PHYSICAL SCIENCES: CONTROL TEST (P2)
MARCH 2018
MEMORANDUM

This memorandum consists of 6 pages
QUESTION 1

1.1 A ✓ ✓ (2)
1.2 C ✓ ✓ (2)
1.3 C ✓ ✓ (2)

[6]

QUESTION 2

2.1
2.1.1 B ✓ (1)
2.1.2 E ✓ (1)
2.1.3 A ✓ (1)
2.1.4 G ✓ (1)

2.2
2.2.1 2-bromo-3-chloro-4-methylpentane

Marking criteria:
- Correct stem i.e. pentane ✓
- All substituents (chloro, bromo and methyl) correctly identified ✓
- Substituents correctly numbered, in alphabetical order, hyphens and commas correctly used ✓

2.2.2 2-methyl propan-1-ol ✓

Notes
IF:
2 methylpropan 1 ol ½

2.2.3 ANY ONE:

2.3
2.3.1 Compounds with the same molecular formula ✓ but different positions of the functional groups / side chain/substituents on parent chain ✓
2.3.2

Marking criteria:
- Whole structure correct: $\frac{2}{2}$
- Only functional group correct $\frac{1}{2}$

Notes:
- If two or more functional groups $\frac{1}{2}$
- Condensed or semi-structural formula: Max $\frac{1}{2}$
- Molecular formula: $\frac{0}{2}$

2.4.1 Esterification (reaction) ✓

2.4.2 pentyl ✓ propanoate ✓

[17]

QUESTION 3

3.1 The temperature at which the vapour pressure of a substance equals atmospheric pressure ✓ ✓

3.2 London forces /Dispersion forces /Induced dipole forces ✓

3.3
- Between molecules of compound A are hydrogen bonds ✓ and London forces /Dispersion forces /induced dipole forces
- Between molecules of compound B are dipole-dipole ✓ forces and London forces
- Intermolecular forces in compound A are stronger ✓ than in B

OR
- Intermolecular forces in compound B are weaker than in A

(3)
### 3.4

\[
n = \frac{m}{M} \quad \checkmark
\]
\[
= \frac{12.8}{16} \quad \checkmark
\]
\[
= 0.8 \text{mol} \quad \checkmark
\]

\[
n_{\text{CH}_4} : n_{\text{Cl}_2} = 1:1 : n_{\text{CH}_2,\text{Cl}} = 0.8 \text{mol}
\]

\[
m_{\text{Cu}} = n \times M \quad \checkmark
\]
\[
= 0.8 \times 50.5 \quad \checkmark
\]
\[
= 40.4 \text{g} \quad \checkmark
\]

\[
\% \text{yield} = \frac{35}{40.4} \times 100 \quad \checkmark
\]
\[
= 86.63\% \quad \checkmark
\]

---

### Marking criteria

- Formula: \( n = \frac{m}{M} \) \( \checkmark \)
- 0.8 mol \( \checkmark \)
- Substitution of 50.5g \( \checkmark \)
- Percentage calculation \( \checkmark \)
- Answer: 86.63% \( \checkmark \)

---

### QUESTION 4

4.1 Elimination \( \checkmark \)

4.2 Alkenes \( \checkmark \)

4.3 Addition /Hydrohalogenation /hydrobromination \( \checkmark \)

4.4

![Chemical Reaction Diagram]

#### Notes

- Condensed/semi-structural formulae or mixture of both: -1 mark
- All bonds shown, one or more H-atoms omitted: -1 mark per structure
- Everything correct, wrong balancing: -1 mark
- Any other reactants or products: -1 mark

---

[11]
4.5

\[
\begin{align*}
\text{H} & \quad \text{C} & \quad \text{C} & \quad \text{C} & \quad \text{C} & \quad \text{H} \\
\text{H} & \quad \text{H} & \quad \text{Br} & \quad \text{H}
\end{align*}
\]

\(2\)-bromobutane \(\checkmark\)

**Notes**
- Condensed/semi-structural formulae or mixture of both: -1 mark
- All bonds shown, one or more H-atoms omitted: -1 mark per structure
- No hypen in the name: -1 mark

4.6 Substitution \(\checkmark\)

4.7 Cracking \(\checkmark\)

**Accept:** elimination

4.8 Addition \(\checkmark\) (polymerisation)

4.9

\[
\begin{align*}
n \text{H} - & \text{C} = \text{C} - \text{H} & \rightarrow & \left\{ \begin{array}{c}
\text{H} \\
\text{H} \\
\text{H}
\end{array} \right\} \\
\text{H} & \quad \text{H} & \quad \text{H}
\end{align*}
\]

**Notes**
- Condensed/semi-structural formulae or mixture of both: -1 mark
- All bonds shown, one or more H-atoms omitted: -1 mark per structure
- Letter n omitted per structure: -1 mark

TOTAL: 50
## ANALYSIS GRID

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