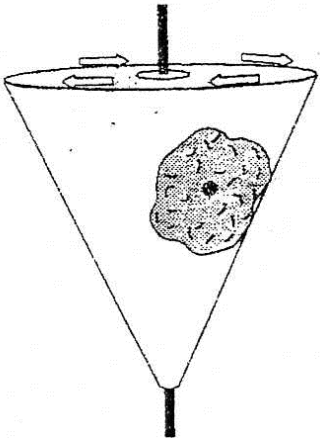
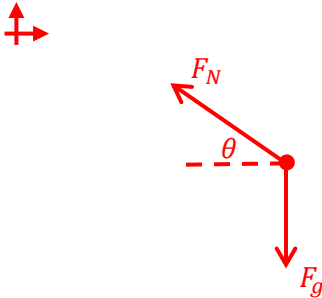
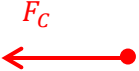
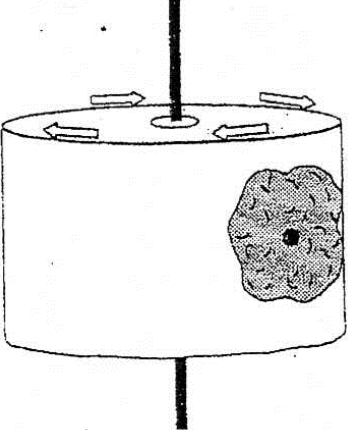
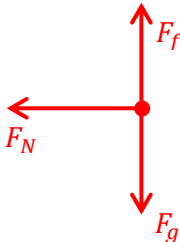

* The rock, in all cases, is undergoing uniform circular motion.

Example	Free-Body Diagram – All Real Forces	Free-Body Diagram – Centripetal Force Only
<p>1.</p>  <p>Swinging on a rope, at lowest position, no friction.</p>		 $\mathbf{F_C} = F_T - F_g = \frac{mv^2}{r}$
<p>2.</p>  <p>Tied to a post and moving in a circle at constant speed on a frictionless horizontal surface. Moving straight out of the paper.</p>		 $\mathbf{F_C} = F_T = \frac{mv^2}{r}$

¹ Free-Body Exercises: Circular Motion, The Physics Teacher, Vol. 37, Oct. 1999

<p>3.</p>  <p>String is tied to a post. Rock is moving toward you in a horizontal circle at a constant speed. No friction.</p>		 $F_C = F_T \sin \theta = \frac{mv^2}{r}$
<p>4.</p>  <p>Rock swinging on a rope. No friction.</p>		 $F_C = F_T - F_g \cos \theta = \frac{mv^2}{r}$
<p>5.</p>  <p>Rock is moving downward in a vertical circle with the string horizontal.</p>		 $F_C = F_T = \frac{mv^2}{r}$

<p>6.</p>  <p>Rock is swinging on a rope, at the top of a vertical circle. No friction.</p>		 $F_C = F_T + F_g = \frac{mv^2}{r}$
<p>7,</p>  <p>Rock is riding on a horizontal disk that is rotating at a constant speed about its vertical axis. Friction prevents the rock from sliding. Rock is moving straight out of the paper.</p>		 $F_C = F_f = \frac{mv^2}{r}$

<p>8.</p>  <p>Rock is resting against the frictionless inside wall of a cone. It moves with the cone, which rotates about its vertical axis at a constant angular speed.</p>		 $F_C = F_N \cos \theta = \frac{mv^2}{r}$
<p>9.</p>  <p>Rock is stuck by friction against the inside wall of a drum rotating about its vertical axis at a constant speed. Rock is moving straight out of the paper.</p>		 $F_C = F_N = \frac{mv^2}{r}$