

## Free-Body Diagrams

There are 15 questions below. In each case, an object is acted upon by one or more forces. Draw accurate free-body diagrams showing all the forces acting on the object. Assume there is no friction unless otherwise noted in the question. Label the forces using the following symbols:

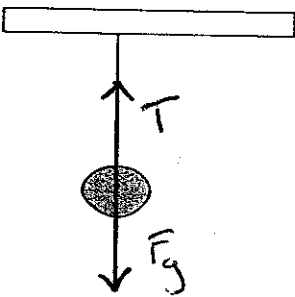
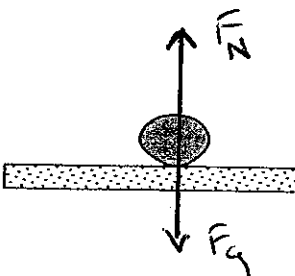
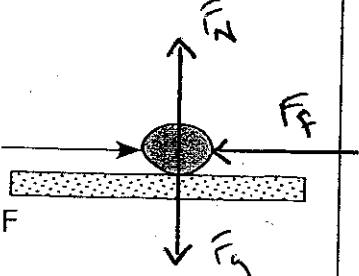

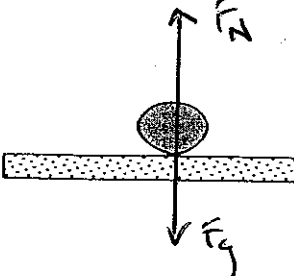

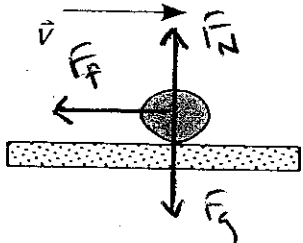


$F_g$  for gravity (or weight)

$T$  for tension

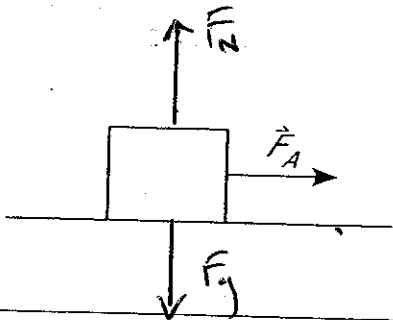
$F_f$  for friction and/or air resistance

$F_N$  for the normal force

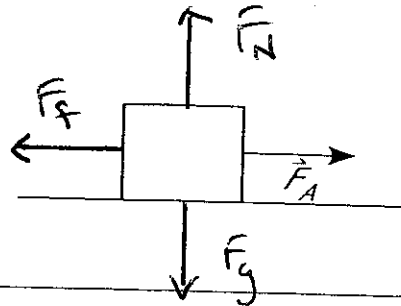
$F_A$  for the applied force

<p>1. Equilibrium</p> 	<p>2. Equilibrium</p> 	<p>3. Rock is pushed but remains motionless. Friction acts.</p> 
<p>4. Rock is falling, no friction.</p> 	<p>5. Rock is sliding at constant speed on a frictionless surface.</p> 	<p>6. Rock is falling at a constant (terminal) velocity.</p> 
<p>7. Rock is decelerating because of kinetic friction.</p> 	<p>8. Rock is rising. No friction.</p> 	<p>9. Rock is at the top of its flight, momentarily motionless.</p> 

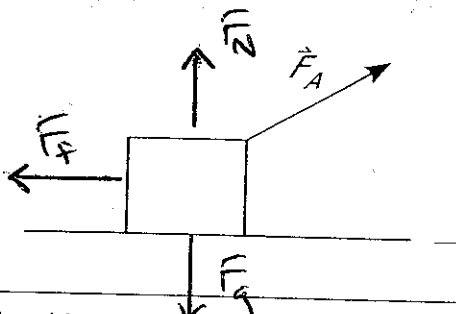
1. The object is pulled horizontally. No friction.



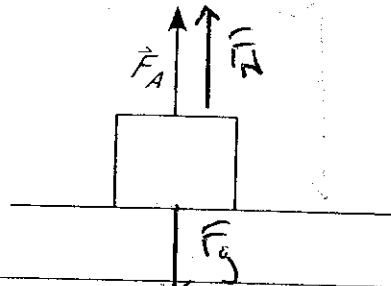
2. The object is pulled horizontally at constant velocity. Kinetic friction acts.



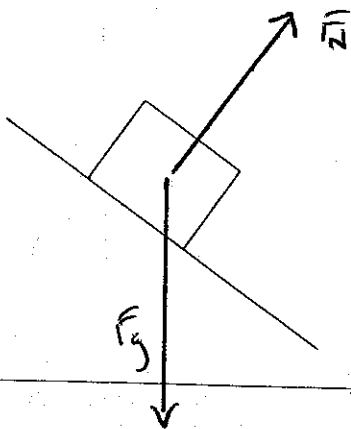
3. The object is pulled by a force acting in the direction shown. Static friction acts. The object is motionless.



4. The object is pulled straight upwards. It is motionless.



5. The object is resting on the plane. No friction acts.



6. The object remains motionless. Static friction acts.

