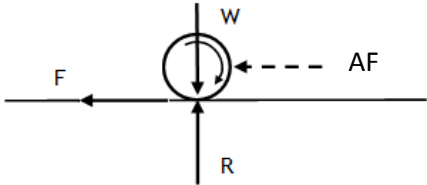


Question number	Answer	Notes	Marks
13 (a) (i)	<p>Any two of -</p> <p>MP1. arrow downwards, labelled weight;</p> <p>MP2. arrow upwards, labelled reaction/contact force;</p> <p>MP3. arrow to the left, labelled air friction / air resistance / drag;</p> <p>MP4. arrow along the surface, labelled friction;</p> <p>e.g.</p> 	<p>In MP1, 2 &amp; 3, position of arrows unimportant, but direction must match label</p> <p>Allow initial letters as shown in example</p> <p>ignore</p> <ul style="list-style-type: none"> <li>gravity</li> </ul> <p>allow</p> <ul style="list-style-type: none"> <li><math>mg</math></li> <li>force of gravity</li> </ul> <p>• arrow drawn on left or right</p> <p>Accept arrow in either direction for MP4</p> <p><math>N</math> = normal contact force</p>	2
(ii)	<p>Any three of -</p> <p>MP1. friction/resistance /drag (acts);</p> <p>MP2. (there is an) unbalanced force;</p> <p>MP3. (hence) ball decelerates;</p> <p>MP4. reference to <math>f_{(R)} = ma</math>;</p> <p>MP5. (kinetic) energy dissipates / fate of energy discussed;</p>	<p>ignore stem</p> <p>allow</p> <ul style="list-style-type: none"> <li>resistive forces &gt; {forward/driving} force</li> <li>there is a resultant force</li> <li>its momentum changes</li> <li>accelerates</li> </ul>	3
(b) (i)	idea that friction is (much) less in the air;	<p>allow</p> <ul style="list-style-type: none"> <li>RA</li> <li>no contact / ground friction</li> <li>less energy lost</li> </ul>	1

Question number	Answer	Notes	Marks
13 (c) (i)	KE = $\frac{1}{2} mv^2$ ;	Words or symbols	1
(ii)	Conversion to kg; Substitution into correct equation; Rearrangement; Evaluation;  e.g. 45 g = 0.045 kg (or 1 kg = 1000 g etc) $36 = \frac{1}{2} \times 0.045 \times v^2$ $v^2 = \frac{2 \times 36}{0.045}$ (= 1600) 40 (m/s)	allow • 1000 seen  • steps in any order • correct answer with no working for full marks • up to 3 marks for use of 45 kg $\rightarrow$ 1.26 (m/s)-working must be seen	4
(iii)	Any one of-  • (Hit the ball transferring) more energy;  • (Hit the ball with) more velocity;  • (Hit the ball with) more speed;  • (Hit the ball with) more force;	Ignore • harder • power Allow • momentum • keep contact for a larger part of the swing • go to a place where g is less (e.g. on the moon) • hit ball at a steeper angle / vertically (e.g. use a more lofted club)	1

Total 12 marks