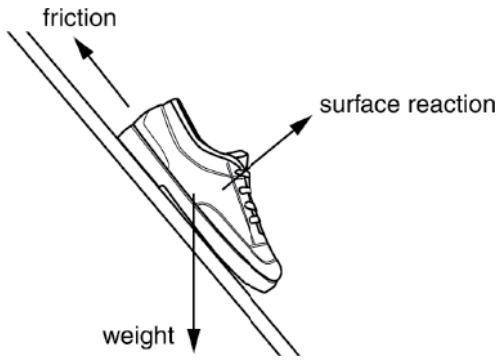
1. The forces on a shoe as it starts to move down a slope are shown in the diagram.



(i) Each force is part of an interaction pair.

Complete the following sentences.

The pair force of the friction from the surface on the shoe is _____

_____
.

The pair force of the weight of the shoe is _____

_____
.

[2]

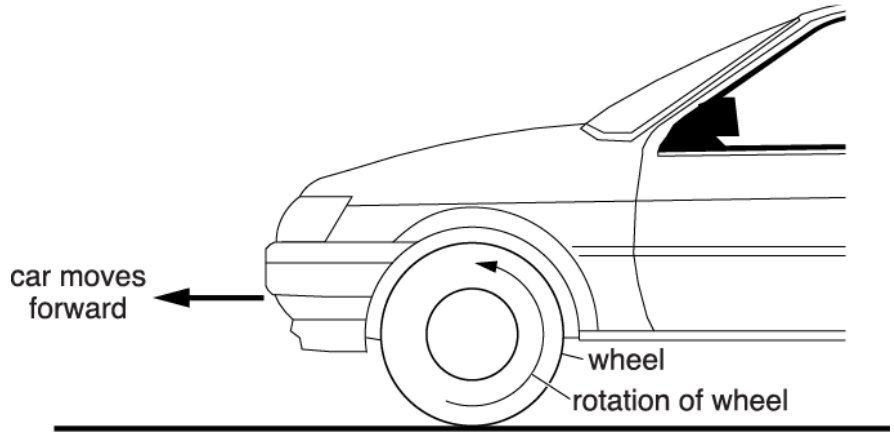
(ii) Describe the resultant force on the shoe as it starts to move down the slope.

_____

_____ **[1]**

2. This question is about the forces that make a car move forwards.

The rotation of a wheel causes the car to move forward.



When the road is icy, it is more difficult to get the car moving.

Use ideas about forces to explain how the rotation of a wheel makes the car move forward and why it is more difficult to get the car moving when the road is icy.

You may draw **labelled** arrows on the diagram to help you answer the question.

The quality of written communication will be assessed in your answer.

[6]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1		i	friction: (friction from) shoe on surface weight: pull of shoe on Earth	2	do not award first mark if it seems that the candidate is referring to any force that is not along the surface Examiner's Comments This question on interaction pairs proved to be the most difficult question on the paper. Almost no correct responses were seen. Very few candidate could demonstrate that to describe any single force they must; (a) state the **two** objects involved in the force and (b) state the direction the force acts in. e.g. **object X** exerts a force on **object Y**. Almost all candidates referred to a single object (or indeed, no object at all) in their responses. The majority of candidates treated the question as multiple choice, choosing from the 3 forces listed.
		ii	a (positive) force down the slope / parallel to the slope	1	**allow** force is 'forward' Examiner's Comments Relatively few candidates demonstrated good understanding of resultant force in relation to change in motion, in this case resulting in acceleration down the slope in the first instance. A common response involved discussing all of the forces, but with no conclusion, or simply stating that 'it moved down because of gravity', which was insufficient to score a mark.
			Total	3	
2			(Level 3) Describes interaction pair (words or arrows) **AND** explains the effect of icy **and** normal conditions on motion. Quality of written communication does not impede communication of the science at this level. (5–6 marks) (Level 2) EITHER Describes interaction pair (words or arrows) OR	6	This question is targeted at grades up to C Indicative scientific points may include: Arrows on diagram: • arrow to right on road • arrow to the left on the car / above the road • arrows same length. Interaction pair of forces:

Question			Answer/Indicative content	Marks	Guidance
			Explains the effect of icy **and** normal conditions on motion. **OR** Describes one half of the interaction pair (words or arrow) **and** makes a correct statement about icy **or** normal conditions. Quality of written communication partly impedes communication of the science at this level. (3–4 marks) **(Level 1)** **EITHER** describes one half of the interaction pair (words or arrow) **OR** makes a correct statement about icy **or** normal conditions. Quality of written communication impedes communication of the science at this level. (1–2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		• (rotating) wheel pushes road backwards • road pushes wheel / car forwards • (resultant) force moves the car. **Effect of normal conditions:** • friction / grip between wheel and road • wheel does not spin / slip • exerts force on road / car. **Effect of icy conditions:** • little / no friction / grip between wheel and road • wheel spins / slips • exerts little / no force on road / car. **Use the L1, L2, L3 annotations in Scoris; do not use ticks.** **Examiner's Comments** Many candidates met the criteria to be awarded a level 1 or 2, by correctly discussing the role of friction and the grip between the tyres and the road. Only a few candidates were able to give a clear account of the interactive pair of forces which make the car move. Where arrows were drawn on the diagram they were often in the wrong direction or on the wrong body and not equal in length. Many candidates included weight of the car, reaction of the road and the drag force in their answer and some thought the engine provided a thrust force like a jet engine. These answers usually became quite confused. Many answers were not well organised and candidates wrote as much as they could about forces, much of which was not relevant to the question.
			Total	**6**	