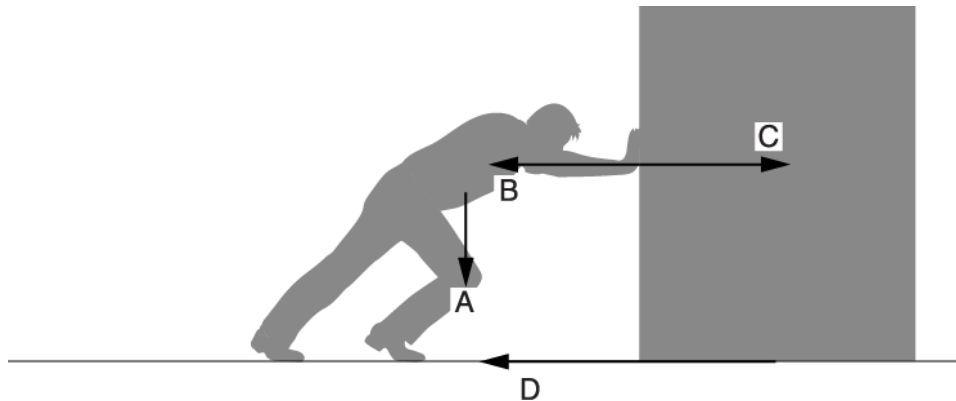


1(a). The picture shows a man pushing a box.  
Some of the forces are shown.



(i) Write down the letter of a force which is friction.

----- [1]

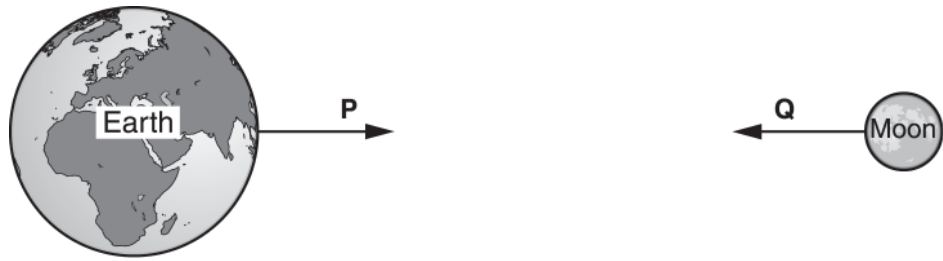
(ii) Write down the letter of a force which is due to gravity.

----- [1]

(iii) Write down the letters of two forces that are the interaction pair of forces between two objects.

----- and ----- [1]

(b). The Moon and the Earth both experience interaction forces that attract them to each other.

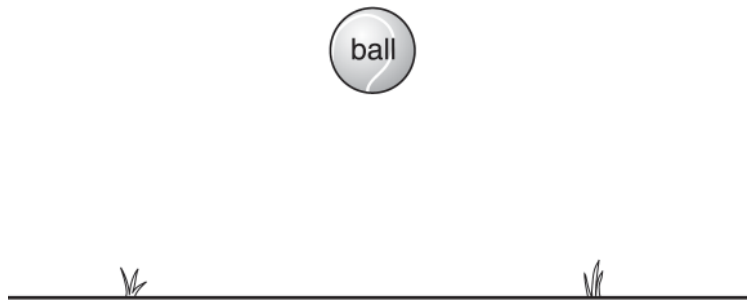


Complete the table about these forces.  
Write either **Earth** or **Moon** in each box.

	The object the force acts on	The object that exerts the force
Force P		
Force Q		

[2]

(c). Here is a diagram of a ball falling towards the ground.



Draw **two** arrows on the diagram to show the size and direction of the interaction forces between the ball and the Earth.

[3]



3. Eve has a mass of 23 kg.

Calculate Eve's weight.

Gravitational field strength = 10 N/kg

Weight = ..... N [3]

**END OF QUESTION PAPER**

### Mark Scheme

Question			Answer/Indicative content	Marks	Guidance									
1	a	i	D	1										
		ii	A	1	a correct pair is required for 1 mark  <u>Examiner's Comments</u>  It was good to find that the vast majority of candidates were able to correctly identify the forces shown in the diagram.									
		ii	B and C	1										
	b		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20%;"></td> <td style="width: 40%;">the object the force acts on</td> <td style="width: 40%;">the object that exerts the force</td> </tr> <tr> <td>Force P</td> <td>Earth</td> <td>Moon</td> </tr> <tr> <td>Force Q</td> <td>Moon</td> <td>Earth</td> </tr> </table>		the object the force acts on	the object that exerts the force	Force P	Earth	Moon	Force Q	Moon	Earth	1	each correct row for (1) each  <b>accept</b> Moon exchanged for Earth throughout for (1)  look for top row matching order in the diagram  remember EM-ME?  <u>Examiner's Comments</u>  Only a minority of candidates were able to earn full marks, with the majority incorrectly stating that the force acted on the object pointed to by the arrow, instead of the one it pointed from.
	the object the force acts on	the object that exerts the force												
Force P	Earth	Moon												
Force Q	Moon	Earth												
				1										
	c		pair of straight arrows in opposite direction (by eye)  of equal length (by eye)  one starting from ball going down, other starting from the ground going up	1	<b>accept</b> straight arrows drawn free-hand <b>accept</b> arrows which are not co-linear  ignore labels on arrows <b>accept</b> arrows which do not touch ball / ground with a gap much smaller than the length of the arrow  <u>Examiner's Comments</u>  Few candidates earned full marks, most drew two arrows in opposite directions, some drew them the same length and a few showed one coming from the ball and the other from the ground, suggesting that candidates have a very poor grasp of the conventions used to represent forces in diagrams.									
				1										
				1										

### Mark Scheme

Question	Answer/Indicative content	Marks	Guidance
			Total
		7	

### Mark Scheme

Question	Answer/Indicative content	Marks	Guidance
2	<p><b>[Level 3]</b> Describes interaction pair (words or arrows) <b>AND</b> explains the effect of icy and normal conditions on motion. Quality of written communication does not impede communication of the science at this level. <span style="float: right;">(5 – 6 marks)</span></p> <p><b>[Level 2]</b> <b>EITHER</b> Describes interaction pair (words or arrows) <b>OR</b> Explains the effect of icy <b>and</b> normal conditions on motion. <b>OR</b> Describes one half of the interaction pair (words or arrow) <b>and</b> makes a correct statement about icy or normal conditions. Quality of written communication partly impedes communication of the science at this level. <span style="float: right;">(3 – 4 marks)</span></p> <p><b>[Level 1]</b> <b>EITHER</b> describes one half of the interaction pair (words or arrow) <b>OR</b> makes a correct statement about icy or normal conditions. Quality of written communication impedes communication of the science at this level. <span style="float: right;">(1 – 2 marks)</span></p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>Arrows on diagram:</p> <ul style="list-style-type: none"> <li>• arrow to right on road</li> <li>• arrow to the left on the car / above the road</li> <li>• arrows same length</li> </ul> <p>Interaction pair of forces:</p> <ul style="list-style-type: none"> <li>• (rotating) wheel pushes road backwards</li> <li>• road pushes wheel / car forwards</li> <li>• (resultant) force moves the car</li> </ul> <p>Effect of normal conditions:</p> <ul style="list-style-type: none"> <li>• friction / grip between wheel and road</li> <li>• wheel does not spin / slip</li> <li>• exerts force on road / car</li> </ul> <p>Effect of icy conditions:</p> <ul style="list-style-type: none"> <li>• little / no friction / grip between wheel and road</li> <li>• wheel spins / slips</li> <li>• exerts little / no force on road / car</li> </ul> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p> <p><b>Examiner's Comments</b></p> <p>This question also appeared on the Higher Tier paper, so was expected to be accessible only to candidates operating at grades D and C. In practice, many candidates managed to earn half marks by discussing the different amounts of friction between the tyre and road in normal and icy conditions. Few were able to draw the correct force arrows on the diagram, let</p>

### Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
					alone identify the interaction pair of forces responsible for the forward motion of the car.
			<b>Total</b>	<b>6</b>	
3			<b>FIRST CHECK THE ANSWER ON ANSWER LINE</b> If answer = 230 (N) award 3 marks  Recall: weight = mass × gravitational field strength ✓  = 23 (kg) × 10 (N/kg) ✓ = 230 (N) ✓	3  (AO 1.2)  (AO 2.1) (AO 2.1)	
			<b>Total</b>	<b>3</b>	