

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 = $\frac{1}{2}bh$ ✓ = 29,8 ✓
= $\frac{1}{2}(17,5)(v)$ ✓
∴ $v = 3,41 \text{ m s}^{-1}$ ✓ (3)

2.1.3 Take motion north as positive

$$a = \frac{v_f - v_i}{\Delta t} = \frac{0 - 3,41}{17,5 - 3,5} = -0,24 \text{ m s}^{-2} \text{ ie } 0,24 \text{ m s}^{-2} \text{ south} \checkmark$$

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

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

$$F_{\text{net}} = ma \checkmark$$

$$F_{\text{fk}} = (20)(-0,24) = -4,87 \text{ N i.e. } 4,87 \text{ N south} \checkmark$$

(4)

2.2.1 $v^2 = u^2 + 2as$ ✓
 $0^2 = 4^2 + 2(-9,8)s$ ✓
 $s = 0,82 \text{ m}$ ✓

(3)

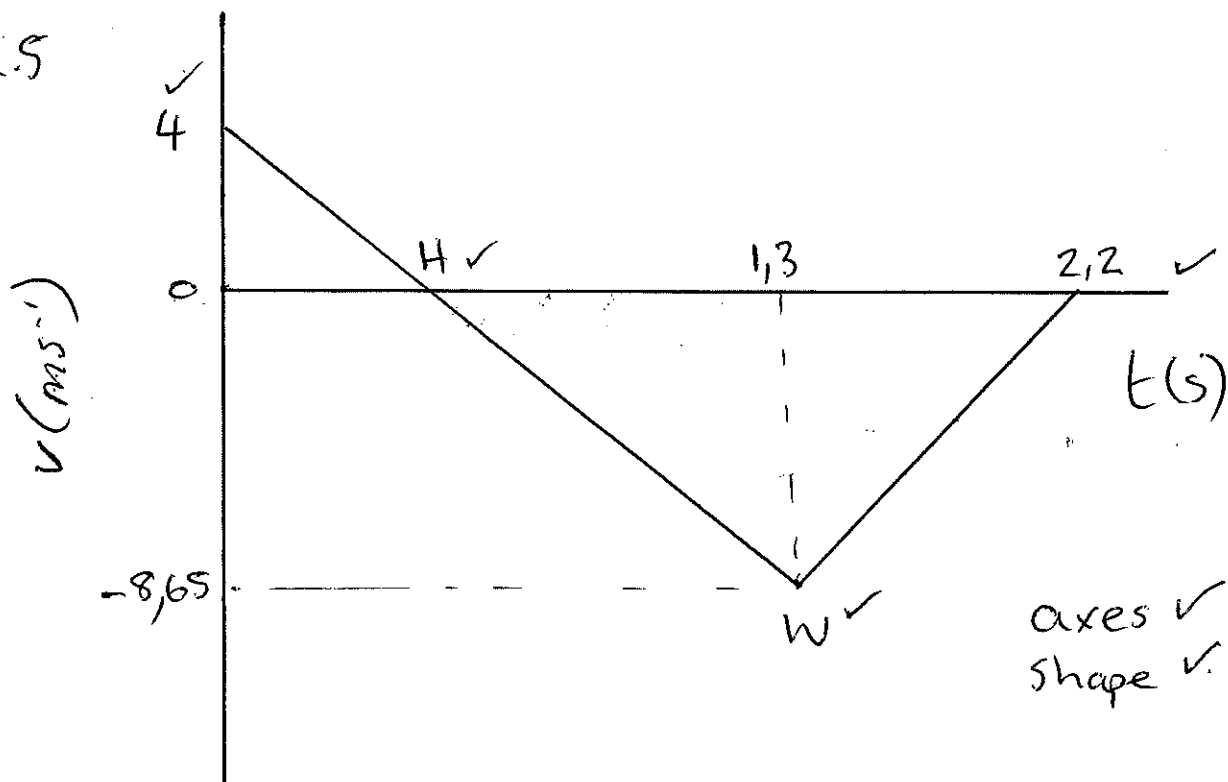
2.2.2 $s = ut + \frac{1}{2}at^2$ ✓
 $= 4(1,3) + \frac{1}{2}(-9,8)(1,3)^2$ ✓
 $= -3,08\text{m}$ ie $3,08\text{m}$ high. ✓ (3)

$t_{\text{up}} = 0,41\text{s}$
 $t_{\text{down}} = 0,89\text{s}$

2.2.3. $v = u + at$ ✓
 $0 = -8,65 + a(0,9)$ ✓
 $a = 9,61\text{ms}^{-2}$ ie $9,61\text{ms}^{-2}$ up. ✓ (3)

2.2.4 $F_{\text{net}} = ma$ ✓
 $= 75 \times 9,61$ ✓
 $= 720,83\text{N}$ ie $720,83\text{N}$ up ✓ (4)

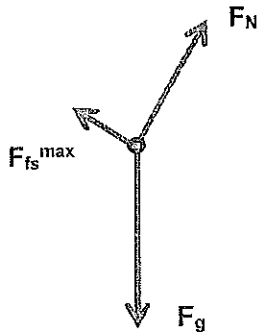
2.2.5



(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)

$$3.2 \quad \mu_s = \frac{F_{fs}^{max}}{F_N} \checkmark = \frac{1382 \checkmark}{(240)(9,8)\cos(36^\circ) \checkmark} = \underline{0.73 \checkmark}$$

1902,81

(4)

3.3.1 Greater than ✓

(1)

$$3.3.2 \quad F_{fs}^{max} = \mu_s F_N \checkmark \quad (\mu_s \text{ is constant})$$

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

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

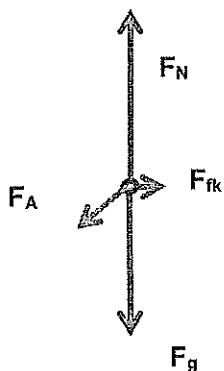
$\therefore F_{fs}^{max}$ is greater on the horizontal surface

(4)

[12]

Question 4: Newton's Laws of Motion

4.1.1



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

$$F_{\text{net}} = ma \checkmark$$

$$480 \cos(37^\circ) \checkmark - F_{\text{fk}} = (200)(0,9) \checkmark$$

$$\therefore F_{\text{fk}} = 203,35 \text{ N} \checkmark$$

$$383,35 - F_{\text{f}} = 200(0,9)$$

(5)

4.2.1 $F_{\text{net}} = ma \checkmark$ LEFT

$$F_g - T = ma$$

$$5,88 - T = 0,6a \checkmark$$

$$-T = 0,6a - 5,88$$

$$T = 5,88 - 0,6a$$

$F_{\text{net}} = ma$ Right.

$$T - F_g = ma$$

$$T - 0,4 \times 9,8 = 0,4a \checkmark$$

$$T = 0,4a + 3,92$$

$$5,88 - 0,6a = 0,4a + 3,92 \checkmark$$

$$a = 1,96 \text{ ms}^{-2} \checkmark$$

(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. $\checkmark \checkmark$ (2)

4.2.3 Force of the 0,5 kg mass down on the pan. \checkmark

(2)

[18]

Question 5:

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

5.2 Graph – on answer sheet Heading \checkmark

y-axis title and unit \checkmark

x-axis title and unit \checkmark

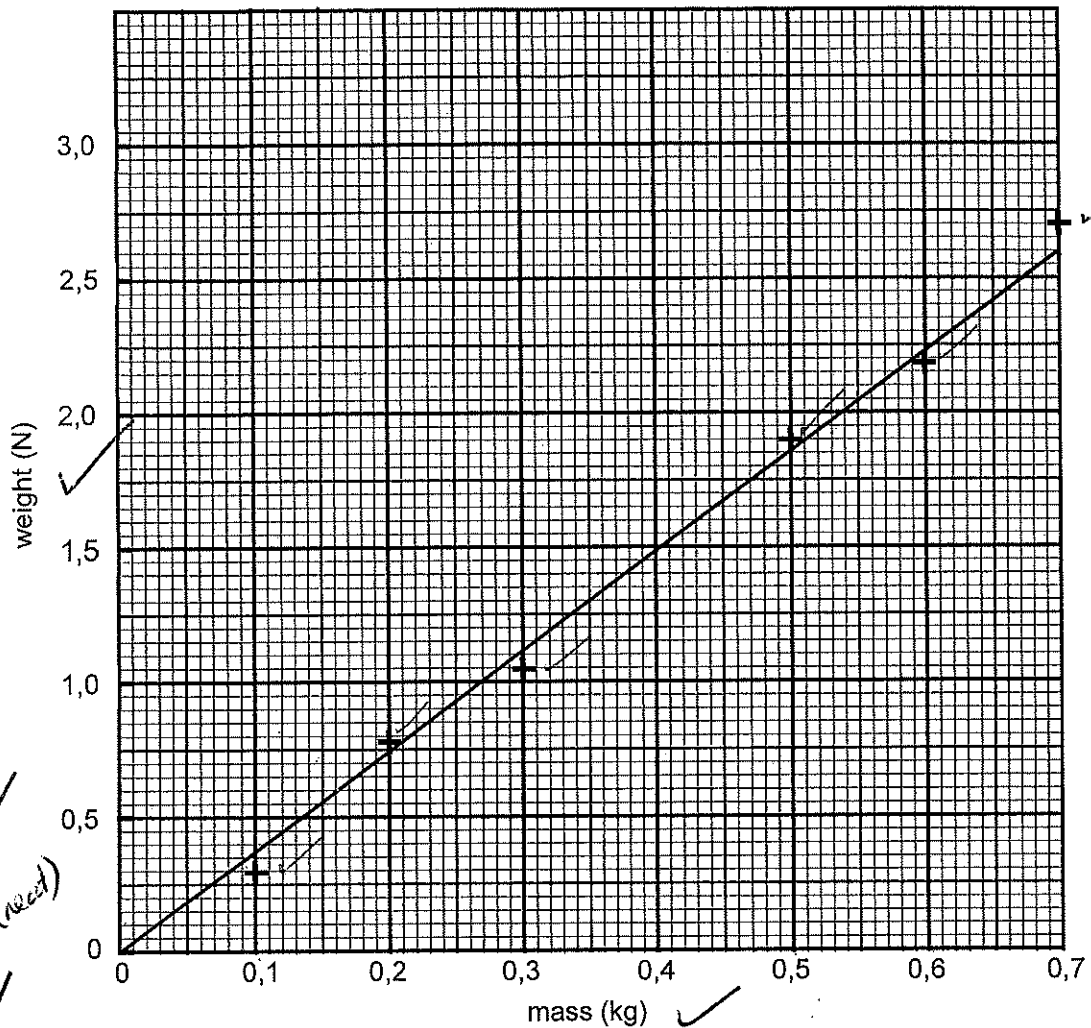
scale (plotted points > 1/2 graph paper) \checkmark

plotted points (accurate and visible to within half a small square) \checkmark

line of best fit \checkmark

(6)

Graph to show weight vs mass ✓



Scale $> \frac{1}{2}$ pg ✓
 Plotted pts ✓
 accurate (best) ✓
 line ✓

5.3 Gradient = $\Delta y / \Delta x$ ✓
 = (values must be from LOBF on graph) ✓
 Gradient = $3,76 \text{ N} \cdot \text{kg}^{-1}$ or $3,76 \text{ m} \cdot \text{s}^{-2}$ (accept $3,56 - 3,96$) ✓ (3)

5.4 $w = mg$ ✓
 Therefore $g = \text{gradient}$

$g = 3,76 \text{ m} \cdot \text{s}^{-2}$ ✓ (2)

5.5 mars ✓ (1)

5.6 $g = \frac{GM}{r^2}$ ✓ $\checkmark 0,58 = \frac{(6,7 \times 10^{-11})M}{(1,19 \times 10^6)^2}$ ✓

$M = 1,23 \times 10^{22} \text{ kg}$ ✓ (4)

[18]

Question 6

6.1.1 $n = c \times v$
 $= 1,5 \times 0,16$
 $= 0,24 \text{ mol}$ (3)

6.1.2 $n = m/M$
 $= 15/100$
 $= 0,15 \text{ mol}$
 $\text{HNO}_3 : \text{CaCO}_3 = 2:1$ HNO_3 is the limiting reagent (4)

6.2 $n = v/V_m$
 $= 3,36/22,4$
 $= 0,15 \text{ mol Cl}_2 \text{ produced}$

$n(\text{NaCl}) \text{ reacted} = 0,15 \times 2 = 0,3 \text{ mol}$

$m(\text{NaCl}) \text{ reacted} = n \times M$
 $= 0,3 \times 58,5$
 $= 17,55 \text{ g}$

$\% \text{ purity} = 17,55/20 \times 100 = 87,8 \%$ (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 temporary 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]

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