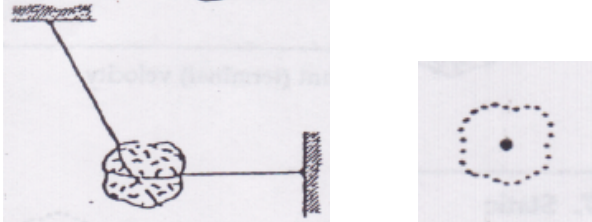


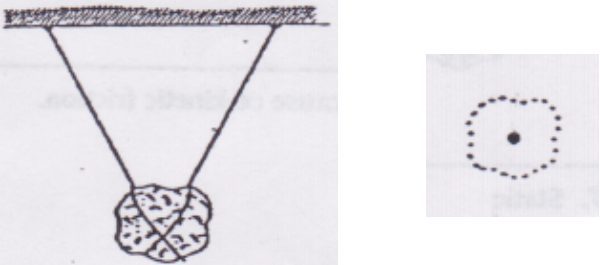
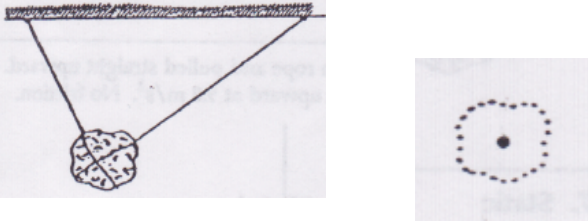
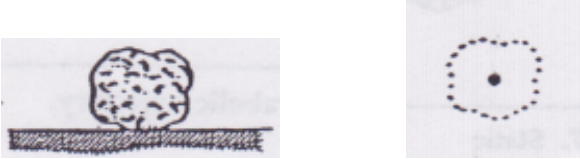
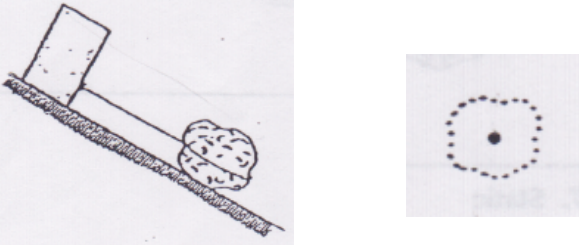
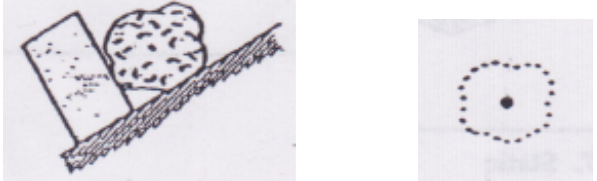


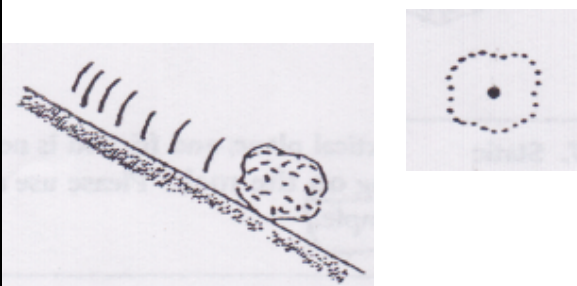
Free-Body Diagrams

Name: _____ #: _____

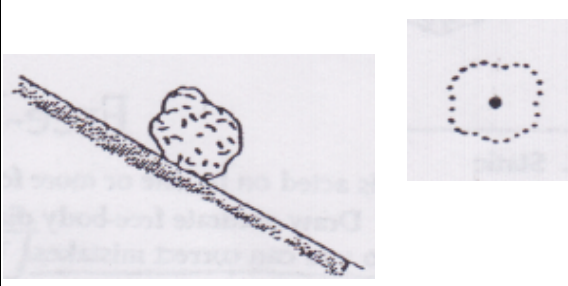
In each case, a **ROCK** is acted on by one or more forces. All drawings are in a vertical plane, and friction is negligible except where noted. Draw accurate free-body diagrams showing all forces (Using Agent-Object Notation) acting on the rock. Make sure you circle your system. Please use a ruler and **do it in pencil so you can correct your mistakes.**

<p>1. Static</p> 	<p>2. Static</p> 
<p>3. Rock is falling. No air friction.</p> 	<p>4. Static</p> 
<p>5. Static</p> 	<p>6. Static</p> 
<p>7. Static</p> 	<p>8. Static</p> 

9. Sliding without friction.



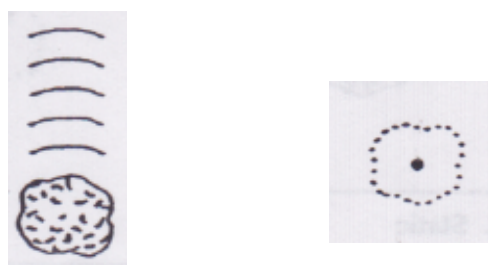
10. Static friction prevents sliding.



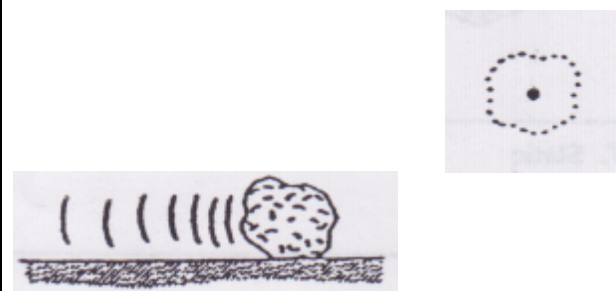
11. Sliding at a constant speed without friction.



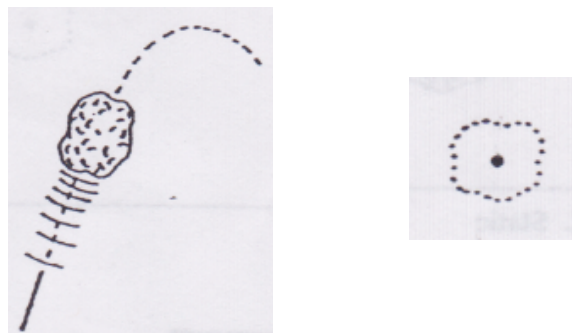
12. Falling at a constant (terminal) velocity.



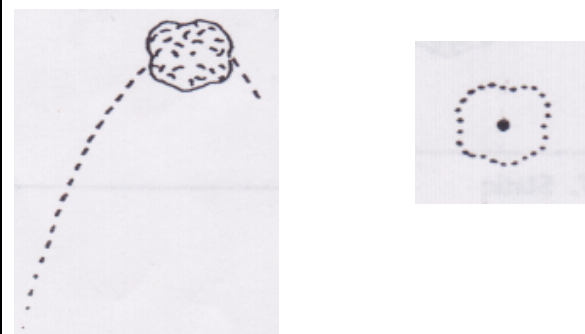
13. Accelerating because of kinetic friction. (*Slowing down*)



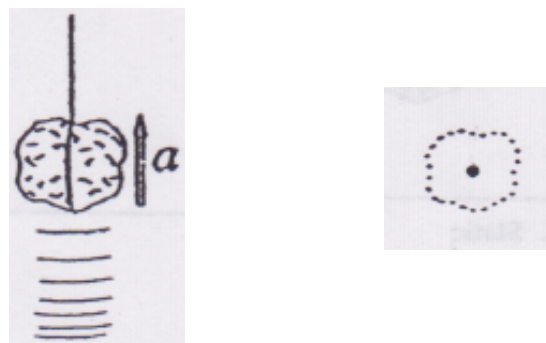
14. Rising in a parabolic trajectory.

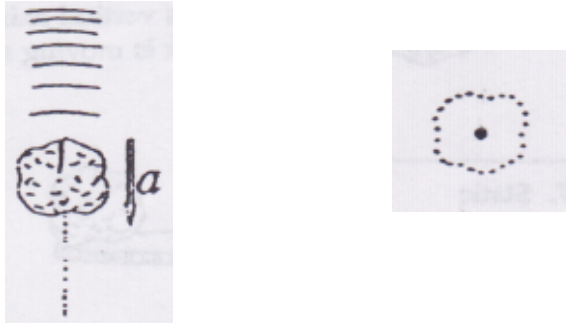
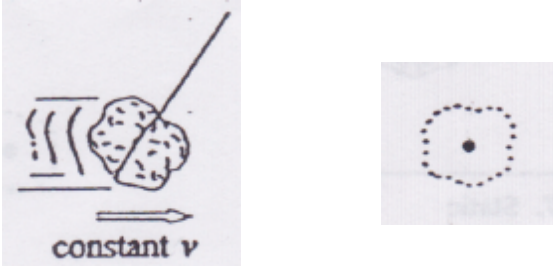

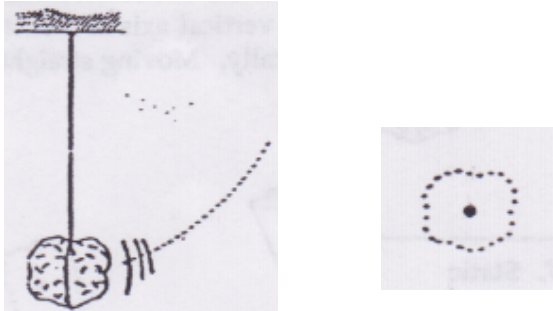

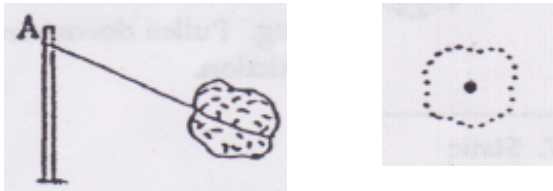
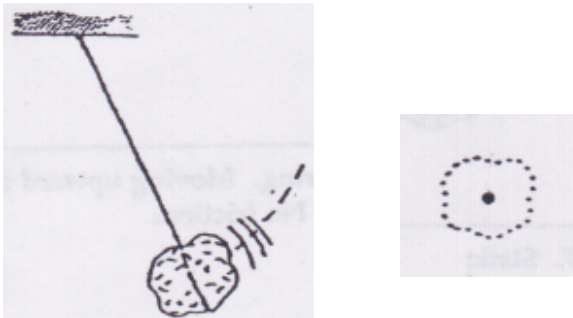
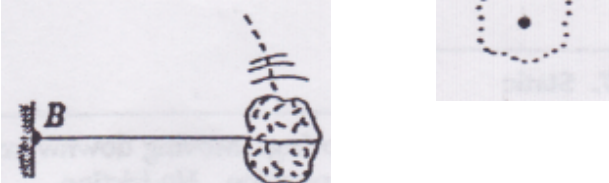


15. At the top of a parabolic trajectory.

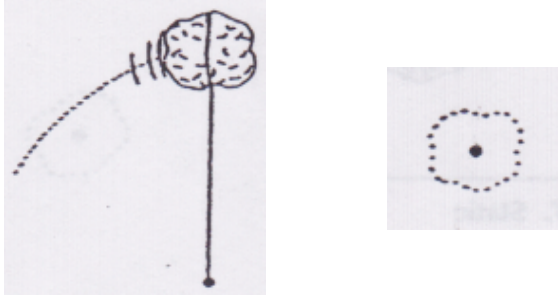


16. Tied to a rope and pulled straight upward. Accelerating upwards at 10 m/s^2 . No friction.



<p>17. Tied to a rope and pulled straight downward. Accelerating downward at 20 m/s^2. No friction.</p> 	<p>18. Tied to a rope and pulled so that the rock moves horizontally at a constant velocity. Note: there must be air friction in this case.</p> 
<p>19. Tied to a rope and pulled so that the rock accelerates horizontally at $2g$. No air friction.</p> 	<p>20. Swinging on a rope, at the lowest position. No friction.</p> 
<p>21. Tied to a post and moving in a circle at constant speed on a frictionless horizontal surface. Coming straight out of the paper.</p> 	<p>22. Tied to point A by a rope. Moving in a horizontal circle at constant speed. Not resting on a solid surface. Coming straight out of the paper.</p> 
<p>23. Swinging on a rope. No friction.</p> 	<p>24. Tied to point B. Moving downward in a vertical circle with rope horizontal. No friction.</p> 

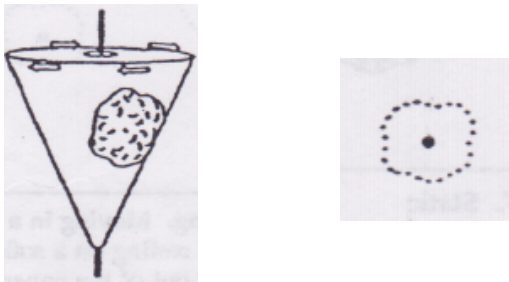
25. Swinging on a rope, at the top of a vertical circle.



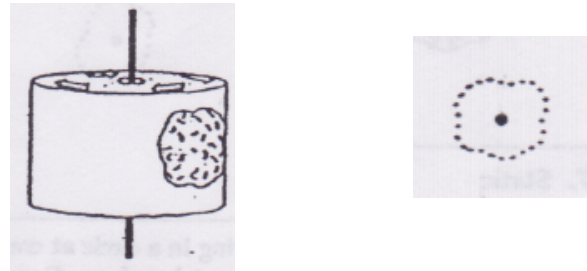
26. Riding on a horizontal disk that is rotating at a constant speed about its vertical axis. Friction prevents rock from sliding. Rock is moving straight out of the paper.



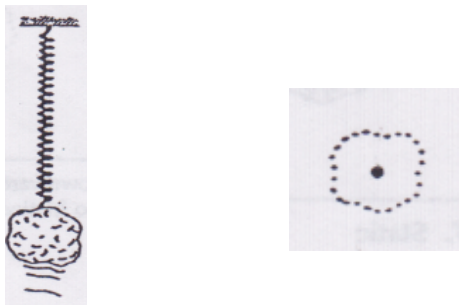
27. Resting against the frictionless inside wall of a cone rotating about a vertical axis at constant speed. Not accelerating vertically. Moving straight out of the paper.



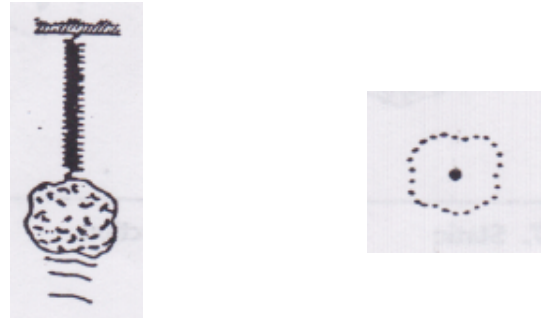
28. Stuck by friction against the inside wall of a drum rotating about its vertical axis at constant speed. Rock is moving straight out of the paper.



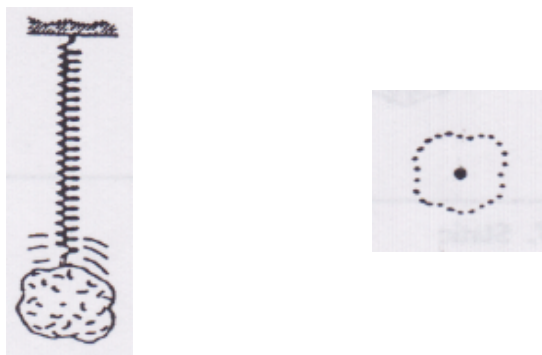
29. Suspended from a spring. Pulled downward slightly and released. No friction.



30. Suspended from a spring. Instantaneously at rest at the top of its travel. No friction.



31. Suspended from a spring. Moving downward through the equilibrium position. No friction.



32. Suspended from a spring. Moving upward through the equilibrium position. No friction.

