

Forces, movement, shape and momentum

Mark Scheme 7

Level	IGCSE(9-1)
Subject	Physics
Exam Board	Edexcel IGCSE
Module	Single Award (Paper 2P)
Topic	Forces and motion
Sub-Topic	Forces, movement, shape and momentum
Booklet	Mark Scheme 7

Time Allowed: 53 minutes

Score: /44

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	775%	70%	60%	55%	50%	<50%

Question number			Answer	Accept	Reject	Marks
1	a)	(i)	Substitution; Calculation; e.g. $m \times g = 0.454 \times 10$ $= 4.54 \text{ (N)}$			2
		(ii)	Centre of gravity;	Centre of mass;		1
	(b)	(i)	force upwards; from top of nail;	Near vertical by eye In line with F_2		2
		(ii)	Any two from: increase F_1 OR increase force (from hand); Increase d_1 OR increase distance of hand from pivot; Keep F_1 perpendicular to hammer;	use two hands use longer handle use longer hammer Ignore: references to d_2 distance from nail to pivot idea of bigger [rather than longer] hammer		2
					Total	7

Question number	Answer	Notes	Marks
2 (a)	<p>A method involving a suitable measurement or comparison; An appropriate check for horizontality; e.g</p> <p>measure height between ruler and bench in several places; height readings consistent; OR set a marker level with pivot; same height as end of ruler; OR place spirit level on ruler; bubble should be central; OR measure angle between stand and ruler; check for right angle</p>	<p>Allow assumption that bench is horizontal and /or stand is vertical</p> <p>Allow alternative methods and checks that would work</p>	2
(b) (i)	moment = force x (perpendicular) distance (from pivot)	or equivalent	1
(b) (ii)	2 x 60 / 2 x 0.6; 120 / 1.2; N cm / N m;		3
(c) (i)	mass / weight of ruler; weight acts downwards /increases (clockwise) moment;	Allow: idea that forcemeter also supports ruler	2
(c) (ii)	off scale on the forcemeter		1

Question number	Answer	Notes	Marks
2 (d)	<p>Explanation including:</p> <p>clockwise and anticlockwise moments equal; (and fish are) closer to A;</p> <p><u>so</u> to get same moment for smaller distance (force must be larger);</p>	<p>Accept similar points made using mathematical symbols</p> <p>e.</p> <p>taking moments – $F_A x = F_B y$ reworking – $F_A = (y/x)F_B$ $y > x$ (so $F_A > F_B$)</p> <p>i.e idea that force and distance are inversely proportional</p>	3

Question number	Answer	Notes	Marks
3 (a) (i)	<p>$p = m \times v$</p> <p>(ii) statement of conservation of momentum; calculation of momentum before seen; use of correct mass for momentum after; evaluation of velocity;</p> <p>e.g. $m_1v_1 = m_2v_2$ 43.2×4.10 OR $177(.12)$ seen $(m_2=)$ 45.7 $(v=)$ 3.88 (m/s)</p>	<p>accept answer in words, standard symbols or rearranged</p> <p>allow in words</p> <p>3.9, 3.876</p>	<p>1</p> <p>4</p>
(b)	<p>MP1. boy and skateboard move backwards/in opposite direction to the ball;</p> <p>Either</p> <p>MP2. because of conservation of momentum/eq;</p> <p>MP3. because of Newton's 3rd law/eq;</p>	<p>total marks = 7</p>	2

Question number	Answer	Notes	Marks
4 (a) (i)	lever arm / bolt moves to the left;		1
(ii)	to return the metal bar (and lever) to the right/eq	allow pulls it back (again)	1
(b) (i)	$F_1d_1 = F_2d_2$;	accept answer in words, standard symbols or rearranged clockwise (moments) = anticlockwise (moments)	1
(ii)	substitution; rearrangement; evaluation; e.g. $110 \times 22 = 38 \times F_2$ $F_2 = \frac{110 \times 22}{38}$ 63.7 (N)	rearrangement and substitution in either order 63.684 (N) -1 for incorrect rounding	3
(iii)	any two from MP1 (since distance to A greater) moment is greater; MP2 distance to B is constant / still 110 cm; MP3 (hence) force will increase;	allow correct re-calculation with d_B	2
		total marks = 8	

Question number	Answer	Notes	Marks
5 (a) (i)	Work done = force x distance moved;	Allow $W = F \times d$ and rearrangements	1
(ii)	Substitution into correct equation; Calculation; e.g. 13×110 1430 (J)	Correct answer without working scores 2 marks	2
(iii)	Same response as for 3(a)(ii)	1430 (J) or ecf	1
(b)	Any two of - MP1 Idea that GPE depends on height OR Statement that $GPE = mgh$; MP2 Idea that h is reduced; MP3 Idea that centre of gravity (is now) lower;	Allow centre of mass for centre of gravity	2

