AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.5.6.2.3 NEWTON'S THIRD LAW (PACK 2)

SCORE	PERCENTAGE
/61	%

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Q1.

(a) arrow of equal size pointing vertically upwards

judged by eye
ignore horizontal arrows if equal and opposite
horizontal arrows of unequal length negates this mark

1

labelled 'upthrust'

ignore buoyancy
ignore 25 kN

1

(b) weight = 25 kN

allow 24 to 25 kN inclusive

1

25 000 = mass × 9.8
or
$m = \frac{25000}{9.8}$

allow their W correctly converted and substituted

1

m = 2551 kg

allow correctly calculated value using their converted W
allow a value correctly calculated with W in kN

1

m = 2600 kg

allow a calculated answer correctly rounded to 2 significant figures

1

*an answer of 2600 scores **4** marks*

(c) Newton's 3rd law (of motion)

1

(d) vertical force (50 N) drawn
and
horizontal force (150 N) drawn to the same scale

1

resultant tension force in the correct direction

shown by an arrowhead

1

value of the tension force in the range 156 N−160 N

allow a calculated value of 158

1

value of direction in the range 18°−20° (from the horizontal)

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allow 70° to 72° (from the vertical)
allow a bearing in the range 288 to 290

1

[11]

Q2.

(a) a vector has direction (a scalar does not)

1

(b) accept any vector quantities eg
- velocity
- force
- weight
- acceleration
- displacement

1

(c) mass × velocity

*do **not** accept speed for velocity*

*do **not** accept symbols*

1

(d) kilogram(s) metre per second

allow kg m/s

1

(e) 1.8 ms = 0.0018 s

*an answer of 60 (m/s) scores **4** marks*

1

$$1500 = \frac{0.045 \times v\,(-0.045 \times 0)}{0.0018}$$

1

$$v = \frac{1500 \times 0.0018}{0.045}$$

1

v = 60 (m/s)

*an answer of 60 000 scores **3** marks*

1

(g) longer the time of contact the greater the change of momentum

allow the converse

1

since the mass of the golf ball is constant

1

the velocity of the golf ball must increase

1

increasing the distance the golf ball travels

1

[12]

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Q3.

(a) Third Law

1

(b) elastic potential

1

(c) weight = mass × gravitational field strength

accept gravity for gravitational field strength

1

accept W = mg

accept correct rearrangement ie mass = weight / gravitational field strength ***or*** *m = W / g*

(d) 343 = m × 9.8

1

m = $\frac{343}{9.8}$

1

m = 35

1

allow 35 with no working shown for ***3*** *marks*

(e) force = spring constant × compression

accept force = spring constant × extension

accept F = k e

accept correct rearrangement ie constant = force / extension ***or*** *k = F / e*

1

(f) compression = 0.07m

1

343 = k × 0.07

1

k = 343 ÷ 0.07

1

k = 4900

1

allow 4900 with no working shown for ***4*** *marks*

allow 49 with no working shown for ***3*** *marks*

[11]

Q4.

(a) **A** constant speed / velocity

accept steady pace

do ***not*** *accept terminal velocity*

do ***not*** *accept stationary*

1

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B acceleration

accept speeding up

1

C deceleration

accept slowing down

accept accelerating backwards

accept accelerating in reverse

*do **not** accept decelerating backwards*

1

(b) (i) the distance the car travels under the braking force

accept braking distance

1

(ii) speed/velocity/momentum

1

(c) (i) 5000 (N) to the left

***both** required*

accept 5000(N) with the direction indicated by an arrow drawn pointing to the left

accept 5000(N) in the opposite direction to the force of the car (on the barrier)

accept 5000(N) towards the car

1

(ii) to measure/detect forces exerted (on dummy / driver during the collision)

1

(iii) 4

*allow **1** mark for showing a triangle drawn on the straight part of the graph*

***or** correct use of two pairs of coordinates*

2

m/s^2

*do **not** accept mps^2*

1

[10]

Q5.

(a) the forces are equal in size and act in opposite directions

1

(b) (i) forwards / to the right / in the direction of the 300 N force

answers in either order

1

accelerating

1

(ii) constant velocity to the right

1

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(iii) resultant force is zero

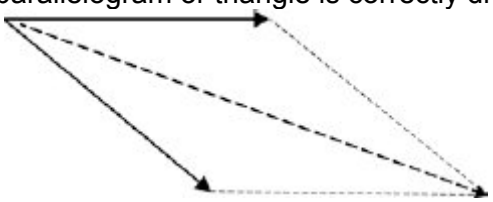
accept forces are equal / balanced

1

so boat continues in the same direction at the same speed

1

(iv) parallelogram or triangle is correctly drawn with resultant



3

value of resultant in the range 545 N – 595 N

*parallelogram drawn without resultant gains **1** mark*

If no triangle or parallelogram drawn:

*drawn resultant line is **between** the two 300 N forces gains **1** mark*

*drawn resultant line is between and longer than the two 300 N forces gains **2** marks*

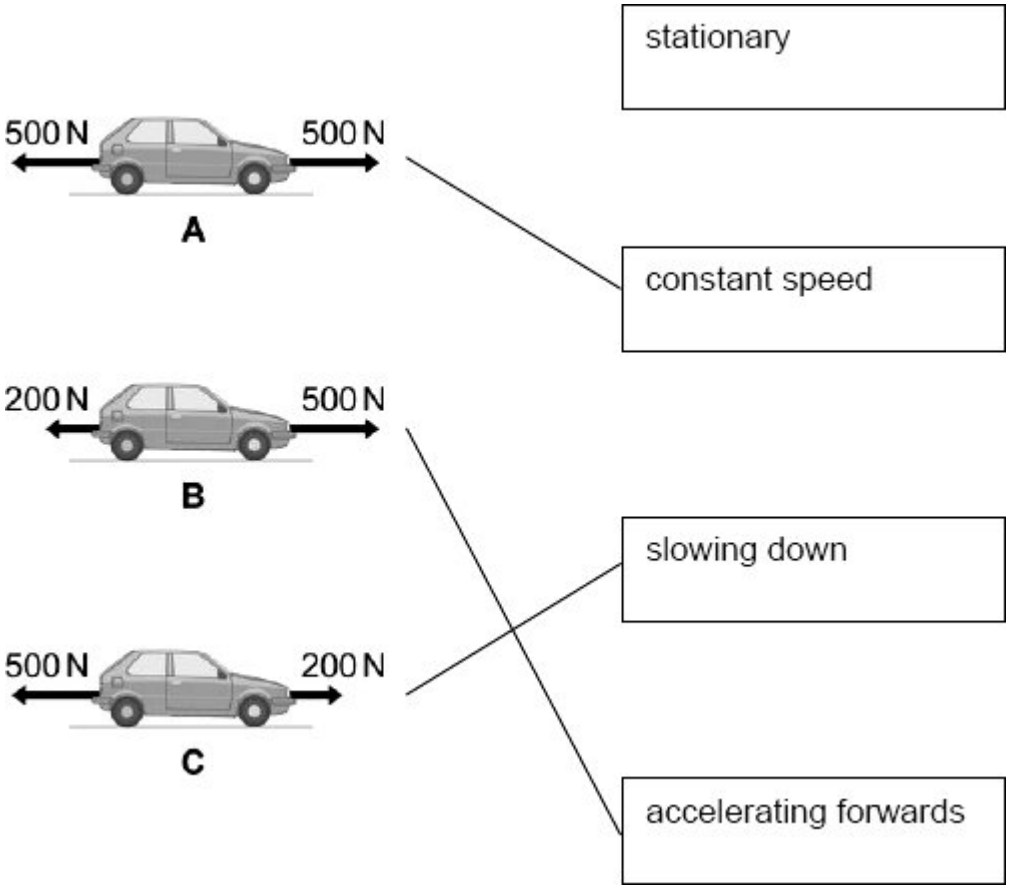
1

[10]

Q6.

(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

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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]

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