

Mark Scheme

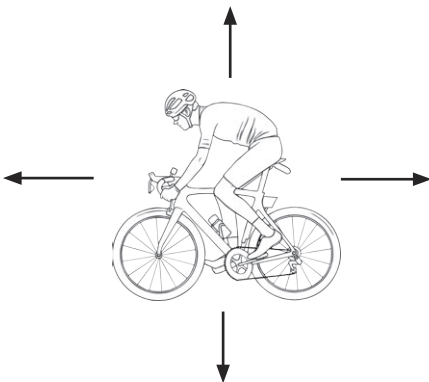
Combined Science GCSE

Forces and Their Effects and Forces and
Matter Test

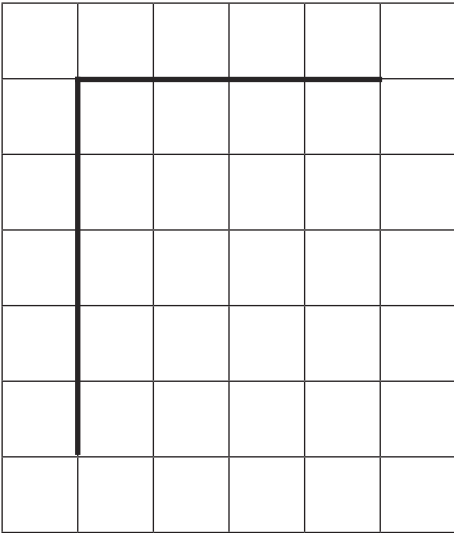
(Levels 4-9)

	Answer	Marks															
1. (a)	Scalar quantities have a magnitude, but no direction. Examples (any from): mass, temperature, distance, speed and time. Vector quantity have a magnitude and direction. Examples (any from): momentum, displacement, force, velocity and acceleration.	(1) (1) (1) (1)															
1. (b)	<table border="1"> <thead> <tr> <th>Force</th><th>Contact</th><th>Non-Contact</th></tr> </thead> <tbody> <tr> <td>air resistance</td><td>✓</td><td></td></tr> <tr> <td>electrostatic</td><td></td><td>✓</td></tr> <tr> <td>gravitational</td><td></td><td>✓</td></tr> <tr> <td>friction</td><td>✓</td><td></td></tr> </tbody> </table>	Force	Contact	Non-Contact	air resistance	✓		electrostatic		✓	gravitational		✓	friction	✓		(4)
Force	Contact	Non-Contact															
air resistance	✓																
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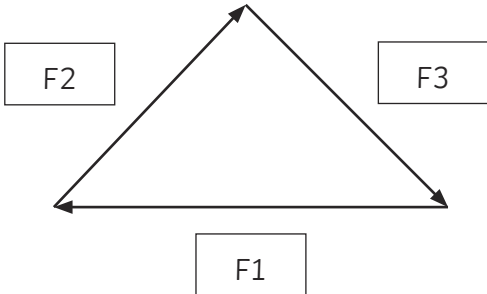
(Total for Question 1 = 8 marks)

	Answer	Marks
2. (a)	For every action, there is an equal and opposite reaction.	(1)
2. (b)	All arrows correctly added (2 marks) Two - three arrows correctly added (1 mark) One arrow correctly added (0 marks) (1 mark for a larger arrow in a forwards direction.) 	(2)
2. (c)	$15\text{N} - 12\text{N} = 3\text{N}$ movement in a forward direction. $12\text{N} - 9\text{N} = 3\text{N}$ movement in an upward direction. Arrow in correct direction.	(1) (1) (1)

(Total for Question 2 = 7 marks)

	Answer	Marks
3. (a)		(2)
3. (b)	Useful energy = $50 - 20 = 30\text{J}$ Efficiency = $\frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}} = \frac{30}{50} \times 100$ 60%	(1) (1) (1)
3. (c)	Lubricate with oil; it can flow easily between the objects and reduces friction.	(1) (1)

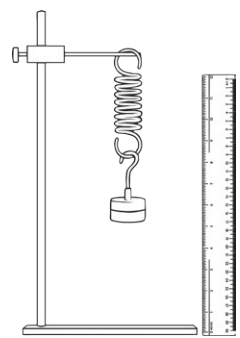
(Total for Question 3 = 7 marks)

	Answer	Marks
4. (a)	The resultant force acting on the object is zero.	(1)
4. (b)	(1 mark for triangle formed) (1 mark for correct labels) 	(2)

(Total for Question 4 = 3 marks)

	Answer	Marks
5. (a)	More than one force is required to make the object change shape, not move.	(1)
5. (b)	Elastic distortion means the object will return to its original shape, for example a spring/elastic band. Inelastic distortion means the object doesn't return to its original shape, for example an overstretched spring.	(1) (1) (1) (1)

(Total for Question 5 = 5 marks)

	Answer	Marks								
6. (a)	To find out what size masses would give the best results.	(1)								
6. (b)	<table><tr><th>0 marks</th><th>1-2 marks</th><th>3-4 marks</th><th>5-6 marks</th></tr><tr><td>No relevant content</td><td>A brief description of how to carry out the experiment and some equipment named.</td><td>A more detailed description of the method. An equipment list provided and a safety precaution.</td><td>A detailed description of the experiment (including units for masses). Equipment listed and a safety precaution listed.</td></tr></table> Equipment list clamp stand weights or G clamp to keep clamp stand secure ruler spring 100g masses Method Set up the experiment as shown. Add a mass to the spring and measure the extension. Continue adding the masses, one at a time, and recording the extension. Safety precaution Ensure the clamp stand is securely fixed to the table. Wear goggles in case the spring breaks. 	0 marks	1-2 marks	3-4 marks	5-6 marks	No relevant content	A brief description of how to carry out the experiment and some equipment named.	A more detailed description of the method. An equipment list provided and a safety precaution.	A detailed description of the experiment (including units for masses). Equipment listed and a safety precaution listed.	(6)
0 marks	1-2 marks	3-4 marks	5-6 marks							
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6. (c)	i) Independent variable: masses	(1)
	ii) Dependent variable: spring extension	(1)
	iii) Control variable: same spring or same increase in mass each time	(1)
6. (d)	$F = k \times x$ or force exerted on a spring (N) = spring constant (N/m) $\times$ extension (m)	(1)

(Total for Question 6 = 11 marks)

7. (a)	$F = k \times x$, rearrange formula $k = F \div x$	(1)
	Convert cm to m: $3 \div 100 = 0.03\text{m}$	(1)
	$2 \div 0.03 = 66.7 \text{ N/m}$	(1)
7. (b)	Linear extension occurs when the extension is directly proportionally to the force applied.	(1)
	Non-linear extension occurs when the extension is no longer directly proportional to the force applied.	(1)

(Total for Question 7 = 5 marks)

8. (a)	Convert cm to m: $4 \div 100 = 0.04\text{cm}$	(1)
	$0.5 \times 50 \times 0.0016$	(1)
	0.04 J	(1)
8. (b)	It will not return to its original shape.	(1)

(Total for Question 8 = 4 marks)