TEACHERS WITHOUT BORDERS PROGRAMME

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In Bill Gates words, at the Mandela Day 'Living Together' address: "Maintaining the quality of this country's higher education system while expanding access to more students will not be easy. But it's critical to South Africa's future" – working together, we can help achieve this."

Contributing schools to date:

Clifton School	Milnerton High	Rustenburg Girls' High	St Peter's
Durban Girls'	Northwood High	St Anne's DC	St Stithians
Fairmont High	Roedean	St John's DSG	Wynberg Boys' High
Herzlia High	Rondebosch Boys'	St Mary's DSG Kloof	Wynberg Secondary

JUNE EXAMINATION - 2019

MEMORANDUM: GRADE 11 PHYSICAL SCIENCE

[Total marks = 130]

SECTION A: MULTIPLE CHOICE

1.1 B
1.2 D
1.3 D
1.4 D
1.5 D

(5)

Question 2:

2.1.1 Rate of change of position or displacement ✓ ✓ (2)

2.1.2 Distance = Area under graph = ½ bh ✓ = 29,8 ✓
= ½ (17,5)(v) ✓
∴ v = 3,41 m s^{-1} ✓

(3)

2.1.3 Take motion north as positive
$a = \frac{v_f - v_i}{\Delta t}$ ✓ $= \frac{0 - 3,41}{17,5 - 3,5}$ ✓ = - 0,24 m s^{-2} ie 0,24 m s^2 south ✓

$v = u + at$ ✓
$0 = 3,41 + a(14)$ ✓
$a = 0,24 ms^{-2}$ ✓ South

(3)

2.1.4 When a net force, F_{net}, is applied to an object of mass, m, it accelerates in the direction of the net force. ✓ The acceleration, a, is directly proportional to the net force and inversely proportional to the mass. ✓

(2)

2.1.5 Take motion north as positive
$F_{net} = ma$ ✓
$F_{fk} = (20)(-0,24)$ ✓ = - 4,87 N i.e. 4,87 N south ✓

(4)

2.2.1 $v^2 = u^2 + 2as$ ✓
$0^2 = 4^2 + 2(-9.8)s$ ✓
$s = 0,82 m$ ✓

(3)

2.2.2 $S = ut + \frac{1}{2}at^2$ ✓

$t_{up} = 0{,}41s$

$t_{down} = 0{,}89s$

$= 4(1{,}3) + \frac{1}{2}(-9.8)(1.3)^2$ ✓

$= -3{,}08m$ ie 3,08m high. ✓ (3)

2.2.3. $v = u + at$ ✓

$0 = -8{,}65 + a(0{,}9)$ ✓

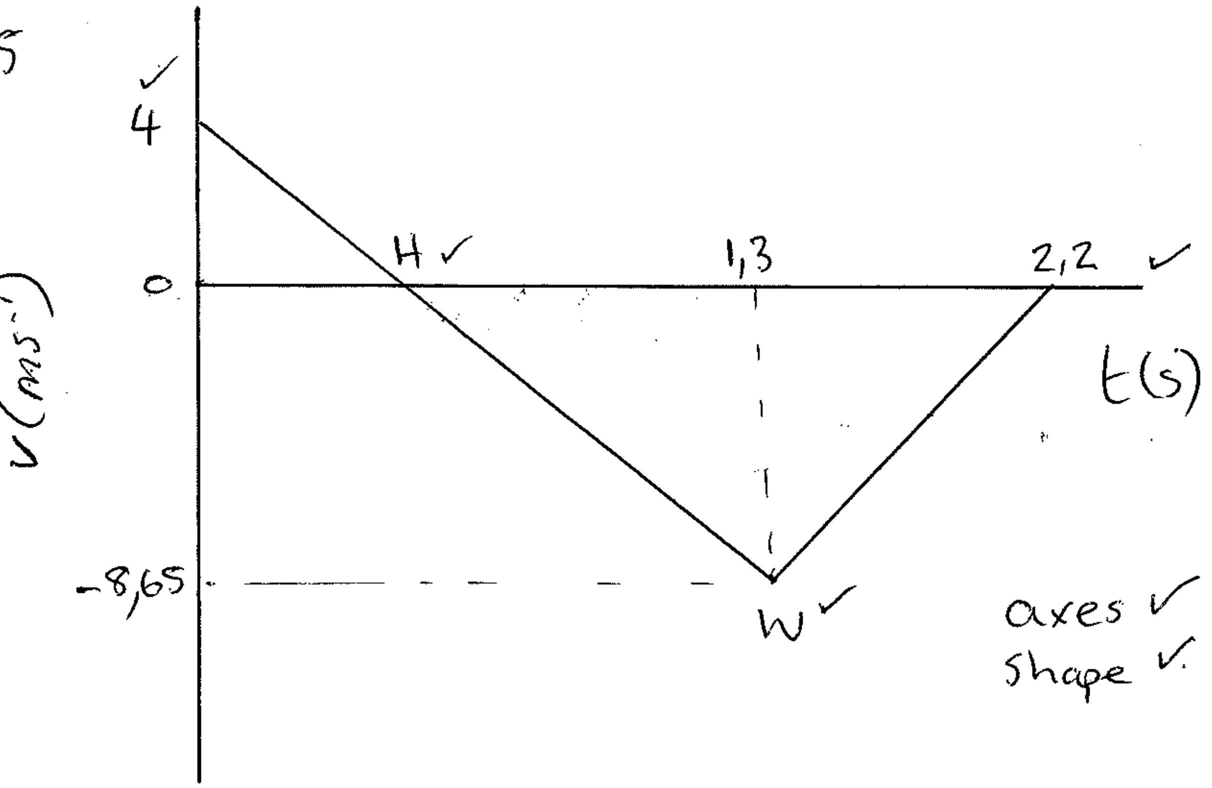
$a = 9{,}61 ms^{-2}$ ie $9{,}61 ms^{-2}$ up. ✓ (3)

2.2.4 $F_{net} = ma$ ✓

$= 75 \times 9.61$ ✓

$= 720{,}83N$ ie $720{,}83N$ up ✓✓ (4)

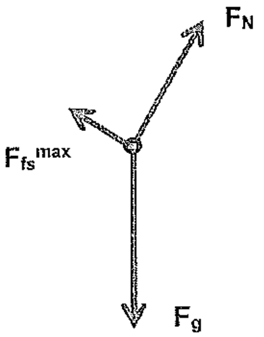
2.2.5



(6)

Question 3:

3.1



F_N = normal force ✓

F_{fs}^{max} = maximum static frictional force ✓

F_g = gravitational force ✓

(-1 if relative magnitudes are incorrect)

(3)

3.2 $\mu_s = \frac{F_{fs}^{max}}{F_N}$ ✓ $= \frac{1382 ✓}{(240)(9,8)\cos(36°) ✓} = \underline{0,73}$ ✓

1902,81

(4)

3.3.1 Greater than ✓ (1)

3.3.2 $F_{fs}^{max} = \mu_s F_N$ ✓ (μ_s is constant)

$\therefore F_{fs}^{max} \propto F_N$ ✓

Inclined plane: $F_N = mg\cos\theta$

$\therefore F_N < mg$

Horizontal surface: $F_N = mg$ ✓✓

$\therefore$ F_N is greater on the horizontal surface

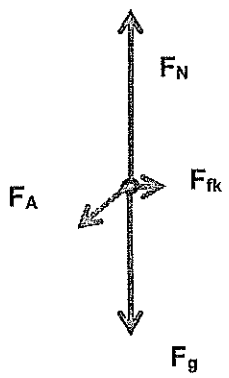
$\therefore F_{fs}^{max}$ is greater on the horizontal surface

(4)

[12]

Question 4: Newton's Laws of Motion

4.1.1



Fg < FN

F_N = normal force ✓

F_{fk} = kinetic frictional force ✓

F_g = gravitational force ✓

F_A = applied force ✓

(-1 if relative magnitudes are incorrect:

$F_N = F_g + F_{Ay}$

$F_{Ax} > F_{fk}$)

(4)

4.1.2 Take motion to the left as positive
$F_{net} = ma$ ✓
480 cos(37°) ✓– F_{fk} = (200)(0,9) ✓
∴ F_{fk} = 203.35 N ✓

383,35 − F_f = 200(0,9)

(5)

4.2.1 $F_{net} = ma$ ✓ LEFT
$F_g - T = ma$
5,88 0,6 × 9.8 − T = 0,6 a ✓
−T = 0,6a − 5,88
T = 5,88 − 0,6a

$F_{net} = ma$ Right.
$T - F_g = ma$
T − 0,4 × 9.8 = 0,4a ✓ (3,92)
T = 0,4a + 3,92

5,88 − 0,6a = 0,4a + 3,92 ✓
a = 1,96 m s⁻² ✓ (5)

4.2.2 When object A exerts a force on object B, object B ***simultaneously*** exerts an ***oppositely directed*** force of ***equal magnitude*** on object A. ✓✓ (2)

4.2.3 Force of the 0,5 kg mass ✓ down ✓ on the pan. (2)

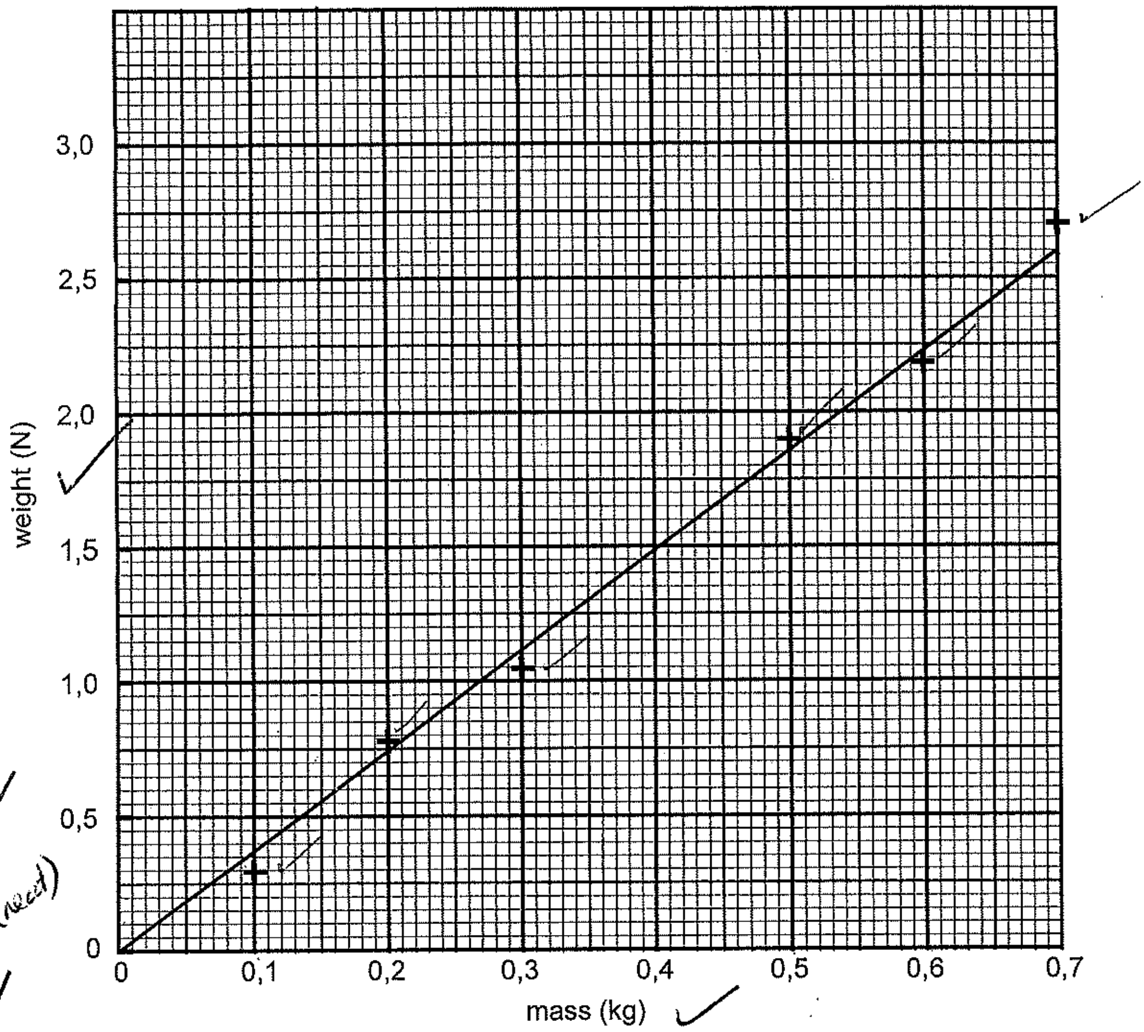
[18]

Question 5:

5.1 Weight is the gravitational force that the earth exerts on an object (on or near its surface) ✓while mass is the quantity of matter in a body. ✓ (2)

5.2 Graph – on answer sheet Heading ✓
y-axis title and unit ✓
x-axis title and unit ✓
scale (plotted points > 1/2 graph paper) ✓
plotted points (accurate and visible to within half a small square) ✓
line of best fit ✓ (6)

Graph to show weight vs mass



5.3 Gradient $= \Delta y/\Delta x$ ✓

= (values must be from LOBF on graph) ✓

Gradient = 3,76 N·kg^{-1} or 3,76 m·s^{-2} (accept 3,56 – 3,96) ✓ **(3)**

5.4 $w = mg$ ✓

Therefore g = gradient

g = 3,76 m·s^{-2} ✓ **(2)**

5.5 mars ✓ (1)

5.6 $g = \frac{GM}{r^2}$ ✓ ✓$0{,}58 = \frac{(6{,}7\times10^{-11})M}{(1{,}19\times10^{6})^2}$ ✓

$M = 1{,}23 \times 10^{22}$ kg ✓ (4)

[18]

Question 6

6.1.1 $n = c \times V$ $n = c \times V$
$= 1,5 \times 0,16$✓ $= 1,5 \times 0,16$
$= 0,24$ mol✓ $= 0,24$ mol (3)

6.1.2 $n = m/M$✓
$= 15/100$✓
$= 0,15$ mol✓
$HNO_3 : CaCO_3 = 2:1$ HNO_3 is the limiting reagent✓ (4)

6.2 $n = v/V_m$✓
$= 3,36/22,4$✓
$= 0,15$ mol Cl_2 produced✓

n (NaCl) reacted = 0,15 x 2 = 0,3 mol✓

m (NaCl) reacted = n x M✓
= 0,3 x 58,5✓
= 17,55 g✓

% purity = 17,55/20 x 100 = 87,8 %✓ (8)

[15]

Question 7:

7.1 NH_3✓
7.2 KBr✓
7.3 Zn✓
7.4 CF_4✓ Ne
7.5 Ne✓
7.6 SiO_2✓

[6]

Question 8:

8.1.1 **An intramolecular bond** occurs between atoms within molecules✓✓ (2)

8.1.2 An intermolecular force is a weak force of attraction between molecules, Ions or atoms of noble gases✓✓ (2)

8.2.1 London Forces✓ (1)

8.2.2 Pure Covalent Bond✓✓ (2)

8.3 Although Iodine and bromine both have London intermolecular forces✓, Iodine has more electrons ✓and therefore sets up larger tempory dipoles✓. More energy is needed ✓to overcome the stronger London forces in Iodine. (4)

8.4 A large amount of energy is needed to break the Many✓ Strong ✓ electrostatic forces ✓in a crystal lattice. between ions not atoms (3)

8.5.1 ion-dipole ✓ (1)

8.5.2 ammonia ✓
Both ammonia and water have strong hydrogen bonds. ✓
The IMF's need to be of similar strength✓ for a substance to dissolve in another (3)

[18]

[Total marks = 130]