NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES: CONTROLLED TEST 2
23 SEPTEMBER 2015
MEMORANDUM

MARKS: 100
DURATION: 2HOURS

This memorandum consists of 6 pages.

QUESTION 1

1.1. B ✓✓

1.2. B ✓✓

1.3. A ✓✓

1.4. A ✓✓

1.5. B ✓✓

1.6. C ✓✓ (12)

QUESTION 2

2.1.1 Starts from rest/0 $m \cdot s^{-1}$ ✓
Velocity increases at a constant rate✓
until he reaches 2,5 $m \cdot s^{-1}$ after 25 s. ✓

OR

Starts from rest/0 $m \cdot s^{-1}$ ✓
Constant positive acceleration ✓
until he reaches 2,5 $m \cdot s^{-1}$ after 25 s. ✓ **(3)**

2.1.2 Constant/uniform velocity ✓
for another 25 s. ✓
OR
Zero/No acceleration ✓
for another 25 s. ✓

OR

Velocity remains 2,5 $m \cdot s^{-1}$ in the direction of motion ✓
for another 25 s. ✓ **(2)**

2.2.1 $\boldsymbol{acceleration} = \frac{\Delta v}{\Delta t}$ ✓

$= \frac{0-2.5}{100-80}$ ✓

$= -0.0625$

a = 0,063 $m \cdot s^{-2}$ ✓ opposite to direction of motion✓ **(4)**

2.2.2 Length of track = Area between the graph and the time axis ✓
= ½ (2.5) ✓ (35+100) ✓
= 168.75 m ✓

OR

Length of track = Area of trapezium ✓
= ½ (2.5) ✓ (35+100) ✓
= 168.75 m ✓

OR

Length of track = Area between the graph and the time axis
= ½ bh + ½ bh +lb
= ½ (2.5)✓ + ½ (40)(2.5)✓+ (35)(2.5)✓
= 31.2 +87.5 + 50
= 168.75 m✓ **(4)**

[13]

QUESTION 3

3.1 To compensate for friction ✓✓

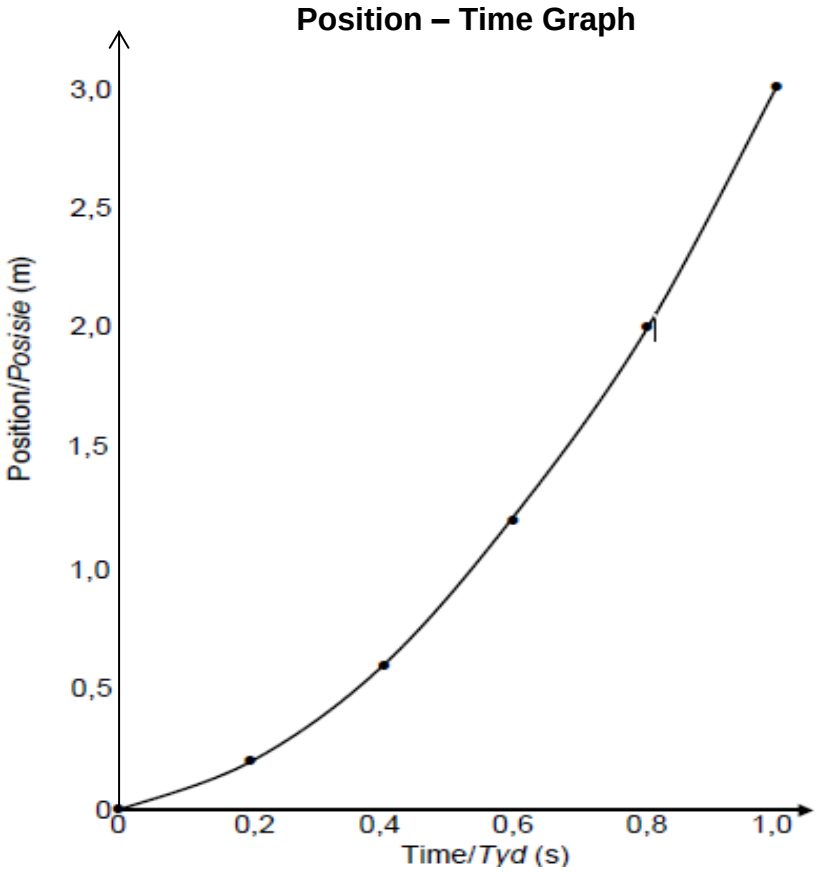
Or

To ensure✓ that the trolley moves at a constant acceleration ✓ (2)

3.2.1 Time ✓✓ (2)

3.2.2 Displacement ✓✓ (2)

3.3



Graph Marking Criteria

- **Suitable heading ✓**
- **Appropriate scale on both axes ✓**
- **Any three points plotted correctly ✓**
- **All six points plotted correctly ✓**
- **Curve joining the points ✓**

(5)

3.4 Uniformly accelerated motion ✓
The gradient of the graph increases constantly✓ **OR (the velocity increases constantly each 0.2 s)✓** (2)

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QUESTION 4

4.1.1 Acceleration ✓✓ **(2)**

4.1.2 Straight line ✓✓ **(2)**

4.2 $15\ m.s^{-1} = (60)\left(\frac{3600}{1000}\right)$ ✓ $km.h^{-1} = 54\ km.h^{-1}$ ✓ $<\ 60\ km.h^{-1}$

No ✓/ He did not

Or

$\mathbf{60\ km.h^{-1}} = (\mathbf{60})\left(\frac{\mathbf{1000}}{\mathbf{3600}}\right)$ ✓ $\mathbf{m.s^{-1} = 16.67\ m.s^{-1}}$ ✓ $>$ $\mathbf{15\ m.s^{-1}}$

No✓ / he did not **(3)**

4.3

Option 1
$\Delta x = v_i \Delta t$ ✓ = 15(1) ✓ = $15\ m.s^{-1}$ ✓
Option 2
$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓ $\Delta x = 15(1) + \frac{1}{2}(0)(1)^2$ ✓ = 15 m ✓
Option 3
$\Delta x = \left(\frac{v_f + v_i}{2}\right) \Delta t$ ✓ $\Delta x = \left(\frac{15+15}{2}\right)(1)$ ✓ = $15\ m.s^{-1}$ ✓

(3)

4.4. Braking distance

$\Delta x = \left(\frac{v_f + v_i}{2}\right) \Delta t$ ✓

$\Delta x = \left(\frac{0+15}{2}\right)$ ✓(3) ✓

= $22.5\ m$

Total stopping distance = 22.5 +15 ✓

= 37.5 m ✓

Yes ✓/ he will stop the pedestrian crossing. (6)

4.5. Increases✓, for the same change in velocity✓ the stopping time will increase ✓ **(3)**

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QUESTION 5 (Start on a new page.)

5.1 No free electrons ✓✓ (2)

5.2 Electrolyte ✓✓ (2)

5.3 NH_4^+ ✓ and NO_3^- ✓ (2)

5.4

OPTION 1	**OPTION 2**
$n(NH_4NO_3) = \frac{m}{M}$ ✓ $= \frac{15}{80}$ ✓ $= 0.19\ mol$ $c(NH_4NO_3) = \frac{n}{V}$ ✓ $= \frac{0.19}{250 \times 10^{-3}}$ ✓ $= 0.75\ mol.dm^{-3}$✓	$c(NH_4NO_3) = \frac{m}{MV}$ ✓✓ $= \frac{15\ ✓}{80(250 \times 10^{-3})✓}$ $= 0.75\ mol.dm^{-3}$ ✓

(5)

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QUESTION 6 (Start on a new page.)

6.1

6.1.1 Barium sulphate ✓; $BaSO_4$ ✓ **(2)**

6.1.2 To ensure that the precipitate is indeed a sulphate ✓✓/ Barium sulphate is insoluble in nitric acid ✓✓ **(2)**

6.1.3 B ✓✓ **(2)**

6.2

6.2.1 $BaCl_2\,(aq) + MgSO_4(aq)$✓ $\rightarrow BaSO_4(s) + MgCl_2\,(aq)$✓ bal ✓ phases ✓ **(4)**

6.2.2 Precipitation reaction ✓✓ **(2)**

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QUESTION 7 (Start on a new page.)

7.1

7.1.1 $n(Mg) = \frac{m}{M}$ ✓
$= \frac{1.5}{24}$ ✓
$= 0.0625\ mol$

$n(H_2) = nMg = 0.0625\ mol$ ✓
$m(H_2) = nM$
$= (0.0625)(2)$ ✓
$= 0.125\ g$ ✓

(5)

7.1.2 $n(H_2) = \frac{V}{V_m}$

$0.0625\checkmark = \frac{V}{22.4}\checkmark$

$V = 1.4\ dm^{-3}\ \checkmark$ (3)

7.1.3 $n(MgCl_2) = \frac{m}{M}\ \checkmark$

$0.0625\checkmark = \frac{m}{95}\checkmark$

$m = 5.95\ g\ \checkmark$ (4)

7.1.4 $n(Cl) = \frac{N}{N_A}\ \checkmark$

$2(0.0625) = \frac{N}{6.02 \times 10^{23}}\checkmark$

$N\ (Cl\ atoms) = 7.53 \times 10^{22}\ \checkmark$ (3)

7.2

7.2.1 The formula which gives the simplest whole number ratio in the compound ✓✓ (2)

7.2.2 In 100 g of compound
$71.65\ g\ Cl, 24.27\ g\ C\ and\ 4.07 g\ H$

$n(Cl) = \frac{71.65}{35.5} = 2.02\ mol\ \checkmark$

$n(C) = \frac{24.27}{12} = 2.02\ mol\ \checkmark$

$n(H) = \frac{4.07}{1} = 4.07\ mol\ \checkmark$

Whole number ratio

$\frac{2.02}{2.02} : \frac{2.02}{2.02} : \frac{4.07}{2.02}\ \checkmark$

$C : Cl : H = 1:2:1$

Empirical formula is $CH_2Cl\ \checkmark$ (5)

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TOTAL MARKS: 100