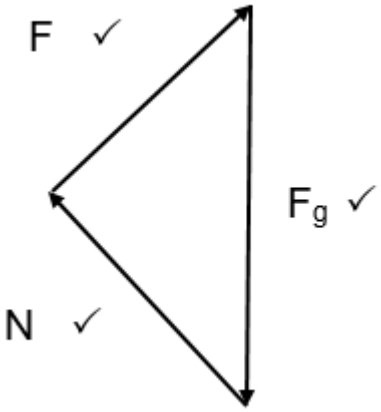
Gr11 June 2022 Exam P1 Memo

1.1	A	1.6	D	
1.2	B	1.7	B	
1.3	D	1.8	C	
1.4	D	1.9	D	
1.5	B	1.10	C	(10 x 2)

2.1 The force that opposes the tendency of motion of a stationary object relative to the surface. (2)

2.2



(3)

2.3 $f = F_{g\parallel}$ ✓

$f = 23(9{,}8)\sin 30°$ ✓

$f = 112{,}7\ N$ ✓ (3)

2.4 $N = F_{g\perp}$ ✓

$N = 23(9{,}8)\cos 30°$ ✓

$N = 195{,}20 \ldots\ldots\ N$

$f = \mu N$ ✓

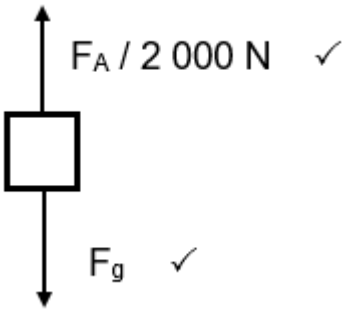
$112{,}7 = \mu\ 195{,}20 \ldots$ ✓

$\mu = 0{,}58$ ✓ (5)

[13]

3.1 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant force acts on it. (2)

3.2



(2)

3.3

$$\left.\begin{aligned} F_{net} &= 0 \\ F_A - F_g &= 0 \\ F_A &= F_g \end{aligned}\right\} \checkmark$$

$$F_g = 2\,000 = m(9{,}8) \quad \checkmark$$

$$m = 204{,}08\,kg \quad \checkmark$$

(3)

3.4

$$\left.\begin{aligned} F_{net} &= ma \\ F_A - F_g &= ma \end{aligned}\right\} \checkmark$$

$$2500 - 2000 = 204{,}08 \times a \quad \checkmark$$

$$a = 2{,}45\,m.s^{-2} \quad \checkmark$$

(3)

3.5 The lift is pulling the earth up. ✓ (1)

[11]

4.1 When a resultant / net force acts on an object, the object will accelerate in the direction of the force, at an acceleration directly proportional to the force and inversely proportional to the mass of the object. (2)

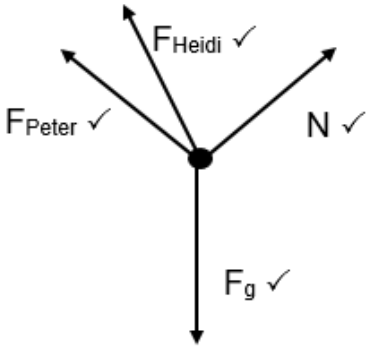
4.2

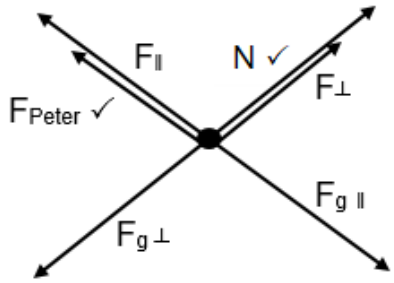
$$F_\perp = 200.\sin 43° \qquad F_\parallel = 200.\cos 43°$$

$$F_\perp = 136{,}40\,N \quad \checkmark \qquad F_\parallel = 146{,}27\,N \quad \checkmark$$

(2)

4.3





(4)

4.4

$$F_{net} = ma$$
$$F_{\parallel} + F_{Peter} - F_g = ma \quad \checkmark$$
$$146{,}27 + 150 - 50(9{,}8)sin30° \checkmark = 50.a \checkmark\checkmark$$
$$a = 1{,}03\ m.s^{-2} \checkmark$$

(5)

4.5

$$N + F_{\perp} - F_{g\perp} = 0$$
$$N = F_{g\perp} - F_{\perp} \quad \checkmark$$
$$N = 50(9{,}8)cos30° \checkmark - 136{,}40 \checkmark$$
$$N = 287{,}95\ N \checkmark$$

(4)

4.6

$$f_k = \mu_k.N \checkmark$$
$$f_k = 0{,}25(287{,}95) \checkmark$$
$$f_k = 71{,}99\ N \checkmark$$

(3)

4.7

$$F_{net} = 0$$
$$F_{\parallel} + F_{Peter} - F_{g\parallel} - f = 0 \quad \checkmark$$
$$146{,}27 + x - 50(9{,}8)sin30° - 71{,}99 = 0 \checkmark$$
$$x = 170{,}72\ N \checkmark$$
$$170{,}72 - 150 = 20{,}72\ N \checkmark$$

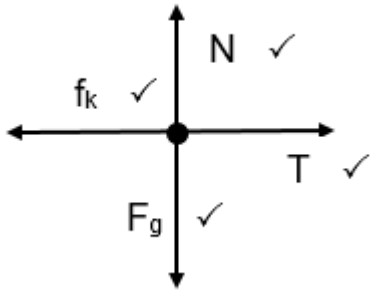
FPeter must increase by 20,72 N.

(4)

[24]

5.1 When object A exerts a force on object B, object B simultaneously exerts a force which is equal in magnitude but opposite in direction on object A. (2)

5.2



(4)

5.3

$$N = F_g$$

$$N = 10(9{,}8) = 98\ N \quad \checkmark$$

$$f_k = \mu_k \quad \checkmark$$

$$f_k = 0{,}25(98) \quad \checkmark$$

$$f_k = 24{,}5\ N \quad \checkmark$$

(4)

5.4

$$\left.\begin{aligned} F_{net} &= ma \\ T - f_k &= ma \end{aligned}\right\} \checkmark$$

$$T - 24{,}5 = 10.a \quad \checkmark$$

$$F_g - T = ma \quad \checkmark$$

$$15(9{,}8) - T = 15.a \quad \checkmark$$

$$10.a + 24{,}5 = 147 - T - 15.a \quad \checkmark$$

$$a = 4{,}9\ m.s^{-2}\ to\ the\ right \quad \checkmark$$

(6)

5.5

$$T = 147 - 15(4{,}9) \quad \checkmark$$

$$T = 73{,}5\ N \quad \checkmark$$

(2)

[18]

6.1 The gravitational force of attraction between two objects is directly proportional to the product of the masses and inversely proportional to the square of the distance between their centres. (2)

6.2 $$r^2 = (2 \times 10^{11})^2 + (4 \times 10^8)^2 \quad \checkmark \quad (Pyth)$$

$$r = 2{,}0\ldots \times 10^{11}\ m$$

$$F_g = \frac{Gm_1m_2}{r^2} \quad \checkmark$$

$$F_g = \frac{6{,}67 \times 10^{-11}(1{,}99 \times 10^{30})(5{,}98 \times 10^{24})}{(2{,}0\ldots \times 10^{11})^2} \quad \checkmark$$

$$F_g = 1{,}98 \times 10^{22}\ N \quad \checkmark$$

(4)

6.3 Equal in magnitude. (2)

6.4 $$W = m.g \quad \checkmark$$

$$W = 1{,}5(9{,}8) \quad \checkmark$$

$$W = 14{,}7\ N\ (True\ weight\ of\ rock\ on\ the\ moon)$$

$$F_g = \frac{Gm_1m_2}{r^2} \quad \checkmark$$

$$14{,}7 \checkmark = \frac{6{,}67 \times 10^{-11}(7{,}35 \times 10^{22})(8{,}67)}{r^2} \quad \checkmark$$

$$r = 1\ 700\ 424{,}95\ m \checkmark$$

(6)

[14]