

Changes in Energy

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.1 Energy
Sub-Topic	Changes in Energy
Difficulty Level	Gold Level
Booklet	Mark Scheme

Time Allowed: 31 minutes

Score: /31

Percentage: /100

Grade Boundaries:

M1. (a) 13 500 (J)

allow 1 mark for correct substitution, ie $90 \times 10 \times 15$ provided no subsequent step shown

2

(b) 17 or $\sqrt{\frac{\text{their (a)}}{45}}$

correctly calculated and answer given to 2 or 3 significant figures

accept 17.3

allow 2 marks for an answer with 4 or more significant figures, ie 17.32

or

allow 2 marks for correct substitution, ie $13\,500 / \text{their (a)} = \frac{1}{2} \times 90 \times v^2$

or

allow 1 mark for a statement or figures showing $KE = GPE$

3

(c) work is done

1

(against) friction (between the miner and slide)

accept 'air resistance' or 'drag' for friction

1

(due to the) slide not (being perfectly) smooth

accept miners clothing is rough

or

causing (kinetic) energy to be transferred as heat/internal energy of surroundings

accept lost/transformed for transferred

accept air for internal energy of surroundings

1

[8]

M2.	(a)	product of mass and velocity	1
	(b)	(i) 4kg or 4000g	1
		(ii) $M = 8\text{kgm/s}$ or Ns <i>for 3 marks</i> else $M = 8$ <i>for 2 marks</i> else $M - mv$ or 4×2 <i>for 1 mark</i>	3
		(iii) 8 kgm/s (watch e.c.f.)	1
		(iv) $v = 400$ <i>for 3 marks</i> else $v = 8/0.02$ <i>for 2 marks</i> else $M - mv$, $v - M/m$ or $8 = 0.02v$ <i>for 1 mark</i>	3
		(v) $ke = 8$ <i>for 3 marks</i> else $ke = 1/2 (4 \times 2^2)$ <i>for 2 marks</i> else $ke = 1/2 (mv^2)$ <i>for 1 mark</i>	3

- (vi) transferred to heat and sound
or does work against wood/pushing wood aside/deforming bullet

1

[13]

- M3.** (a) *any evidence of: momentum = mass × velocity (words, symbols or numbers)*
appropriate re-arrangement mass as 0.05kg
each gains 1 mark

but 800

gains 4 marks

4

- (b) (i) *any reference to friction with air/air resistance*
gains 1 mark

but *idea that friction with air/air resistance is high (at high speed)*
gains 2 marks

2

- (ii) *any evidence of: k.e. $\propto v^2$ or k.e. = $\frac{1}{2}mv^2$*
final k.e.
initial k.e.
either initial or final k.e. correctly calculated (i.e. 16000; 10240)
each gains 1 mark

but $(0.8)^2$

gains 3 marks

but 64%(credit 0.64)

gains 4 marks (also credit e.c.f)

4

[10]

