CHEMISTRY

UNIT 1(IAL)

2020 — 2025

1 - (WCH11/1(IAL)_Summer_2020_Q1) - *Structure, Bonding And Introduction To Organic Chemistry*

What is the empirical formula of butane?

☒ **A** C_4H_{10}

☒ **B** C_2H_5

☒ **C** $CH_{2.5}$

☒ **D** C_nH_{2n+2}

2 - (WCH11/1(IAL)_Summer_2020_Q2) - *Structure, Bonding And Introduction To Organic Chemistry*

When zinc is added to copper(II) sulfate solution, copper is formed.

(a) Which of these is the best name for this type of reaction?

(1)

☒ **A** addition

☒ **B** displacement

☒ **C** neutralisation

☒ **D** substitution

(b) Which is the ionic half-equation for a process that takes place during this reaction?

(1)

☒ **A** $Cu^{2+} + e^- \rightarrow Cu^+$

☒ **B** $Cu^+ + e^- \rightarrow Cu$

☒ **C** $Zn \rightarrow Zn^+ + e^-$

☒ **D** $Zn \rightarrow Zn^{2+} + 2e^-$

3 - (WCH11/1(IAL)_Summer_2020_Q3) - *Structure, Bonding And Introduction To Organic Chemistry*

How many molecules are there in 44.0 g of carbon monoxide?

$$\left[\begin{array}{l}\text{Avogadro constant } L = 6.02 \times 10^{23}\,\text{mol}^{-1} \\ A_r \text{ values: } C = 12.0 \quad O = 16.0\end{array}\right]$$

☒ **A** 3.83×10^{23}

☒ **B** 6.02×10^{23}

☒ **C** 9.46×10^{23}

☒ **D** 1.89×10^{24}

4 – (WCH11/1(IAL)_Summer_2020_Q4) – *Structure, Bonding And Introduction To Organic Chemistry*

A compound has $M_r = 84$ and its composition by mass is 71.4% carbon, 9.6% hydrogen and 19.0% oxygen.

What is the molecular formula of this compound?

[A_r values: H = 1.0 C = 12.0 O = 16.0]

☒ **A** $C_4H_3O_2$

☒ **B** $C_4H_4O_2$

☒ **C** C_5H_8O

☒ **D** $C_6H_{10}O$

5 – (WCH11/1(IAL)_Summer_2020_Q5) – *Structure, Bonding And Introduction To Organic Chemistry*

The formula of barium chloride is $BaCl_2$.

Which is correct for barium chloride?

[A_r values: Ba = 137.3 Cl = 35.5]

☒ **A** barium chloride exists as a molecule

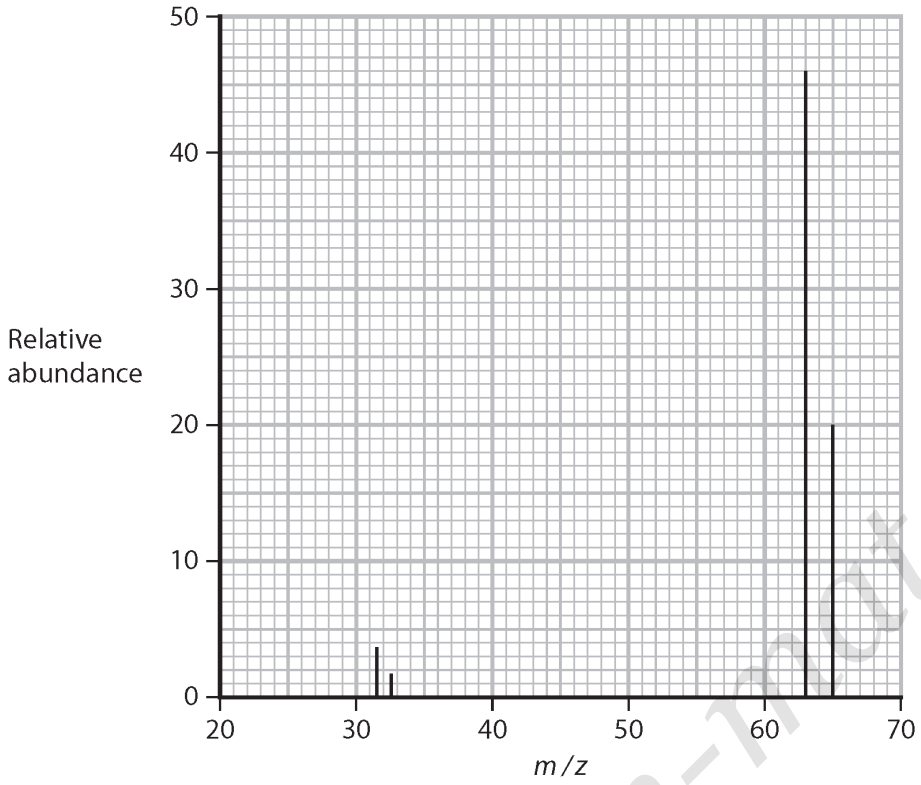
☒ **B** barium chloride is a compound

☒ **C** the empirical formula of barium chloride is BaCl

☒ **D** the M_r of barium chloride is 172.8

6 – (WCH11/1(IAL)_Summer_2020_Q6) – *Structure, Bonding And Introduction To Organic Chemistry*

The mass spectrum of a sample of an element is shown.



(a) What is the A_r of the element?

(1)

- ☐ **A** 42.0
- ☐ **B** 48.0
- ☐ **C** 63.6
- ☐ **D** 64.0

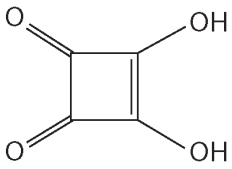
(b) Which species could be responsible for the peak at $m/z = 32.5$?

(1)

- ☐ **A** $^{32}S^{+}$
- ☐ **B** $^{63}Cu^{2+}$
- ☐ **C** $^{65}Cu^{2+}$
- ☐ **D** $^{98}Tc^{3+}$

7 – (WCH11/1(IAL)_Summer_2020_Q7) – *Structure, Bonding And Introduction To Organic Chemistry*

What is the molecular formula of the compound shown?



☒ **A** C_2HO_2

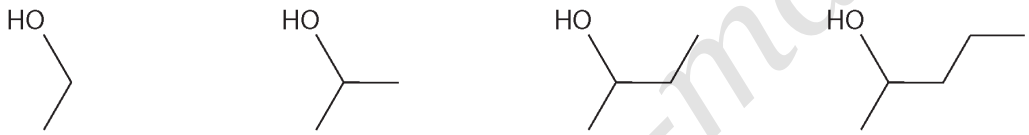
☒ **B** $C_4H_2O_4$

☒ **C** $C_4H_4O_4$

☒ **D** $C_4H_6O_4$

8 – (WCH11/1(IAL)_Summer_2020_Q8) – *Structure, Bonding And Introduction To Organic Chemistry*

A sequence of four molecules is shown.



1 2 3 4

(a) What is the molecular formula for the fifth molecule in this sequence?

(1)

☒ **A** CH_4O

☒ **B** $C_6H_{11}O$

☒ **C** $C_6H_{14}O$

☒ **D** $C_7H_{16}O$

(b) What is the name of this type of sequence?

(1)

☒ **A** functional group

☒ **B** homologous series

☒ **C** homolytic series

☒ **D** skeletal formulae

ANSWERS

1 – (WCH11/1(IAL)_Summer_2020_Q1) – *Structure, Bonding And Introduction To Organic Chemistry*

B

2 – (WCH11/1(IAL)_Summer_2020_Q2) – *Structure, Bonding And Introduction To Organic Chemistry*

Question number	Answer	Mark
(a)	**The only correct answer is B** (displacement) *A is incorrect because addition usually refers to organic reactions* *C is incorrect because no acids or bases are involved* *D is incorrect because substitution usually refers to organic reactions*	(1)

Question number	Answer	Mark
(b)	**The only correct answer is D** ($Zn \rightarrow Zn^{2+} + 2e^-$) *A is incorrect because Cu^+ is not formed* *B is incorrect because Cu^+ is not a reactant* *C is incorrect because Zn^+ is not formed*	(1)

3 – (WCH11/1(IAL)_Summer_2020_Q3) – *Structure, Bonding And Introduction To Organic Chemistry*

C

4 – (WCH11/1(IAL)_Summer_2020_Q4) – *Structure, Bonding And Introduction To Organic Chemistry*

C

5 – (WCH11/1(IAL)_Summer_2020_Q5) – *Structure, Bonding And Introduction To Organic Chemistry*

B

6 – (WCH11/1(IAL)_Summer_2020_Q6) – *Structure, Bonding And Introduction To Organic Chemistry*

Question number	Answer	Mark
(a)	**The only correct answer is C** (63.6) *A is incorrect as this is the answer when the abundance of the single charge peaks are used but are divided by 100* *B is incorrect because this is the average of the mass of all the ions with the abundancies not considered* *D is incorrect because this is the A_r when the mass of the two single charge peaks are averaged with the abundancies not considered*	(1)

Question number	Answer	Mark
(b)	**The only correct answer is C** ($^{65}Cu^{2+}$) *A is incorrect because sulphur would not produce the rest of the peaks* *B is incorrect because this is the peak at 31.5* *D is incorrect because this would give a peak at 32.7*	(1)

7 – (WCH11/1(IAL)_Summer_2020_Q7) – *Structure, Bonding And Introduction To Organic Chemistry*

B

8 – (WCH11/1(IAL)_Summer_2020_Q8) – *Structure, Bonding And Introduction To Organic Chemistry*

Question number	Answer	Mark
(a)	**The only correct answer is C** ($C_6H_{14}O$) *A is incorrect because this precedes the first molecule in the sequence* *B is incorrect because this is not in this sequence* *D is incorrect because this is the sixth molecule in the sequence*	(1)

Question number	Answer	Mark
(b)	**The only correct answer is B** (homologous series) *A is incorrect because this structure is within each of the molecules* *C is incorrect because homolytic is a type of bond breaking* *D is incorrect because this is the type of structure shown*	(1)

9 – (WCH11/1(IAL)_Summer_2020_Q9) – *Structure, Bonding And Introduction To Organic Chemistry*

C

10 – (WCH11/1(IAL)_Summer_2020_Q10) – *Structure, Bonding And Introduction To Organic Chemistry*

D

11 – (WCH11/1(IAL)_Summer_2020_Q11) – *Structure, Bonding And Introduction To Organic Chemistry*

A

12 – (WCH11/1(IAL)_Summer_2020_Q12) – *Structure, Bonding And Introduction To Organic Chemistry*

B

13 – (WCH11/1(IAL)_Summer_2020_Q13) – *Structure, Bonding And Introduction To Organic Chemistry*

C

14 – (WCH11/1(IAL)_Summer_2020_Q14) – *Structure, Bonding And Introduction To Organic Chemistry*

A