Province of the
EASTERN CAPE
EDUCATION

ORTID DISTRICT

GRADE 11

Stanmorephysics.com

PHYSICAL SCIENCES

Controlled Test

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MEMORANDUM

MARKS: 100

THIS MEMORANDUM CONSISTS OF SIX PAGES

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QUESTION 1

1.1 A ✓✓
1.2 C✓✓
1.3 D✓✓
1.4 A✓✓
1.5 D✓✓
1.6 B✓✓
1.7 C✓✓
1.8 C✓✓

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QUESTION 2

2.1 Activated complex is the unstable transition state from reactants to products. ✓✓ (2)

2.2 Exothermic ✓. $H_{products} < H_{reactants}$ ✓/The energy of the products is less than the energy of the reactants (2)

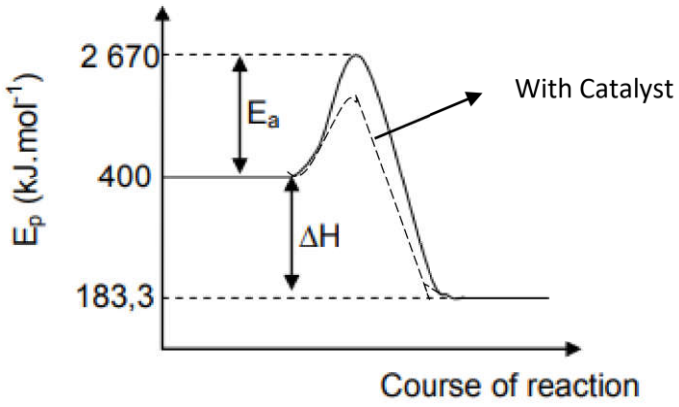
2.3.1 2670 $kJ.mol^{-1}$ ✓✓ (2)

2.3.2 2270 $kJ.mol^{-1}$ ✓✓ (2)

2.3.3 $\Delta H = -216.7\ kJ.mol^{-1}$ ✓✓ (2)

2.3.4 2486.7 $kJ.mol^{-1}$ ✓✓ (2)

2.4.1



(2)

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QUESTION 3

3.1 A base is a proton/H+ ion acceptor. ✓✓ (2)

3.2 H_2O/Water ✓✓ (2)

3.3 H_2O/ OH^-✓✓ (4)
NH_4^+/ NH_3✓✓

3.4 BASIC (ALKALINE) ✓ (2)
There is presence of OH^- ions in solution. ✓

3.5.1 H_2O ✓✓ (2)

3.5.2 $\underline{H_2SO_4 + H_2O}$ ✓ ⇌ $H_3O^+ + SO_4^{2-}$ ✓ Balanced ✓ (3)

3.6 An acid-base indicator is a weak acid, or a weak base, which colour changes as the H^+ ion concentration or the OH^- ion concentration in a solution changes. ✓✓ (2)

3.7.1 Concentration is the amount of solute per litre of solution. ✓✓ (2)

3.7.2 Option 1

$c = \frac{m}{MV}$ ✓

$c = \frac{0.365}{(36.5✓)(0.5✓)}$

$c = 0.02\ mol.dm^{-3}$ ✓

Option 2

$n = \frac{m}{M}$

$n = \frac{0.365}{36.5✓}$

$n = 0.01\ mol$ ✓

$c = \frac{n}{V}$

$c = \frac{0.01}{0.5✓}$

$c = 0.02\ mol.dm^{-3}$ ✓ (4)

3.7.3 1 : 1✓ (2)

$c(HCℓ) = c(H_3O^+)$

$c(H_3O^+) = 0.02\ mol.dm^{-3}$✓

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QUESTION 4

4.1 Empirical formula as the simplest whole-number ratio of atoms in a compound. ✓✓ (2)

4.2 $n\ \frac{m}{M}$

$n(C) = \frac{75.95}{12}$✓ = 6.329

$n(N) = \frac{17.72}{14}$✓ = 1.266

$n(H) = \frac{6.33}{1}$ ✓= 6.33

C : N : H

$\frac{6.329}{1.266} : \frac{1.266}{1.266} : \frac{6.33}{1.266}$ ✓

5 : 1 : 5

C_5H_5N✓ (5)

4.3 $n = \frac{240}{79} = 3$ ✓ (2)

$C_{15}H_{15}N_3$ ✓

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QUESTION 5

5.1.1 Limiting reagent in a reaction is the reactant that is consumed completely. ✓✓ (2)

5.1.2 $n(Na) = \frac{m}{M}$ ✓

$n(Na) = \frac{483}{23}$ ✓

$n(Na) = 21\ mol$ ✓

$Na : O_2$

4 : 1✓

$\frac{21}{4} : \frac{5.8}{1}$

5.25 < 5.8✓

$Na\ is\ a\ limiting\ reagent$ ✓ (6)

5.1.3 $Na : Na_2O$

4 : 2 ✓

21 : n

$n(Na_2O) = 10.5\ mol$✓

$10.5 = \frac{m}{62}$

$m = 651$g ✓ (3)

5.1.4 $Na : O_2$

4 : 1

21 : n

$n(O_2)$ = 5.25 mol

$n\ (O_2) = \frac{V}{V_m}$ ✓

$5.25 = \frac{V}{22.4}$ ✓

V = 117. 6 dm^3 ✓ (3)

5.2.1 $M_{reacted}$ = 15 x 0.925%

= 13.88 g✓

$n\ (Mg(OH)_2) = \frac{m}{M}$

$= \frac{13.875}{58}$✓

= 0.2392 mol

$Mg(OH)_2 : Mg_3(PO_4)_2$

3 : 1✓

0.2392 : n

n = 0.07973 mol

$0.07973 = \frac{m}{262}$ ✓

n = 20.88926 g✓

$\%Yield = \frac{Actual\ mass}{theoretical} \times 100$

$100 = \frac{Actual\ mass}{20.88926} \times 100$ ✓

m = 20.89 g✓

(7)
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QUESTION 6

6.1 One mole of any gas occupies the same volume at the same temperature and pressure✓✓ (2)

6.2.1 $n\ (SO_3) = \frac{m}{M}$

$n\ (SO_3) = \frac{4}{80}$ ✓

$n\ (SO_3) = 0.05\ mol$ ✓

$SO_3 : SO_2$

2 : 2

$n\ (SO_3) = n\ (SO_2)$

$n\ (SO_2)$ = 0.05 mol✓ (3)

6.2.2 $n = \frac{V}{V_m}$ ✓

$0.05 = \frac{V}{22.4}$ ✓

V = 1.12 dm^3✓

(3)

6.2.3 $SO_2 : O_2$

2 : 1 ✓

0.05 : n

$n(O_2)$ = 0.025mol✓

$m\ (O_2) = 0.025 \times 32$ ✓

$m\ (O_2) = 0.8$ g✓ (4)

6.3 $C_4H_{10} + O_2 \rightarrow CO_2$ ✓+ H_2O✓ (2)

[14]
[100]