

# Forces, movement, shape and momentum

## Mark Scheme 4

<b>Level</b>	IGCSE(9-1)
<b>Subject</b>	Physics
<b>Exam Board</b>	Edexcel IGCSE
<b>Module</b>	Double Award (Paper 1P)
<b>Topic</b>	Forces and motion
<b>Sub-Topic</b>	Forces, movement, shape and momentum
<b>Booklet</b>	Mark Scheme 4

**Time Allowed:** 57 minutes

**Score:** /47

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	77.5%	70%	60%	55%	50%	<50%

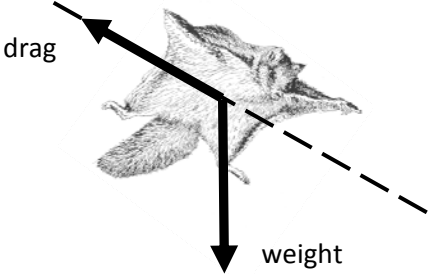
Question number			Answer	Notes	Marks
1	(a)	Clip diagram	<p>Any <b>five</b> from:</p> <p><b>Basic plan</b> –</p> <p>MP1. Add (known value) masses one at a time;</p> <p>MP2. Measure length of the spring;</p> <p>MP3. Find extension;</p> <p><b>Results</b> –</p> <p>MP4. Draw graph with suitable named axes;</p> <p><b>Accuracy</b> –</p> <p>MP5. Detail of spring measurement, e.g. measure from same part each time/ fiducial marker;</p> <p>MP6. Make sure spring stationary before reading;</p> <p>MP7. repeat readings by taking off masses;</p> <p>MP8. Check value of masses on a balance;</p> <p>MP9. Check ruler vertical or parallel to spring/ hold ruler in clamp / avoid parallax errors;</p>	<p>allow suitable labelled additions to diagram</p> <p>Force or load or mass against extension or length</p>	5
1	(b)		<p>MP1. straight line only;</p> <p>MP2. axes labelled force/weight and extension;</p> <p>MP3. DOP line through origin;</p>	<p>units not needed, any orientation</p> <p>allow for 2 marks max:</p> <p>graph of force and length, st line with intercept</p>	3
	(c)		<p>returns to original length / shape;</p> <p>when (stretching) force is removed;</p>		2

Total 10 marks

Question number	Answer	Notes	Marks
2 (a) (i)	gravitational potential energy = mass x gravitational field strength x height;	ALLOW standard symbols (m x g x h) DO NOT ALLOW 'gravity' for g	1
(ii)	substitution into correct equation; calculation; e. g.p.e. = 2000 x 10 x 128 2.56 (MJ)	answer given to at least 3 sf  Allow J if correct (2560 000)	1 1
(b) (i)	2.56 (MJ);	Value from (a) (ii) / 2.6 MJ	1
(ii)	They are <u>equal</u> / k.e. = work done;		1
(iii)	work done = force x distance;	ALLOW standard symbols	1
(iv)	Substitution into correctly rearranged equation; Calculation; e. $d = W / F = 2\,560\,000 / 32\,000$ 80 (m)	Allow ecf for value of energy stated in (a) (ii) or (b) (i)	1 1

Question Number	Answer		Marks
2 (c)	Any TWO from  (Windy) – (extra) drag / air resistance / friction; more energy wasted (overcoming friction);  (Wet) – less friction / no friction / slippier / less traction / less grip; less energy transferred to car (at launch);	ANSWERS SHOULD REFER TO THE SITUATIONS GIVEN	2
		<b>Total</b>	<b>10</b>

Question number	Answer	Notes	Marks
3 (a) (i)	gravitational potential energy = mass × g × height	Allow abbreviations e. g.p.e. = mgh for g/gravitational field strength reject 'gravity'	1
(ii)	Substitution into correct equation; Evaluation; e.g. g.p.e. = $0.19 \times 10 \times 17$ = 32 (J)	32.3 (J) (or 31.6 J when $g = 9.8 \text{ ms}^{-2}$ ) allow 32300 for 1 mark	2
(iii)	Value same as for (a)(ii)	Allow "the same"	1

<p>(b) (i)</p>	<p>Judge by eye</p> <p><b>Weight</b> shown acting downwards;</p> <p>Drag shown acting against motion;</p> 	<p>NB NO label = no mark Allow abbreviations for labels e.g W, mg ignore gravity</p>	<p>2</p>
<p>(ii)</p>	<p>k.e. = <math>\frac{1}{2} \times \text{mass} \times \text{velocity}^2</math></p>	<p>Allow abbreviations e.g. k.e. = <math>\frac{1}{2}mv^2</math></p>	<p>1</p>
<p>(iii)</p>	<p>Substitution into correct equation; Evaluation; e.g. k.e. = <math>\frac{1}{2} \times 0.19 \times 13^2</math> = 16 (J)</p>	<p>(16.055) 16055 gets 1 mark</p>	<p>2</p>
<p>(iv)</p>	<p><b>A</b> an unbalanced force acts on the squirrel</p>		<p>1</p>

Total 10 marks

Question number	Answer	Notes	Marks
4 a	a moon orbits a <u>planet</u> ; a planet orbits a star (/the Sun) ;	Ignore <ul style="list-style-type: none"> <li>• comments about eccentricity, oval, plane of orbit, time of orbit etc</li> </ul>	1 1
	b Substitution; Evaluation; Unit (to <b>match</b> the value of v); e.g. $V = \frac{(2 \times \pi \times 385000)}{27} = \frac{2\,417\,800}{27}$	Note value of $\pi$ used may vary time values and corresponding approximate speeds are 27 days..... 89 600 km/days 648 hours..... 3 731 km/ hours 38 880 mins..... 62 km/min 2 332 800 s..... 1.04 km/s	1 1
	90 000 km/day	allow answers which round to 89 600 Accept suitable <b>matching</b> units	1
c i	$E = \frac{1}{2} mv^2$ ;	Accept <ul style="list-style-type: none"> <li>• rearranged equation</li> <li>• equation in words</li> </ul>	
	ii substitution ; Mass converted to kg ; 47.(33.....) seen;	allow sub of mass as 50 g 1.496 or 1.5 seen gets 2 marks	3
d i	44(J) ;		1
	ii GPE = mgh;	Accept <ul style="list-style-type: none"> <li>• rearranged equation</li> <li>• equation using (all the) words</li> </ul> Allow for 'g' <ul style="list-style-type: none"> <li>• gravitational field strength but NOT gravity</li> </ul>	1

iii	Substitution and rearrangement; Calculation ; $\frac{12}{0.05 \times 1.6}$ 150 (m)	POT error loses 1 mark e.g. 0.15 (m) gets 1 mark	2
e	any Two from: <ul style="list-style-type: none"> <li>• Value of g lower(on the Moon)/RA;</li> <li>• lack of air resistance (on the Moon)/RA;</li> <li>• Time of flight greater;</li> </ul>	ignore <ul style="list-style-type: none"> <li>• 'no gravity'</li> </ul> allow <ul style="list-style-type: none"> <li>• less gravity</li> <li>• drag for air resistance</li> </ul>	2

(Total for Question 4 = 15 marks)