GR 11 Physical Sciences Paper 2 June 2019 MEMO

1.1 D
1.2 B
1.3 A
1.4 D
1.5 D
1.6 B
1.7 B
1.8 B
1.9 B
1.10 A

2.1 The **minimum** amount of energy needed to start a reaction. ✓ (1)

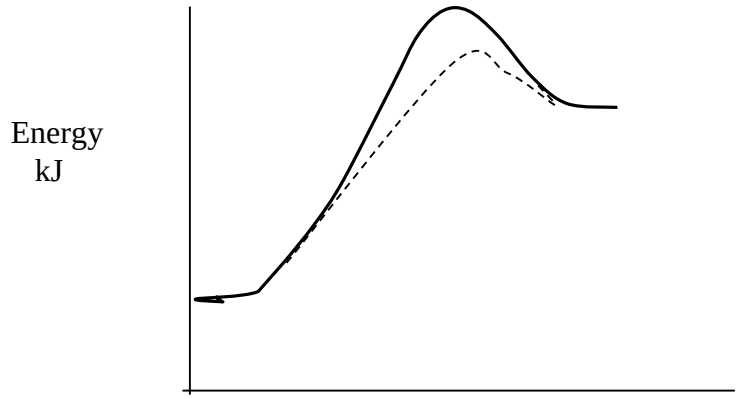
2.2 65 kJ ✓ (1)

2.3 185 Kj ✓

2.4 ΔH = E(products) – E(reactants) ✓
= - 30 – 90
= - 120 kJ ✓ (2)

2.5 EXOTHERMIC. The product's energy is lower that the reactant's energy ✓✓
OR
More energy is relaeased that absorbed.✓✓ (2)

2.6



✓endo graph
✓dotted line

3.1 Pressure - 1 atm or 101,3 kPa ✓
Temperature - 0°C or 273 K ✓ 2

3.2 NH_3: $n = \frac{m}{M}$
$= \frac{750}{1(14)+3(1)} = 17$
$= 44,12$ mol ✓mol NH_3

O_2: $n = \frac{m}{M}$ ✓formula
$= \frac{750}{2(16)} = 32$
$= 23,44$ mol ✓mol O_2

O_2 : NH_3
5 : 4
× 23,44 : n
$5n = 93,76$
$\therefore n = 18,75$ mol NH_3 needed if O_2 limiting

$\therefore O_2$ is the limiting reactant. ✓conclusion 4

3.3 NO : O_2
4 : 5
× n : 23,44
$5n = 93,76$
$n = 18,752$ mol ✓mol NO

$n = \frac{m}{M}$
$18,752 = \frac{m}{14+16} (= 30)$ ✓subst.
$\therefore m = 562,56$ g ✓answer 3

[9]

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⊕-marking: 3.2 → NH_3 limiting ×

3.3 NO : NH_3
4 : 4
× n : 44,12
$4n = 176,48$
$\therefore n = 44,12$ mol (✓mol NO)

$n = \frac{m}{M}$
$44,12 = \frac{m}{14+16} (= 30)$ ✓subst.
$\therefore m = 1323,6$ g ✓answer 3

4.1 Concentration is the number of moles of solute per volume of solution. ✓✓ 2

4.2 $C_9H_8O_4$ + $NaOH$ → $C_9H_7O_4Na$ + H_2O

$c = 0,7\ mol.dm^{-3}$

$V = 50\ cm^3 = 0,05\ dm^3$

$n = cV$ ✓formula [or $c = \frac{n}{V}$]

$= (0,7)(0,05)$ ✓subst.

$= 0,035\ mol$ ✓ans.

$n = 0,035\ mol$ ✓ratio

$n = \frac{m}{M}$ ✓formula

$0,035 = \frac{m}{9(12)+8(1)+4(16)}$ $(= 180)$ ✓subst.

$\therefore m_{pure} = 6,3\ g$ ✓ans.

$\%\ Purity = \frac{m_{pure}}{m_{total}} \times 100$

$= \frac{6,3}{7} \times 100$

$= 90\%$ ✓ans. 8

4.3 $multiple = \frac{360}{180} = 2$ ✓ ∴ Molecular Formula: $2(C_9H_8O_4)$

$= C_{18}H_{16}O_8$ ✓✓ 3

[12]

5.1 Bond order increases ✓, Multiple bonds <u>need more energy</u>✓ to be broken.

5.2 S is a bigger atom✓ – weaker bond✓

5.3 Energy released = $2 \times 707 = 1414$ kJ.mol^{-1}

5.4 Covalent

5.5 Overlapping of $\frac{1}{2}$-filled orbitals between non-metals

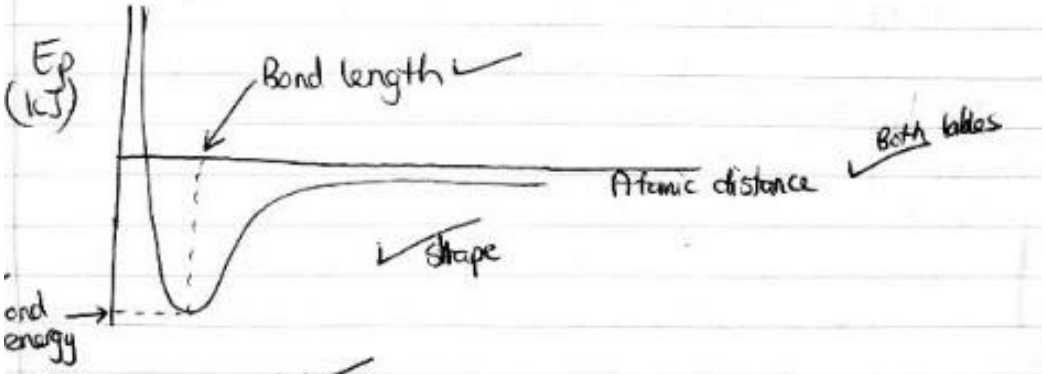
5.6 ΔH = energy in − energy out

$= 4(413) + 2(498) - (1414 + 4 \times 463)$

$= -618$ kJ.mol^{-1}

$\Delta H < 0$, ∴ exothermic

5.7



5.8 Ar is noble gas, has full orbitals, no overlapping of $\frac{1}{2}$-filled orbitals possible. Repelling forces strong

6.1 

6.2.1 hydronium / oxonium ✓

6.2.2 dative covalent bond ✓

6.2.3 empty orbital ✓, lone pair on other molecule ✓

6.3.1 A: linear ✓ B: trigonal planar ✓ C: tetrahedral ✓

6.3.2 BCl_3 (BF_3) ✓

no lone pairs on the central atom ✓ (according to VSEPR)

6.3.4 VSEPR ✓

7.1 $P_1V_1 = P_2V_2$ ✓

$(20)(V) = P_2(V+2)$ ✓

$\frac{20V}{V+2} = P_2$ ✓

7.2.1 Charle's law ✓

7.2.2 The volume of an enclosed gas is directly ✓ prop. to absolute Temperature ✓ at constant pressure. ✓

7.2.3 $pV = nRT$ ✓

$(101,3 \times 10^3)(50 \times 10^{-3}) = n\,(8,31)(373)$ ✓

$n = 1,63$ mol. ✓

7.2.4 Less ✓

7.2.5