

Question Number	Answer	Mark
6(a)	Use of $\frac{1}{2}mv^2$ and mgh (1) (do not credit use of $v^2 = 2as$ since a not constant, scores 0/2) velocity = $0.77 \text{ (m s}^{-1}\text{)}$ (1)	2
6(b)	Use of mv (1) Correct momentum conservation statement (1) Speed = 0.53 m s^{-1} (accept 0.56 m s^{-1} from use of show that value) (1) Assumption: no external forces/ no air resistance/ no force on pivot/negligible resistance (1) <u>Example of calculation</u> $320 \text{ g} \times 0.77 \text{ m s}^{-1} = (320 \text{ g} \times v) + (55 \text{ g} \times 1.4 \text{ m s}^{-1})$ Speed of bat = 0.53 m s^{-1}	4
6(c)	Use of $E_k = \frac{1}{2}mv^2$ (allow mass in g or kg) (1) Correct calculation of E_k before and after (95, 45, 54 to any power of ten (see below) (If 0.8 m s^{-1} and 0.56 m s^{-1} , values are 102, 50 and 54) (1) Elastic. (1) <u>Example of calculation</u> Before impact $E_k \text{ bat} = \frac{1}{2} 0.320 \text{ kg } 0.77^2 \text{ (m s}^{-1}\text{)}^2 = 0.095 \text{ J}$ After impact $E_k \text{ bat} = \frac{1}{2} 0.320 \text{ kg } 0.53^2 \text{ (m s}^{-1}\text{)}^2 = 0.045 \text{ J}$ $E_k \text{ ball} = \frac{1}{2} 0.055 \text{ kg } 1.4^2 \text{ (m s}^{-1}\text{)}^2 = 0.054 \text{ J}$	3
6(d)	Max 2 x measured to nearest cm (1) uncertainty in x gives an uncertainty in GPE / speed (of ball) (1) difficulty of measuring a moving object (1) some energy to sound (1) comments on $E_{(k)}$ after > before (1) relates uncertainty to conclusion made in (c) (1)	2
Total for Question		11

Q5.

Question Number	Acceptable answers	Additional guidance	Mark
	<p>The only correct answer is B</p> <p><i>A is not correct because this is not dimensionally correct</i></p> <p><i>C is not correct because $E_k/2p = v/4$</i></p> <p><i>D is not correct because this is not dimensionally correct</i></p>		1

Q6.

Question Number	Answer	Mark
	B	1

Q7.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	<ul style="list-style-type: none"> Use of momentum = mv (1) See component(s) in x direction (1) Uses momentum conservation (1) $u = 1.6 \text{ (m s}^{-1}\text{)}$ (1) 	<p>Example of calculation:</p> $7.1(\text{g})u = 7.1(\text{g}) \times 0.9(\text{ms}^{-1}) \times \cos 8^\circ + 3.6(\text{g}) \times 1.4(\text{ms}^{-1}) \times \cos 10^\circ$ $u = \frac{(6.33 + 4.96)}{7.1}$ $u = 1.59\text{ms}^{-1}$	(4)

Question Number	Acceptable answers	Additional guidance	Mark
(ii)	<ul style="list-style-type: none"> Use of $E_k = \frac{1}{2}mv^2$ (1) Value of Initial $E_k = 9.0 \times 10^{-3} \text{ (J)}$ and Final $E_k = 6.4 \times 10^{-3} \text{ (J)}$ (Show that value gives Initial $E_k = 1.42 \times 10^{-2} \text{ (J)}$ allow ecf from (b)(i)) (1) 	<p>Allow ecf from b(i)</p> <p>Example of calculation:</p> <p>Initial $E_k = \frac{1}{2} \times 7.1 \times 10^{-3}(\text{kg}) \times 1.59^2(\text{ms}^{-1})^2 = 9.0 \times 10^{-3} \text{ J}$</p> <p>Final $E_k = \frac{1}{2} \times 7.1 \times 10^{-3} \times 0.9^2 + \frac{1}{2} \times 3.6 \times 10^{-3} \times 1.4^2 = 6.4 \times 10^{-3} \text{ J}$</p>	(2)

MCQ Answers:

1)B

2)B

12)C

17)C

18)B