Forces and their effects

1. (a) (i) 9400(m) 1

(ii) 26.5(hours) 1

(b) (i) F 1

(ii) D 1

(iii) B 1

[5]

2. (a) (i) same size 1

(ii) **K** 1

(b) velocity 1

(c) **C** 1

greatest mass **or** because it's heavier 1

*accept biggest load; accept heaviest **or** more weight*
*do **not** accept fuller; do **not** accept more items*
*do **not** accept it's loaded; do **not** accept loaded most*
ignore references to time as neutral

[5]

3. (a) (i) plasticine stretches/snaps stays stretched/snapped 2

for 1 mark each

(ii) spring compresses OWTTE 2
returns to **original** length/shape or gets longer

for 1 mark each

(iii) ruler bends/breaks 2
returns to original shape or stays broken

for 1 mark each

(b) (i) 1.5N 1

(ii) 4 cm 1

(iii) 19 cm 1

[9]

4. (a) (i) a single force that has the same effect as all the forces combined 1

accept all the forces added / the sum of the forces / overall force

(ii) constant speed (in a straight line) 1

*do **not** accept stationary*

or constant velocity

(b) 3 allow **1** mark for correct substitution into transformed equation 2

*accept answer 0.003 gains **1** mark; answer = 0.75 gains **1** mark*

m/s^2 1

(c) as speed increases air resistance increases 1

accept drag / friction for air resistance

reducing the resultant force 1

[7]

5. (a) (i) constant speed 1

*do **not** accept normal speed; do **not** accept it is stopped/stationary*

in a straight line 1

accept any appropriate reference to a direction
*constant velocity gains **2** marks; 'not accelerating' gains **2** marks*
*terminal velocity alone gets **1** mark*

(ii) goes down owtte 1

accept motorbike (it) slows down

(b) (i) 20 (m/s) *ignore incorrect units* 1

(ii) acceleration = $\frac{\text{change in velocity}}{\text{time (taken)}}$ 1

*do **not** accept velocity for change in velocity; accept change in speed*

accept $a = \frac{v-u}{t}$ ***or*** $a = \frac{v_1 - v_2}{t}$

or $a = \frac{\Delta v}{t}$

*do **not** accept* $a = \frac{v}{t}$

(iii) 4 **or** their (b)(i) ÷ 5 2

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

m/s^2 *m/s/s **or** ms^{-2} **or** metres per second squared* 1
***or** metres per second per second*

(c) vehicle may skid / slide 1

loss of control / brakes lock / wheels lock
*accept greater stopping distance **or** difficult to stop*

due to reduced friction (between tyre(s) and road) 1

*accept due to less grip; do **not** accept no friction*

(d) any **three** from: 3

*do **not** accept night time / poor vision*

- increased speed
- reduced braking force
- slower (driver) reactions

*NB specific answers may **each** gain credit eg tiredness (1), drinking alcohol (1), using drugs (1), driver distracted (1) etc*

- poor vehicle maintenance

*specific examples may **each** gain credit eg worn brakes or worn tyres etc*

- increased mass / weight of vehicle

accept large mass / weight of vehicle

- poor road surface
- more streamlined

*if candidates give three answers that affect stopping distance but not specific to increase award **1** mark only*

[13]