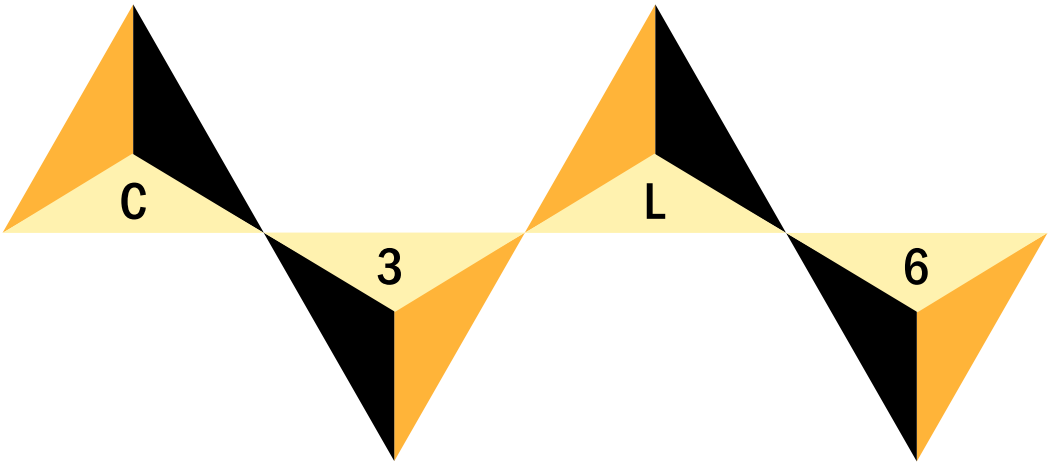



# Cambridge Chemistry Challenge Lower 6th

# June 2017

# Student Answer Booklet

Student name _____

male ☐ female ☐

Date of exam _____

Email _____

School _____

School year (eg year 12) _____

A-level (or equiv) subjects taken _____

_____

| | p2 | p3 | p4 | p5 | p6 | p7 | p8 | p9 | Total |
|---|---|---|---|---|---|---|---|---|---|
| mark | | | | | | | | | |

leave blank

**1(a)** **The electron configuration of manganese:**

**1(b)**

**(i)** **The highest oxidation state of manganese:**

**(ii)** **Briefly justify your answer to b(i):**

**1(c)**

**(i)** **Dot and cross diagram for $MnO_4^-$:**

**(ii)** **Bond angle in $MnO_4^-$:**

**1(d)** **Balanced equation for the reaction of pyrolusite:**

**1(e)**

**(i)** **Half equation for the reduction of water:**

leave blank

**1(e)**

**(ii)** **Half equation for the oxidation of potassium mangante(VI):**

**(iii)** **Reaction for production of potassium manganate(VII):**

**1(f)** **Disproportionation reaction:**

**1(g)** **Units of $\varepsilon$:**

**1(h)** **Value of $\varepsilon$:**

**1(i)** **Absorbance of solution:**

**1(j)**

**(i)** **Concentration of potassium manganate(VII):**

leave blank

**1(j)**

**(iii) Amount of water for a toxic dose:**

**1(k)**

**(i) Molecular formula of Compound X:**

**(ii) Balanced equation for reaction of $KMnO_4$ with $H_2SO_4$:**

**(iii) Structure of Compound X:**

**1(l) Standard change enthalpy of reaction:**

**1(m)** **Mass of $KMnO_4$ needed:**

leave blank

**1(n)** **How many times more expensive:**

leave blank

**2(a)**

**(i) Equation for bromination of ethane:**

**(ii) Classification of this reaction:**

Addition Elimination Substitution Hydrolysis Cracking Polymerisation

**(iii) The bond broken by light:**

**2(b) Smallest proportion bromoalkane:**

**Systematic name:**

**2(c) Expected percentages A–D:**

| | | | |
|---|---|---|---|
| **A:** | **B:** | **C:** | **D:** |

**2(d) Relative reactivity between B and C:**

**2(e) Number of structural isomers:**

| | | |
|---|---|---|
| **(i)** | **(ii)** | **(iii)** |
| **(iv)** | **(v)** | **(vi)** |

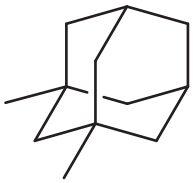
**2(f)**

**(i) Number of structural isomers of compound E:**

leave blank

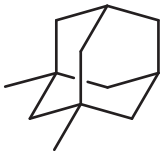
**2(f)**

**(ii) Structure of Compound E (carbon skeleton given):**

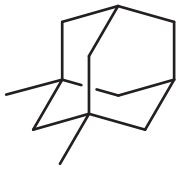


**2(g) Structures in memantine synthesis:**

**Compound F**



**Memantine**



**Anion $G^-$**

**2(h) Structural isomers of dibromopropane:**

**2(i) Percentage of 1,3-dibromopropane:**

leave blank

**2(j)**

**(i) Structure of Compound H:**

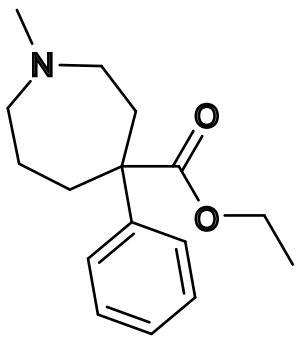
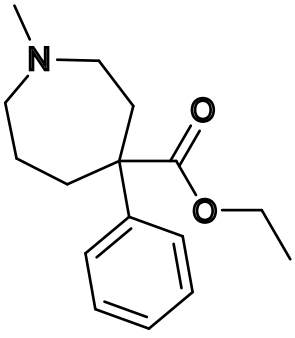
**(ii) Classification of this reaction:**

Addition Elimination Substitution Hydrolysis Cracking Polymerisation

**2(k) Structures in memantine synthesis:**

| **Compound I** | **Reagent J** |
| --- | --- |
| | |

**2(l) Structures:**

| **(i) Carbon atoms from 1,3-dibromopropane** | **(ii) Carbon atoms from ethanol** |
| --- | --- |
|  |  |

**2(m)** **Structures:**

leave blank

| | |
|---|---|
| **(Anion $K^-$)** | **(Compound L)** |
| **(Cation $M^+$)** | **(Compound N)** |