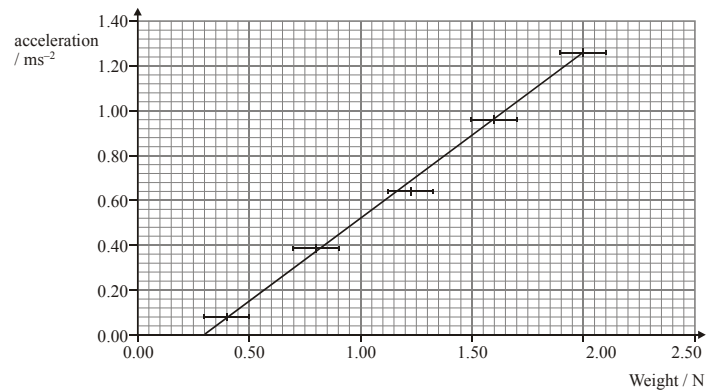


NEWTON REVIEW PROBLEMS MARKSCHEME

1. (a) a straight line;
through the origin; 2 max
- (b) any straight line;
that fits within ALL the error bars; 2 max



- (c) (i) a systematic error is when every data point deviates from the "correct" value;
by the same fixed amount as seen by intercept on graph / OWTTE; 2 max
Accept answers that explain by giving an example of a possible systematic error eg friction.
- (ii) 0.3 N; 1
Accept 0.25 N → 0.35 N. NB Watch for use of wrong axis!
- (iii) realization that mass = (gradient)⁻¹;
Award this mark for full Newton II equation (with friction)
to give mass = 1.4 kg (*Accept 1.2 kg → 1.6 kg.*); 2 max
Use of F = ma for 1 data point receives [0] (unless candidate's line is through origin).
Watch for ecf from candidate's own line.

[9]

2. B

[1]

1

3. A

[1]

4. (a) (i) $F = Mg \sin \theta$
 $= 960 \times 9.8 \times 0.26;$
 $2.4 \times 10^3 \text{ N}$ 2
- (ii) $KE = \left(\frac{1}{2}mv^2\right) = (480 \times 81) = 3.9 \times 10^4 \text{ J};$ 1
- (b) $KE = Fs;$
to give $F = 2.6 \times 10^3 \text{ N};$ 2
Award [1 max] if $v^2 = 2$ as is used.
- (c) recognize that $KE = \text{mass} \times \text{sp ht} \times \text{rise in temperature};$
 $\Delta\theta = \frac{3.9 \times 10^4}{2 \times 900 \times 5.2};$
 $= 4.2 \text{ K};$
Award full marks for bald correct answer.
no energy / heat loss to the surroundings / energy distributed evenly in shoe and drum; 4

[9]

5. B

[1]

6. C

[1]

7. C

[1]

8. (a) zero;

1

2

(b) resultant vertical force from ropes = $(2.15 \times 10^3 - \text{weight}) = 237\text{N}$;
equating their result to $2T \sin 50$;
ie $2T \sin 50 = 237$
calculation to give $T = 154.7\text{N} \approx 150\text{N}$; 3
Accept any value of tension from 130 N to 160 N. Award [2] for missing factor of 2 but otherwise correct ie 309 N.

(c) correct substitution into $F = ma$;
to give $a = \frac{237}{1.95 \times 10^2} = 1.21 \text{ms}^{-2}$; 2

Watch for ecf.

NB Depending on value of g answer will vary from 1.0(3) ms^{-2} to 1.2(3) ms^{-2} all of which are acceptable.

(d) statement that air friction increases with increased speed seen / implied;
in 10 seconds friction goes from 0 N to 237 N / force increases from zero
until it equals the net upward accelerating force; 2

[8]

9. D [1]

10. B [1]

11. B [1]

12. C [1]

13. A [1]