



education

Department:
Education
PROVINCE OF KWAZULU-NATAL

PHYSICAL SCIENCES P2 (CHEMISTRY)

COMMON TEST

JUNE 2019

MARKING GUIDELINE

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

TIME: 2 hours

MARKS: 100

This marking guideline consists of 7 pages.

QUESTION 1

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

7x2 = (14)

QUESTION 2

- 2.1.1 A✓ and I✓ (2)
- 2.1.2. (B and F) ✓✓ OR (D and F) (2 or 0) (2)
- 2.1.3. G ✓ (1)
- 2.1.4. G✓ (1)
- 2.1.5. C ✓ (1)
- 2.1.6. E ✓ (1)

2.2 H₂O has hydrogen bonding ✓ and H₂S has dipole- dipole forces. ✓ The intermolecular forces in water are stronger ✓ Therefore more energy is required to break the IMF in water. ✓ (4)



2.4.1 NON- POLAR ✓
 CO₂ is a symmetrical molecule with even distribution of electrons ✓
 There is no net dipole moment/dipoles cancel out ✓/. There is no distinct opposite positive and negative ends. (3)

2.4.2 London forces ✓ (1)

[18]

QUESTION 3

- 3.1. Capillarity / height ✓ (1)
- 3.2. Nail polish remover ✓ (1)
- 3.3. It has the weakest intermolecular forces /cohesive forces ✓ molecules separate easily. ✓ The adhesive forces are stronger than the cohesive forces/IMF ✓ (3)
- 3.4. Nail polish remover; water ; glycerine ✓✓ (2)
- 3.5 Glycerine ✓ (1)

[8]**QUESTION 4**

- 4.1.1 Charle's Law --✓ The volume of an enclosed gas is directly proportional to its Kelvin temperature provided the pressure is kept constant. ✓✓ (3)
- 4.1.2. Amount/mass of gas ✓ (1)
- 4.1.3. volume is directly proportional to Kelvin temperature/ $V \propto T$ ✓ / volume is linearly proportional to Celsius temperature
ACCEPT As temperature increases, volume increases. (1)
- 4.1.4. P_3 ✓ (1)
- 4.1.5. From $pV = nRT$, gradient which is V/T is equal to nR/P . ✓ Since R and n are constant, ✓ Gradient is inversely proportional to the pressure/ higher pressure represents smaller gradient. ✓ (3)

OR

From Boyles law --- at a constant temperature, ✓ the gas with the highest volume will have the lowest pressure ✓ $pV = k$ ✓

4.2.

OPTION 1

$$\text{Change in pressure} = 100 - 55 = 45 \text{ kPa} \checkmark$$

$$pV = nRT \checkmark$$

$$45 \times 10^3 \times 10 \times 10^{-3} \checkmark = n \times 8.31 \times 298 \checkmark$$

$$n = 0.182 \text{ mol} \checkmark$$

$$n = m/M \checkmark$$

$$0.182 = m/32 \checkmark$$

$$m = 5.824 \text{ g} \checkmark \text{ of O}_2 \text{ is lost}$$

OPTION 2

$$pV = nRT \checkmark$$

$$100 \times 10^3 \times 10 \times 10^{-3} = n \times 8.31 \times 298 \checkmark$$

$n = 0.404 \text{ mol}$ (original no. of moles of oxygen in vessel)

$$pV = nRT$$

$$55 \times 10^3 \times 10 \times 10^{-3} = n \times 8.31 \times 298 \checkmark$$

$n = 0.222 \text{ mol}$ (no of mol in vessel after leak is repaired)

no of moles of gas leaked

$$= 0.404 - 0.222 \checkmark$$

$$= 0.182 \text{ mol} \checkmark$$

$$n = m/M \checkmark$$

$$0.182 = m/32 \checkmark$$

$$m = 5.824 \text{ g} \checkmark \text{ of O}_2 \text{ is lost}$$

NB: ACCEPT p values in kPa with V values in dm^3

(8)

[17]**QUESTION 5**

5.1 Simplest whole number ratio in which elements in a compound combine $\checkmark \checkmark$ (2)

5.2.

Element	Mass per 100 g	$n = m/M$ (mol)	Simplest ratio
C	54.56	$54.56/12 = 4.547 \checkmark$	$4.547/2.2725 = 2$
H	$9.08 \checkmark$	$9.08/1 = 9.08 \checkmark$	$9.08/2.2725 = 4$ \checkmark
O	36.36	$36.36/16 = 2.2725 \checkmark$	$2.2725/2.2725 = 1$

Empirical formula is $\text{C}_2\text{H}_4\text{O} \checkmark$ (6)

5.3 $n = \text{True } M_r / \text{Empirical } M_r$

$$= 132/44$$

$$= 3 \checkmark$$

Molecular formula is $\text{C}_6\text{H}_{12}\text{O}_3 \checkmark$ (award both marks if answer correct without calculation) (2)

[10]

QUESTION 6

- 6.1. The amount of substance having the same number of particles as there are atoms in 12g of C-12. ✓✓/ Amount of substance having $6,02 \times 10^{23}$ elementary particles. (2)

6.2.

$$n = V/V_m \quad \checkmark$$

$$= \underline{63/22.4} \quad \checkmark$$

$$= 2.8125 \text{ mol}$$

$$N = \underline{2.8125 \times 6.02 \times 10^{23}} \quad \checkmark$$

$$= 1.693 \times 10^{24} \text{ molecules} \quad \checkmark \text{ of CO}_2$$

(4)

6.3

POSITIVE MARKING FROM 6.2

Fe : CO₂

2 : 3 ✓

$n_{\text{Fe}} = 2.8125 \times 2/3$

$= 1.875 \text{ mol} \quad \checkmark$

(4)

(2)

6.4.

Positive marking form 6.2/6.3

$\text{CO}_2 : \text{Fe}_2\text{O}_3$ $3 : 1$ $n_{\text{Fe}_2\text{O}_3} = 2.8125/3 \quad \checkmark$ $= 0.9375 \text{ mol}$ $m_{\text{Fe}_2\text{O}_3} = nM$ $= \underline{0.9375 \times 160} \quad \checkmark$ $= 150 \text{ g}$ $\% \text{ purity} = \underline{150/160 \times 100} \quad \checkmark$ $= 93,75\% \quad \checkmark$	OR	$\text{Fe} : \text{Fe}_2\text{O}_3$ $2 : 1$ $n_{\text{Fe}_2\text{O}_3} = 1.875/2$ $= 0.9375 \text{ mol}$
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(4)

[12]

QUESTION 7

7.1 Substance that is used up completely in a reaction. ✓ ✓

(2)

7.2

Ratio	5	1	5	2
Moles	Ca	V ₂ O ₅	CaO	V
Initial	500✓	175 ✓	0	0
Change	500✓	100	500	200✓
End	0	75	500	200

Ca

$$n = m/M$$

$$= 20\,000/40$$

$$= 500 \text{ mol}$$

$$n_V \text{ formed} = 200 \text{ mol}$$

$$m = n \times M$$

$$= 200 \times 51 \checkmark$$

$$= 10\,200 \text{ g } \checkmark$$

(6)

V₂O₅

$$n = m/M$$

$$= 31\,850/182$$

$$= 175 \text{ mol}$$

7.3 % yield = $\frac{8670}{10\,200} \times 100 \checkmark$

$$= 85 \% \checkmark$$

(2)

[10]

QUESTION 8

8.1 Amount of solute per litre of solution. ✓ ✓ (2)

8.2. $n = m/M$

$$= 4.14/69 \quad \checkmark$$

$$= 0.06 \text{ mol} \quad \checkmark$$

(2)

8.3 **Positive marking from 8.2.**

$$c = n/V \quad \checkmark$$

$$\underline{0.05 = 0.06/V} \quad \checkmark$$

$$V = 1,20 \text{ dm}^3 \quad \checkmark$$

(3)

8.4

Positive marking from 8.3

$$c_1 V_1 = c_2 V_2 \quad \checkmark$$

$$\underline{0.05 \times 1.20} \quad \checkmark = \underline{c_2 \times 1.45} \quad \checkmark$$

$$C_2 = 0.04 \text{ mol.dm}^{-3} \quad \checkmark$$

Positive marking from 8.2. and 8.3

$$c = n/V \quad \checkmark$$

$$= 0.06 \quad \checkmark / 1.45 \quad \checkmark$$

$$c = 0.04 \text{ mol.dm}^{-3} \quad \checkmark$$

(4)

[11]**TOTAL MARKS : 100**