**Mark schemes**

Q1.

(a) speed

must be in correct order

1

direction

1

(b)

Quantity Scalar Vector

Momentum

Acceleration

Distance

Force

Time

any three correct scores 2 marks

any two correct scores 1 mark

only one correct scores zero

3

(c) (i) 16 and 2

16 or 2 scores 2 marks

allow 1 mark for correct substitution, ie

8 × 2

or

4 × 0.5

3

kg m / s or N s

1

(ii) 1.5 (m / s)

or

their pA + pB = 12 × v correctly calculated

allow 2 marks for correct substitution, ie

18 = 12 × v

or

their pA + pB = 12 × v

18 or their pA + pB scores 1 mark if no other mark awarded

3

(iii) 14 (kg m / s)

or

their pA - pB

1

16.5 (J)

1

[14]

Q2.

(a) (i) decreases (to zero)

1

resultant force acts in opposite direction to motion

accept air resistance and weight for resultant force

accept resultant force acts downwards

do not accept air resistance increases

1

(ii) velocity includes direction

or

velocity is a vector (quantity)

1

(b) (i) 3.6

allow 1 mark for correct substitution i.e.

½ × 0.05 × 122 provided no subsequent step

2

(ii) 3.6 or their (i)

1

(iii) 7.2

or

their (ii) ÷ 0.5 correctly calculated

allow 1 mark for correct substitution i.e.

3.6 or their (ii) = 0.05 × 10 × h

2

(iv) B

1

(c) range increases up to 45°

1

range decreases from 45°

the range is a maximum at 45° gains both marks

for any two angles that add up

to 90° the range is the same gains both marks

the range increases then decreases gains 1 mark

1

[11]

Q3.

(a) any two from:

• (acceleration occurs when) the direction (of each capsule) changes

• velocity has direction

• acceleration is (rate of) change of velocity

2

(b) to(wards) the centre (of the wheel)

1

(c) the greater the radius / diameter / circumference (of the wheel) the smaller the (resultant) force (required)

accept ‘the size’ for radius

both parts required for the mark

1

[4]

Q4.

(a) 3 lines drawn

all correct

allow 1 mark for each correct line

if two or more lines are drawn from any diagram then all these lines are incorrect

3

(b) (i) horizontal arrow to the right

judge by eye

accept an arrow drawn outside the box if it is labelled correctly

1

(ii) horizontal arrow to the left

judge by eye

accept an arrow drawn outside the box if it is labelled correctly

1

(iii) equal to

1

(iv) to measure the forces exerted on the dummy during the impact

1

[7]

Q5.

(a) (i) horizontal arrow pointing to the left

judge by eye

drawn anywhere on the diagram

1

(ii) 60 (N)

1

(at steady speed) resultant force must be zero

accept forces must balance/are equal

accept no acceleration

do not accept constant speed

1

(b) 1680

allow 1 mark for correct substitution, ie 60 x 28 provided no subsequent step shown

2

joule

accept J

do not accept j

1

[6]

Q6.

(a) B

reason only scores if B is chosen

1

gradient / slope is the steepest / steeper

answers must be comparative

accept steepest line

ignore greatest speed

1

(b) (velocity includes) direction

‘it’ refers to velocity

1

[3]