M1. (a) terminal

1

(b) 5.4 (kg)

*correct substitution of 54 = m × 10 gains **1** mark*

2

(c) (i) 0< a <10

1

some upward force

accept some drag / air resistance

1

reduced resultant force

1

(ii) 0

1

upward force = weight (gravity)

1

resultant force zero

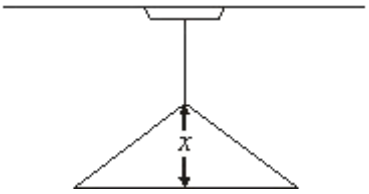
1

[9]

M2. (a) centre of **X** should appear to be on the continued line of the flex and in the

body of the lamp as judged by eye

example



1

(b) below

1

(c) (D)→B→F→A→C→(E)

*all four correct for **3** marks*
***or** any two correct for **2** marks*
***or** just one correct for **1** mark*

3

[5]

M3. (a) (i) 0.6

*allow **1** mark for correct substitution*

2

newtons

accept N
*do **not** accept n*
accept Newtons

1

(ii) the same as

1

(b) (i) changed velocity

accept increased/ decreased for change
accept speed for velocity
accept <u>change</u> direction
accept getting faster/ slower
accept start/ stop moving
accept correct equation in terms of change in speed or change in velocity

1

(ii) down(wards)

accept towards the ground
accept ↓
*do **not** accept south*

1

[6]

M4. *any evidence of idea that* weight acts through/near centre of mass/gravity/brick

gains 1 mark

but *clear indication that brick topples if*
vertical line through centre of mass is outside base line of brick
or line of action of weight is outside base line of brick

gains 2 marks

[2]

M5. (a) centre of X at the point where the axes cross

to within 1 mm in any direction

1

(b) (i) (at / in the) centre (of the tyre)

or *unambiguously shown on the diagram*

1

(ii) (this is) where axes of symmetry (of the tyre) cross / intersect / meet

or *point at which the mass of the tyre seems to be (concentrated)*

1

[3]

M6. (a) (i) moment

1

(ii) rotation

1

(iii) the girl moves nearer to point **P**

1

(b) (i) **X** drawn in the centre of the space enclosed by the tyre
judge by eye

1

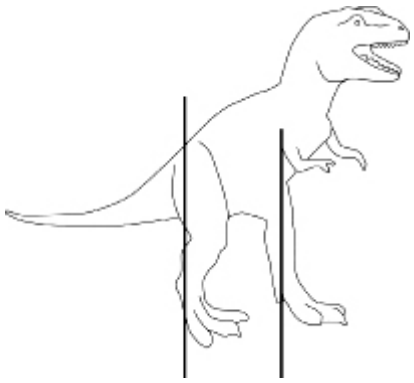
(ii) below

1

[5]

M7. (a) (i) centre of **X** above the feet and in the body

*a vertical line from their **X** falls between two lines in diagram - judged by eye*



1

(ii) where the mass seems to be concentrated

accept it's above the <u>base</u> (area)
accept because otherwise it would topple
accept line of action (of weight) passes through the <u>base</u>
*do **not** accept where the mass is concentrated*

1

(b) any **two** from:

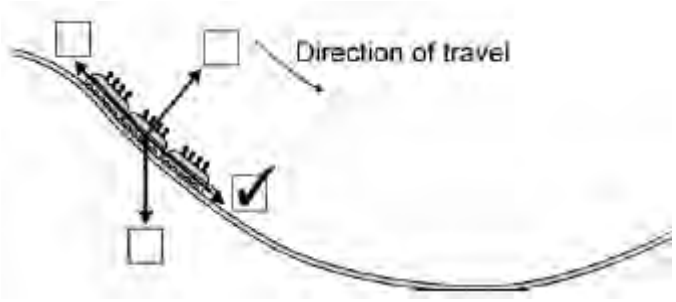
- make (the area of) feet / base bigger
- make feet wider apart
- makes legs shorter / heavier
- make head smaller / lighter
- make tail touch the ground / make the tail longer

accept 'make centre of mass / gravity lower'

2

[4]

M8. (a) correct box ticked



1

(b) (i) 30

ignore added units

1

(ii) 2250 **or** their (b)(i) × 75 correctly calculated

*allow **1** mark for correct substitution ie 75 × 30 **or** their (b)(i) × 75 provided no subsequent step shown*

*an answer of 750 gains **1** mark only if answer to (b)(i) is 10*

2

[4]

M9. (a) (i) **X** placed at 50 cm mark

1

(ii) point at which mass of object may be (thought to be) concentrated

1

(b) (i) **Y** placed between the centre of the rule and the upper part of mass

1

(ii) 16.5

*allow for **1** mark*
(16.5 + 16.6 +16.5) / 3

2

1.65

value consistent with mean value given
only penalise significant figures once

1

(iii) Marks awarded for this answer will be determined by the quality of communication as well as the standard of the scientific response. Examiners should apply a 'best-fit approach to the marking.

0 marks
No relevant content

Level 1 (1 – 2 marks)
A description of a method which would provide results which may not be valid

Level 2 (3 – 4 marks)
A clear description of a method enabling some valid results to be obtained. A safety factor is mentioned

Level 3 (5 – 6 marks)
A clear and detailed description of experiment. A safety factor is mentioned. Uncertainty is mentioned

examples of the physics points made in the response:

additional apparatus

- stopwatch

use of apparatus

- measure from hole to centre of the mass
- pull rule to one side, release
- time for 10 swings and repeat
- divide mean by 10
- change position of mass and repeat

fair test

- keep other factors constant
- time to same point on swing

risk assessment

- injury from sharp nail
- stand topple over
- rule hit someone

accuracy

- take more than 4 values of *d*
- estimate position of centre of slotted mass
- small amplitudes
- discard anomalous results
- use of fiducial marker

6

(c) (i) initial reduction in *T* (reaching minimum value) as *d* increases

1

after 30 cm *T* increases for higher value of *d*

1

(ii) (no)

any **two** from:

- fourth reading is close to mean
- range of data 0.2 s / very small
- variation in data is expected

2

[16]