



HILLCREST HIGH SCHOOL
PHYSICAL SCIENCE
GRADE 11
PAPER 2- Chemistry



NOVEMBER 2022 MEMO

TIME: 2 HRS

Total 100

Section A

Question 1

- 1.1 A
1.2 C
1.3 C
1.4 C
1.5 B

[10]

Question 2

$$2.1.1 \quad \% \text{ Composition} = \frac{5 \times 18}{(63,5 + 32 + 4 \times 16 + 5 \times 18)} \times 100 \checkmark$$
$$= 36,07 \% \checkmark$$

(3)



$$m = 55 \text{ g}$$

$$n = m/M$$
$$= 55 / 159,5 \checkmark$$

$$= 0,3448 \text{ mol}$$

$$n = 0,3448 \div 1 \times 5 \checkmark$$

$$= 1,7241 \text{ mol}$$

$$V = n \times V_m \checkmark$$

$$= 1,7241 \times 30,6 \checkmark m$$

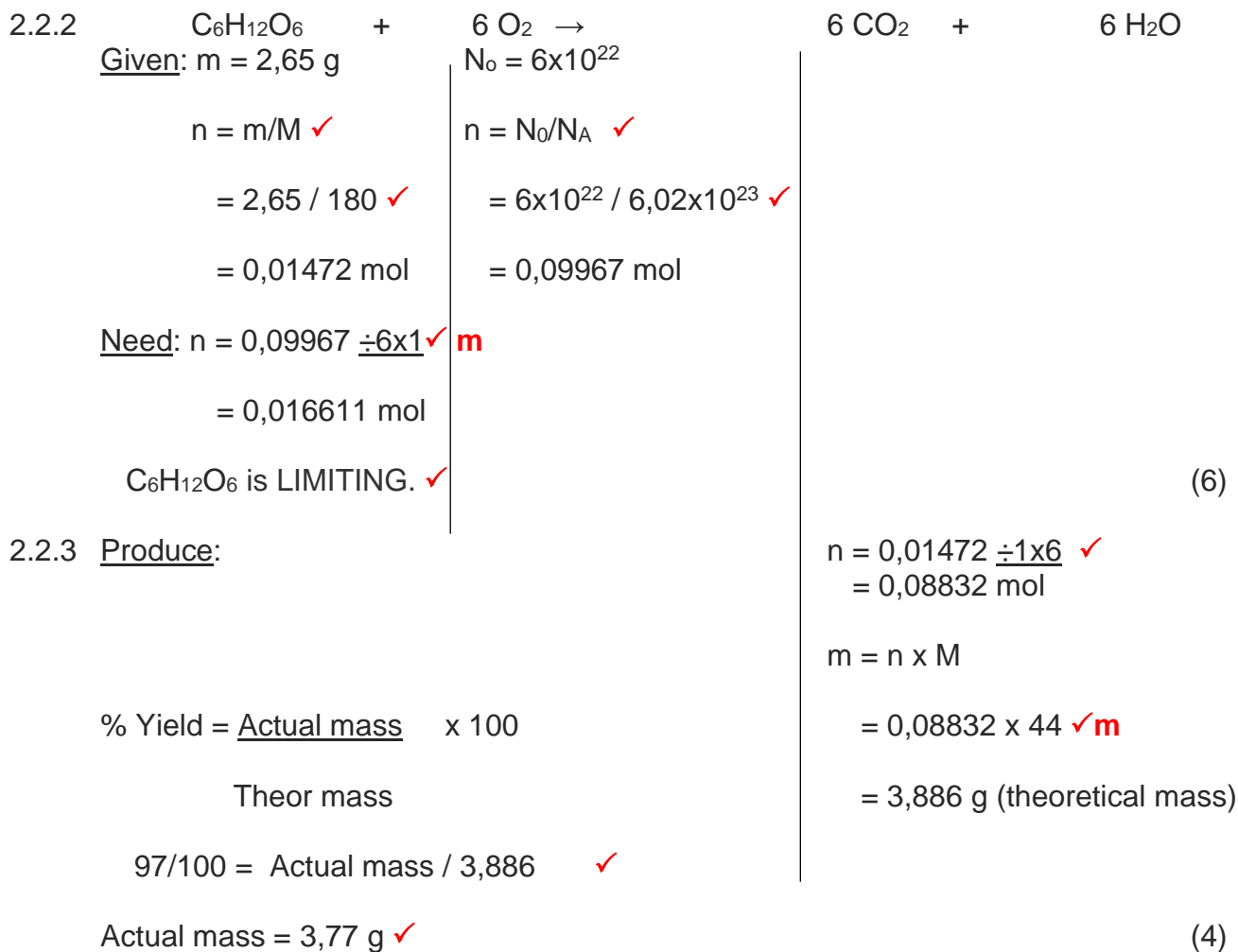
$$= 52,76 \text{ dm}^3 \checkmark$$

(5)

2.2

2.2.1 EXOTHERMIC \checkmark

(1)



[19]

Question 3

- 3.1 Experiment 2. ✓ This reaction had the faster rate. ✓ An increase in surface area increases the number of particles exposed ✓ at the surface for collisions to occur. Therefore more effective collisions per unit time. ✓ (4)
- 3.2 Avg rate = $\Delta m / \Delta t$ ✓
- $= \frac{20 - 60}{13 - 0}$ ✓
- $= (-) 3,08 \text{ g.s}^{-1}$ ✓ (3)
- 3.3 A catalyst is a substance that increases the rate of a chemical reaction without itself undergoing a permanent change. ✓✓ (2)
- 3.4 A catalyst would lower the activation energy ✓ for the reaction, thus allowing more particles to have sufficient energy ✓ to react. This would result in more effective collisions, and so more effective collisions per unit time. ✓ (3)
- 3.5 Increase temperature OR Increase hydrochloric acid concentration ✓ (**either one**) (1)

[13]

Question 4

4.1 A *strong base* dissociates completely in water to form a high concentration of OH⁻ ions. ✓✓ (2)

4.2 Burette ✓

- read at the bottom of the meniscus ✓

- eye level with meniscus (to avoid error of parallax) ✓ (3)

4.3 yellow to orange ✓ (**both colours**) (1)

4.4.1 DECREASES ✓ (1)

4.4.2 DECREASES ✓ (1)

4.4.3 DECREASES ✓ (1)

4.5.1 [OH] = 0,1 x 2 ✓ = 0,2 mol.dm⁻³

pOH = -log [OH] = -log (0,2) ✓ = 0,69897

pH = 14 - 0,69897 ✓ = 13,30 ✓ (4)

or

[OH⁻] = 2 x 0,1 ✓

= 0,2 mol.dm⁻³

[H₃O⁺][OH⁻] = 1 x 10⁻¹⁴

[H₃O⁺][0,2] = 1 x 10⁻¹⁴ ✓

[H₃O]⁺ = 5 x 10⁻¹⁴ mol.dm⁻³

pH = -log[H₃O⁺]

= -log[5 x 10⁻¹⁴] ✓

= 13,3 ✓

4.5.2 **H₂SO₄ (aq) + Ba(OH)₂(aq) → BaSO₄(s) + 2H₂O(l)**

Given:

$$V = 50/1000$$

$$= 0,05 \text{ dm}^3$$

$$C = 0,1 \text{ mol.dm}^{-3}$$

$$n = C \times V \checkmark$$

$$= 0,05 \times 0,1 \checkmark$$

$$= 0,005 \text{ mol}$$

Produce:

$$n = 0,005 \div 1 \times 1 \checkmark$$

$$= 0,005 \text{ mol}$$

$$m = n \times M$$

$$= 0,005 \times 233 \checkmark \text{ m}$$

$$= 1,17 \text{ g} \quad \checkmark \quad (5)$$

$$4.5.3 \quad \frac{n_a}{n_b} = \frac{C_a V_a}{C_b V_b} \quad \checkmark$$

$$\frac{1}{1} \checkmark = \frac{C_a \times 0,03}{0,1 \times 0,05} \quad \checkmark$$

$$C_a = 0,17 \text{ mol.dm}^{-3} \quad \checkmark \quad (4)$$

[22]

Question 5

5.1 A *covalent bond* is one where there is sharing of electrons between two atoms to form a molecule. $\checkmark\checkmark$ (2)

5.2

$$\text{:}\ddot{\text{O}}\text{:}\times\text{C}\times\text{:}\ddot{\text{O}}\text{:} \quad \checkmark\checkmark$$

(2)

5.3 HBr – Dipole-dipole forces \checkmark

H₂O – Strong Hydrogen bonds \checkmark

Dipole-dipole forces are weaker than Hydrogen bonds \checkmark therefore the melting and boiling point of water is higher than that of HBr \checkmark

OR:

Hydrogen bonds are stronger than Dipole-dipole forces \checkmark therefore the melting and boiling point of HBr is lower than that of H₂O \checkmark (4)

5.4 He / helium \checkmark (1)

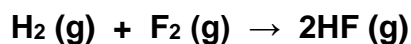
5.5 CH₄ molecule is NON-POLAR. \checkmark

Each bond between C and H is polar \checkmark because the electronegativity difference between C and H is $2,5 - 2,1 = 0,4$ \checkmark . However, the molecule is a tetrahedral shape, which is symmetrical \checkmark , and therefore the charge is evenly distributed and so the molecule is non-polar. (4)

[13]

Question 6

Consider the following chemical equation which represents a redox reaction:



6.1 Hydrogen \checkmark (1)

6.2 $\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$ $\checkmark\checkmark$ (2)

[3]

Question 7

7.1 chemical to electrical ✓ (1)

7.2 $\text{Ni(s)} \mid \text{Ni}^{2+}(\text{aq})(1\text{mol}\cdot\text{dm}^{-3}) \parallel \text{Fe}^{3+}(\text{aq})(1\text{mol}\cdot\text{dm}^{-3}) \mid \text{Fe(s)}$ (3)

✓ ✓ ✓

7.3 $E_{\text{cell}} = E_{\text{red}} - E_{\text{ox}}$ ✓
 $= -0,06 - (-0,27)$ ✓
 $= 0,21\text{ V}$ ✓ (4)

7.4 The temperature is not 25C / The concentration of the electrolytes is not 1 mol.dm⁻³. ✓ (either one) (1)

7.5 $3\text{Ni(s)} + 2\text{Fe}^{3+}(\text{aq}) \rightarrow 3\text{Ni}^{2+}(\text{aq}) + 2\text{Fe(s)}$

Produce:

$$m = 0,87\text{ g}$$

$$n = m/M$$

$$= 0,87/56$$

$$= 0,0155\text{ mol}$$

Used:

$$n = 0,0155 \div 2 \times 3$$

$$= 0,0233\text{ mol}$$

$$m = n \times M$$

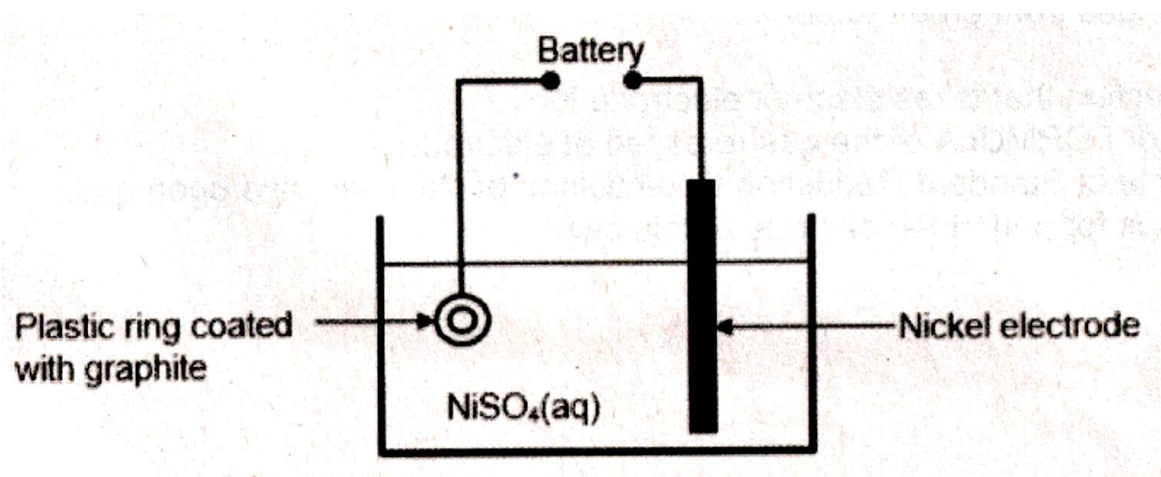
$$= 0,0233 \times 59$$

$$= 1,37\text{ g}$$

(4)

[13]

Question 8



8.1 $\text{Ni}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Ni(s)}$ ✓✓ (-1 if no phase symbols) (2)

- 8.2 The RING. ✓ (1)
- 8.3 A substance of which the aqueous solution contains ions / a substance that dissolves in water to give a solution that conducts electricity. ✓✓ (2)
- 8.4 NO CHANGE. ✓ The rate of reduction at the cathode is equal to the rate of oxidation at the anode. ✓ (2)

[7]

Total 100