

PHYSICAL SCIENCES**MEMORANDUM/ EXPECTED ANSWER MARCH TEST 2018 – GRADE 11****MARKS : 75****TIME : $1\frac{1}{2}$ Hrs****QUESTION 1**

1.1	D✓✓	1.2	A✓✓	1.3	A✓✓	1.4	C✓✓	1.5	C✓✓
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[10]**QUESTION 2**

2.2 Resultant is the vector sum of two or more vectors, i.e. a single vector having the same effect as two or more vectors together. ✓✓ (2)

2.2.1 $F_x = -3 + 4 + 2 \cos 30^\circ$ ✓

$F_x = 2,73 \text{ N}$ ✓ (2)

2.2.2 $F_y = 5 + -2 \sin 30^\circ$ ✓

$F_y = 4 \text{ N}$ ✓ (2)

2.2.3 $F_{\text{net}}^2 = F_x^2 + F_y^2$

$F_{\text{net}} = (2,73)^2 + (4)^2$ ✓

$F_{\text{net}} = 4.84 \text{ N}$ ✓

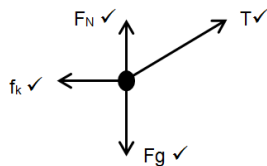
$\tan \theta = \frac{4}{2,73}$ ✓

$\theta = 55,7^\circ$ ✓ (5)


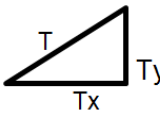
[11]**QUESTION 3**

3.1 State Newton's second law of motion: When a resultant/net force acts on an object, the object will accelerate in the direction of the (net) force at an acceleration directly proportional to the (net) force ✓ and inversely proportional to the mass of the object. ✓ (2)

3.2



(4)

<p>3.3.1 F_{net} on the car $F_{\text{net}} = ma$ ✓ $F_{T_x} - f_k = ma$ $F_{T_x} - 1456 = 1100a$ $F_{T_x} = 1100a + 1456 \dots (1)$ ✓ F_{net} on the truck $F_{\text{net}} = ma$ $F_{\text{app(engine)}} - *F_{T_x} - f_k = ma$ $15\ 000 - F_{T_x} - 4520 = 4000a$ $-F_{T_x} = 4000a - 10480 \dots (2)$ ✓  $(1) = (2)$ $1100a + 1456 = -(4000a - 10480)$ ✓ $a = 1.77 \text{ m}\cdot\text{s}^{-2}$ ✓ right ✓</p>	<p>Car</p>  <p>*The T_x of the cable exerts a force to the left on the truck.</p> <p>(6)</p>
<p>3.3.2 Substitute a in (1) or (2) $F_{T_x} = 1100a + 1456$ ✓ $T \cos 30^\circ = 1100a + 1456$ $T \cos 30^\circ = 1100(1.77) + 1456$ ✓ $T = 3929.45 \text{ N}$ ✓</p>	<ul style="list-style-type: none"> $F_{T_x} = T \cos 30^\circ$ + from 3.3.1 for acceleration. <p>(3)</p>

3.5 (Wrong numbering.) $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$ $= 0 + \frac{1}{2} (1.77) (4)^2$ $= 14.16 \text{ m} \checkmark$	• + from 3.3.1. (2)
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- 3.6 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it. $\checkmark \checkmark$ (2)
- 3.7 If the rope breaks/snaps, the car will continue forward at the same speed as before and will crash into the back of the tow truck. $\checkmark \checkmark$ (2)
- 3.8 1890 N \checkmark Newton's Third law. The truck exerts the same force on the car. \checkmark (2)
- [23]**

QUESTION 4

- 4.1 $f_k = \mu_k N \checkmark$
 $f_k = 0,2(4)(9,8) \cos 40^\circ \checkmark$
 $f_k = 6,01 \text{ N} \checkmark$ up the slope \checkmark (4)

4.2		(5)
8 kg $f_k = \mu_k N$ $f_k = 0,2(8)(9,8)$ $f_k = 15,68 \text{ N} \checkmark$ $F_{\text{net}} = ma$ $T - 15,68 = 8a \checkmark$ $a = (T - 15,68) / 8$	4 kg $f_k = 6,01$ $F_{g//} = mg \sin 40^\circ$ $= (4)(9,8) \sin 40^\circ$ $= 25,19 \text{ N}$ $F_{\text{net}} = ma$ $F_{g//} - T - f_k = ma$ $25,19 - T - 6,01 = 4a \checkmark$	
25,19 - T - 6,01 = 4 x (T - 15,68) / 8 \checkmark T = 18,01 N \checkmark		
4.2 (Sorry for the wonky numbering.) Greater than \checkmark . The $F_{g//}$ increases hence F_{net} increases \checkmark		(2)

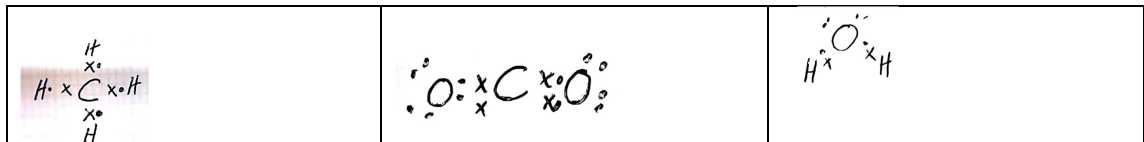
[11]**QUESTION 5**

- 5.1 Each particle in the universe attracts every other particle with a gravitational force that is directly proportional to the product of their masses \checkmark and inversely proportional to the square of the distance between their centres. \checkmark (2)
- 5.2 $F = \frac{Gm_1m_2}{r^2} \checkmark$
 $F = \frac{(6,67 \times 10^{-11})(5,98 \times 10^{24})(250\,000)(5,98 \times 10^{24})}{(1,27 \times 10^9)^2} \checkmark$
 $F = 3,70 \times 10^{26} \text{ N} \checkmark$ (4)
- 5.3 Equal to \checkmark . Newton's third law obeyed \checkmark (2)

[08]**QUESTION 6**

- 6.1 Electronegativity is a measure of the tendency of an atom in a molecule to attract bonding electrons. $\checkmark \checkmark$ (2)
- 6.2.1 $\text{CH}_4 =$ tetrahedral shape \checkmark
 $\text{CO}_2 =$ linear shape \checkmark
 $\text{H}_2\text{O} =$ angular/bent \checkmark (3)

6.2.2



- 6.3 $\text{CH}_4 =$ non-polar \checkmark
 $\text{CO}_2 =$ non-polar \checkmark
 $\text{H}_2\text{O} =$ polar \checkmark (3)
- 6.3 Hydrogen bonds \checkmark (1)

[12]**TOTAL = 75**