ALEXANDER ROAD HIGH SCHOOL

April 2021 | **PHYSICAL SCIENCES CONTROL TEST** | 55 MINUTES

JA | **GRADE 11 MEMO** | TOTAL = 50

1.1 D ✓✓

1.2 B ✓✓

1.3 D ✓✓

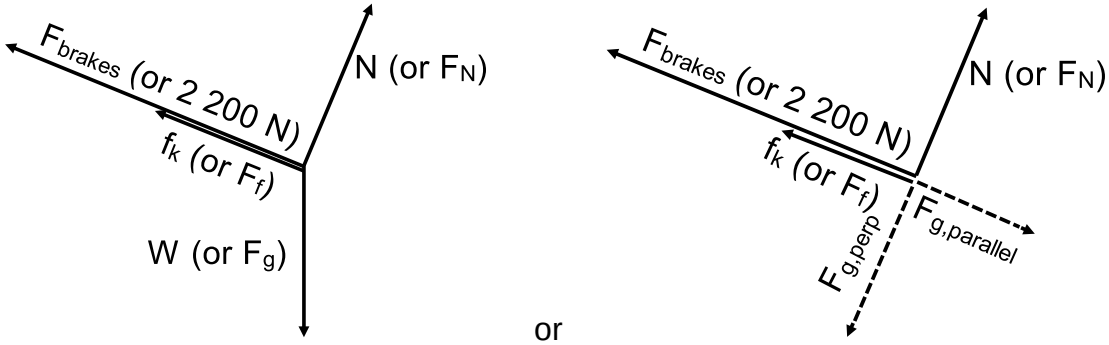
1.4 C ✓✓

1.5 A ✓✓

[10]

2.1 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)

2.2 ✓F_{brakes} ✓f_k ✓F_N ✓F_g



(4)

2.3 $F_{g\perp} = (900)(9{,}8)(\cos 35{,}3°) = 7\,198{,}33\ N$ ✓

$F_{g\parallel} = (900)(9{,}8)(\sin 35{,}3°) = 5\,096{,}70\ N$ ✓ (2)

2.4 $f_k = \mu_k . N$ ✓

$f_k = (0{,}17)(7\,198{,}33)$ ✓POSITIVE MARKING FROM 2.3

$\therefore f_k = 1\,233{,}72\ N$ ✓ (3)

2.5 $F_{net} = ma$ or $F_{g\parallel} - F_{brake} - f_k = ma$ ✓

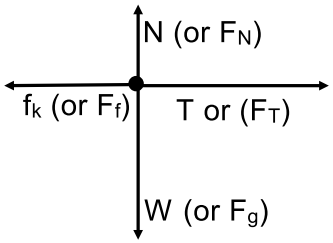
$5096{,}7 - 2\,200 - 1\,233{,}72 = (900)(a)$ ✓POSITIVE MARKING FROM 2.3 & 2.4

$\therefore a = 1{,}85\ m.s^{-2}$ down the hill ✓MUST INCLUDE DIRECTION (3)

[14]

3.1 When object A exerts a force on object B, object B SIMULTANEOUSLY exerts an oppositely directed force of equal magnitude on object A. ✓✓ (2 or 0) (2)

3.2 ✓T ✓f_k ✓F_N ✓F_g



(4)

3.3.1 $F_{net} = ma$ ✓

5kg trolley:	10kg block:
$T - 23 = 5a$ ✓MARK FOR $T - f_k$	$(10)(9{,}8)$✓ $- T = 10a$ ✓MARK FOR $F_g - T$
$T = 5a + 23$ ... (eqn. 1)	$98 - T = 10a$ ... (eqn. 2)

Sub eqn. 1 into eqn. 2:

$98 - (5a + 23) = 10a$ ✓

$15a = 75$

$\therefore a = 5\ m.s^{-2}$ ✓ (6)

3.3.2 $T = 5(5) + 23$ ✓POSITIVE MARKING FROM 3.3.1

$\therefore T = 48\ N$ ✓ (2)

3.4 DECREASE. ✓ (1)

[15]

4.1 Each particle in the universe attracts every other particle with a gravitational force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres. ✓✓ (2 or 0) (2)

4.2 $F = \frac{Gm_1m_2}{r^2}$ ✓

$F = \frac{(6{,}67 \times 10^{-11})(6{,}39 \times 10^{23})(5{,}98 \times 10^{24})}{(2{,}80 \times 10^{8} \times 10^{3})^2}$ ✓ ✓

$\therefore F = 3{,}25 \times 10^{15}\ N$ ✓ (4)

4.3 $W = mg$ ✓

$W = (24{,}7)(9{,}8)$ ✓

$\therefore W = 242{,}06\ N$ ✓

$W = F = \frac{Gm_1m_2}{r^2}$

$242{,}06 = \frac{(6{,}67 \times 10^{-11})(6{,}39 \times 10^{23})(65)}{(\mathrm{R_{Mars}})^2}$ ✓

$\therefore R_{\mathrm{Mars}} = 3{,}38 \times 10^{6}\ m$ ✓ (5)

[11]