

Momentum

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.5 Forces
Sub-Topic	Momentum
Difficulty Level	Silver Level
Booklet	Mark Scheme 1

Time Allowed: 60 minutes

Score: /59

Percentage: /100

Grade Boundaries:

M1.(a) acceleration = change in velocity / time taken

allow $a = \Delta v / t$

1

(b) $= \frac{(5 - 3)}{6}$

1

$-0.33 \text{ (m / s}^2\text{)}$

1

allow 0.33 m / s^2 with no working shown for 2 marks

(c) force = mass × acceleration

allow $F = m a$

1

(d) 70×0.33

allow ecf from 4.3

1

23.1 (N)

allow 23.1 with no working shown for 2 marks

1

(e) before throwing the bag the momentum of the skater and bag is zero

1

when it is thrown the bag has momentum forwards

1

because momentum before = momentum after

1

the skater has equal backwards momentum so will move backwards

1

[10]

M2.(a) increases

1

increases

1

(b) 23 (m)

accept 43 circled for 1 mark

accept 9 + 14 for 1 mark

2

(c) (i) all points correctly plotted

all to $\pm \frac{1}{2}$ small square

one error = 1 mark

two or more errors = 0 marks

2

line of best fit

1

(ii) correct value from their graph ($\pm \frac{1}{2}$ small square)

1

(d) (i) 70

$\frac{1}{2} \times 35 \times 4$ gains 2 marks

attempt to estimate area under the graph for 1 mark

3

(ii) line from (0.6,35)

1

sloping downwards with a less steep line than the first line

1

cutting time axis at time > 4.6 s
accept cutting x-axis at 6

1

(e) (i) 42 000

1200 \times 35 gains 1 mark

2

kgm / s
Ns

1

(ii) 10 500 (N)

42 000 / 4 gains 1 mark

alternatively:

$$a = 35 / 4 = 8.75 \text{ m / s}^2$$

$$F = 1200 \times 8.75$$

2

[19]

M3. (a) (i) 16 000

allow 1 mark for correct substitution ie 3200×5

2

(ii) 16 000 or their (a)(i)

1

(iii) less than

1

(b) increases

1

decreases

correct order only

1

[6]

M4. (a) (i) lorry

reason only scores if lorry chosen

1

greatest mass

accept weight for mass

accept heaviest

accept correct calculations for all 3 vehicles

the biggest is insufficient

1

(ii) 2450

allow 1 mark for correct substitution

ie 175×14

2

(b) (i) increases

accept any clear indication of the correct answer

1

(ii) speed increases

accept velocity for speed

accept gets faster

*do **not** accept it accelerates on its own*

moves more is insufficient

1

(iii) straight line going to 6, 20

allow 1 mark for a curve going to 6,20

***or** a straight line diagonally upwards but missing 6,20*

2

horizontal line from 6,20 to 8,20

*allow a horizontal line from where their **diagonal** meets*

20m/s to 8,20

1

[9]

M5. (a) (i) 10800

allow 1 mark for correct substitution i.e. 900×12

2

(ii) arrow pointing towards the left

allow anywhere on the diagram or at bottom of the page

1

(b) zero

accept 0 / none / nothing

1

velocity is zero

accept speed for velocity

accept stopped / not moving
accept a calculation i.e. $900 \times 0 = 0$

1

[5]

M6. (a) (i) 4.5

allow 1 mark for correct substitution i.e. $9 \div 2$

2

(ii) m/s^2

accept answer given in (a)(i) if not contradicted here

1

(iii) speed

1

(iv) straight line from the origin passing through (2s, 9m/s)

allow 1 mark for straight line from the origin passing through to $t = 2$ seconds

allow 1 mark for an attempt to draw a straight line from the origin passing through (2,9)

allow 1 mark for a minimum of 3 points plotted with no line provided if joined up would give correct answer. Points must include (0,0) and (2,9)

2

(b) (i) **B**

if **A** or **C** given scores 0 marks in total

1

smallest (impact) force

1

on all/ every/ any surfaces

these marks are awarded for comparative answers

1

(ii) (conditions) can be repeated

or

difficult to measure forces with human athletes

accept answers in terms of variations in human athletes e.g.

*athletes may have different weights area / size of feet may
be different difficult to measure forces athletes run at
different speeds*

*accept any answer that states or implies that with humans
the conditions needed to repeat tests may not be constant*

e.g.

*athletes unable to maintain constant speed during tests (or
during repeat tests)*

*do **not** accept the robots are more accurate*

removes human error is insufficient

fair test is insufficient

1

[10]