MARK SCHEME

GCSE

PHYSICS

AQA - TRIPLE SCIENCE

P5 - TEST 5

FORCES

Intermediate

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1.

(a) (i) the point where the mass is (thought to be) concentrated

1

(ii) the centre of mass is higher

1

the base (area) is smaller / narrower

1

(b) (the blocks at A and B) create equal and opposite moments

1

the resultant moment is zero

accept (moments are in) equilibrium / balanced

or
the block at A creates an anti-clockwise moment (1)
so this must be balanced by an equal clockwise moment from the block at B (1)

1

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2.

(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*

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3.

(a) (resultant) force = mass × acceleration

allow F = ma

symbols must be correct

1

(b) (2.7 – 1.5) = 0.75 × a

*an answer of 1.6 scores **3** marks*

1

$$a = \frac{1.2}{0.75}$$

allow compensation marks for correct use of incorrect resultant force

1

a = 1.6

1

m/s^2

1

(c) transverse

1

the oscillation / vibration is perpendicular to the direction of energy transfer

allow wave travel for energy transfer

1

(d) use springs with a smaller spring constant

allow use weaker springs

or

use a trolley with greater mass

allow use a heavier trolley

do not accept use a larger trolley

allow add a mass / weight to the trolley

1

(Total 8 marks)

4. (a) starting / stopping the stopwatch

human error is insufficient

reaction time is insufficient

or

timing over the smaller distances

accept not timing accurately

do not accept references to measuring distance incorrectly

1

(b) (i) before

1

(ii) increasing

accept accelerating

it is not constant is insufficient

it is less than after four seconds is insufficient

it reaches a constant speed negates

1

(iii) calculate the gradient of the straight/steepest/constant section

accept gradient of any section after 5.5 seconds/30 cm

1

(iv) drag (force) increases (as the ball bearing gets faster)

accept frictional/upward force for drag

1

(until) drag (force) = weight

or

(until) resultant force is zero

accept upward force = downward force

accept till forces are balanced

1

(c) less than

1

ball bearing increases speed at a greater rate

accept it travels the same distance in less time

or

ball bearing has a greater acceleration

accept the ball bearing is going faster

or

terminal velocity has not been reached

1

so resultant force must be greater

or

as weight is the same (the drag must be less)

accept warmer oil has a lower density/viscosity for 1 mark if neither of the two reason marks score

1

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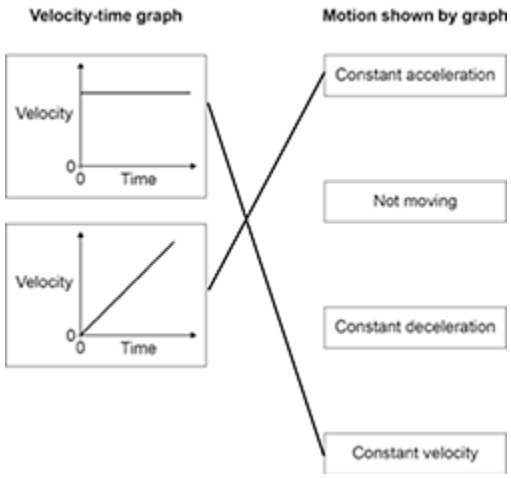
5. (a)



*if more than one line is drawn from a graph then all those lines are wrong allow **1** mark for 1 correct line*

2

(b) speed

1

(c) (i) 2.25

*allow **1** mark for correct substitution i.e.*

$a = \frac{9 - 0}{4}$ or $a = \frac{9}{4}$

provided no subsequent step

2

(ii) the air resistance increases

1

(d) 2000 J

1

mass is half
or
kinetic energy depends on mass

*do **not** accept weight for mass*

1

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6. (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 ± ½ small square
*one error = **1** mark*
*two or more errors = **0** marks*

2

line of best fit

1

(ii) correct value from their graph (± ½ small square)

1

(d) (i) 70

*½ × 35 × 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 × 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 m / s²

F = 1200 × 8.75

2

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7. (a) (i) any **two** from:

- length of coils increased
- coils have tilted
- length of loop(s) increased
- increased gap between coils
- *spring has stretched / got longer*
- *spring has got thinner*

2

(ii) remove mass

accept remove force / weight

1

observe if the spring returns to its original length / shape *(then* it is behaving elastically)

1

(b) (i) 8.0 (cm)

1

extension is directly proportional to force *(up to 4 N)*

for every 1.0 N extension increases by 4.0 cm (up to 4 N)

evidence of processing figures eg 8.0 *cm* is half way between 4.0 *cm* and 12.0 *cm*

1

allow spring constant (k) goes from to $\frac{1}{4}$ to $\frac{5}{22}$

1

(ii) any value greater than 4.0 N and less than or equal to 5.0 N

1

the increase in extension is greater than 4 cm per 1.0 N (of force) added

dependent on first mark

1

(c) (i) elastic potential energy

1

(ii) misread stopwatch

1

timed too many complete oscillations

1

(iii) 4.3 (s)

accept 4.33 (s)

1

(iv) stopwatch reads to 0.01 s

1

reaction time is about 0.2 s
or
reaction time is less precise than stopwatch

1

(v) use more masses

1

smaller masses eg 50 g

not exceeding limit of proportionality

1

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