

OCR A-Level Chemistry A

Carbon–carbon bond formation and synthesis

Questions only

All 5 carbon–carbon bond formation and synthesis questions

Questions

5

Total marks

33

Time allowed

45 min

Name

Class or teacher

Date

Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the OCR Data Sheet.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2018 P2 Q14	1	
2	2018 P2 Q15	1	
3	2018 P3 Q4	11	
4	2022 P2 Q21	6	
5	2021 P2 Q19	14	

Total _____ / 33 Percentage _____ %

Questions from OCR past papers, 2018–2022, reproduced for revision. Practise these topics online, with instant marking:

whiteboardchemistry.com/revision/exam-questions/ocr-a-level-chemistry/?topics=carbon-carbon-bond-formation-and-synthesis&len=0

Questions

Carbon-carbon bond formation and synthesis · 5 questions · 33 marks · time allowed 45 min

Q1 · June 2018 · Paper 2 (Synthesis and analytical techniques) · Q14 · [1 mark]

A solid organic compound can be purified by recrystallisation.

Which statement(s) about recrystallisation is/are true?

- 1 The organic compound is more soluble in hot solvent.
- 2 The hot solution is cooled before the purified organic compound is collected.
- 3 The melting point of the purified organic compound is lower than the impure compound.

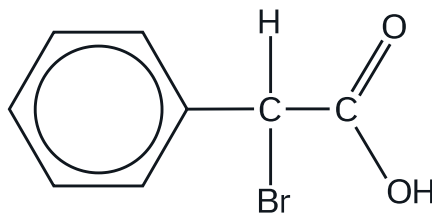
Tick (✓) one box.

- ☐ **A** 1, 2 and 3
- ☐ **B** Only 1 and 2
- ☐ **C** Only 2 and 3
- ☐ **D** Only 1

Q2 · June 2018 · Paper 2 (Synthesis and analytical techniques) · Q15 · [1 mark]

This question also needs Alcohols and haloalkanes.

Which of the following could react with the compound below to form a carbon-carbon bond?



1 CH_3Cl and AlCl_3

2 KCN in ethanol

3 CH_3OH and H_2SO_4

Tick (✓) one box.

☐ **A** 1, 2 and 3

☐ **B** Only 1 and 2

☐ **C** Only 2 and 3

☐ **D** Only 1

Q3 · June 2018 · Paper 3 (Unified chemistry) · Q4 · [11 marks]

This question also needs Acids and redox reactions, Amines, amino acids and polymers, Amount of substance and 4 other topics.

This question is about two compounds used in medicine.

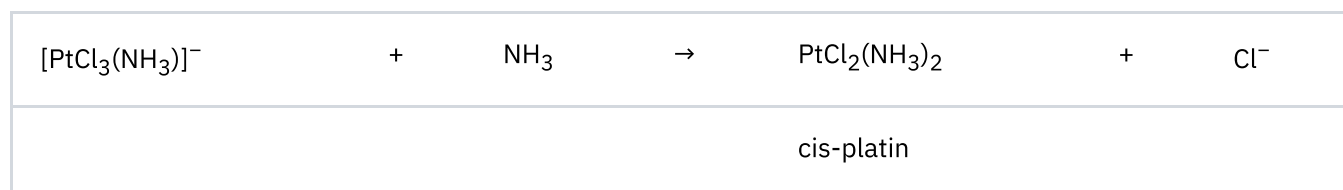
Cis-platin, $\text{PtCl}_2(\text{NH}_3)_2$, is a complex of platinum which is used in cancer treatment.

4(a)(i) What is the oxidation number of platinum in cis-platin?

[1 mark]

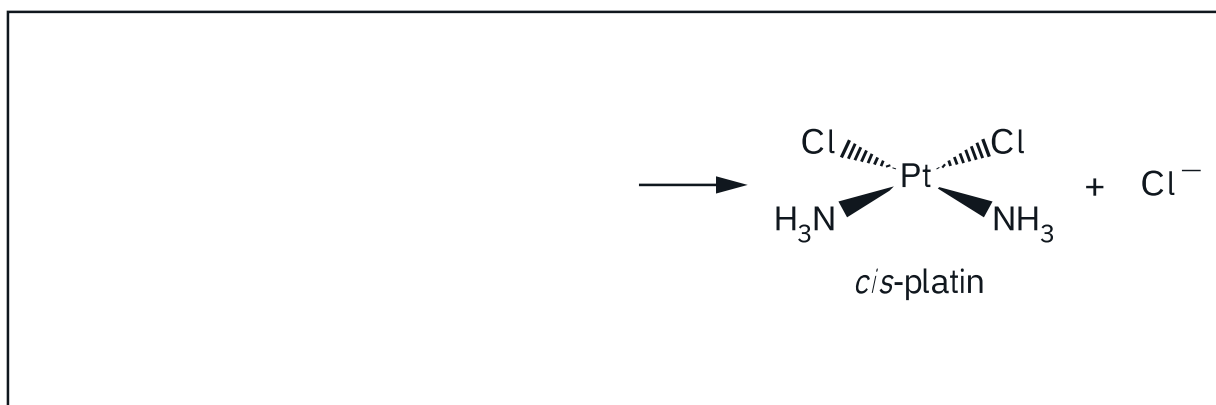
4(a)(ii) Cis-platin is prepared in a ligand substitution reaction which takes place in multiple steps.

The equation for the final step forming cis-platin is shown below.



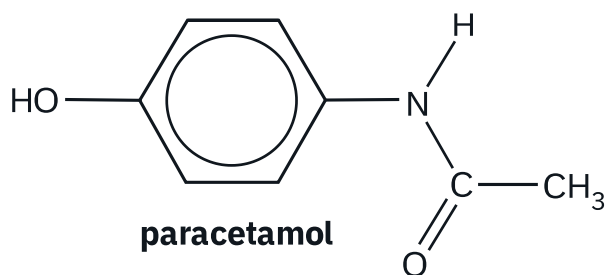
In the box, outline the mechanism for the formation of cis-platin from $[\text{PtCl}_3(\text{NH}_3)]^-$.

Use curly arrows and lone pairs where appropriate.



[2 marks]

Paracetamol is a solid organic compound used in tablets as a painkiller.



4(b)(i) Name the functional groups present in paracetamol.

[2 marks]

4(b)(ii) A chemist prepares a pure solid sample of paracetamol from 4-nitrophenol in two stages:



Describe a two-stage synthesis of 5.00 g of pure paracetamol from 4-nitrophenol. The overall percentage yield of paracetamol from 4-nitrophenol is 40.0%.

In your answer, include the mass of 4-nitrophenol required, the reagents and intermediate, and details of the purification of paracetamol.

[6 marks]

Q4 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q21 · [6 marks]

21 Carbon-carbon bond formation is used in synthesis to increase the length of a carbon chain.

Describe the formation of carbon-carbon bonds in aliphatic compounds by **two** different mechanisms.

Your answer should include mechanisms for each aliphatic compound.

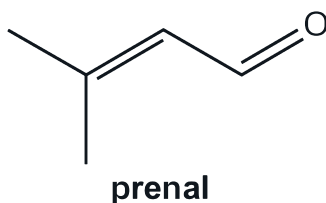
[6 marks]

Q5 · November 2021 · Paper 2 (Synthesis and analytical techniques) · Q19 · [14 marks]

This question also needs Alcohols and haloalkanes, Amount of substance, Aromatic compounds and phenols and 4 other topics.

This question is about organic synthesis.

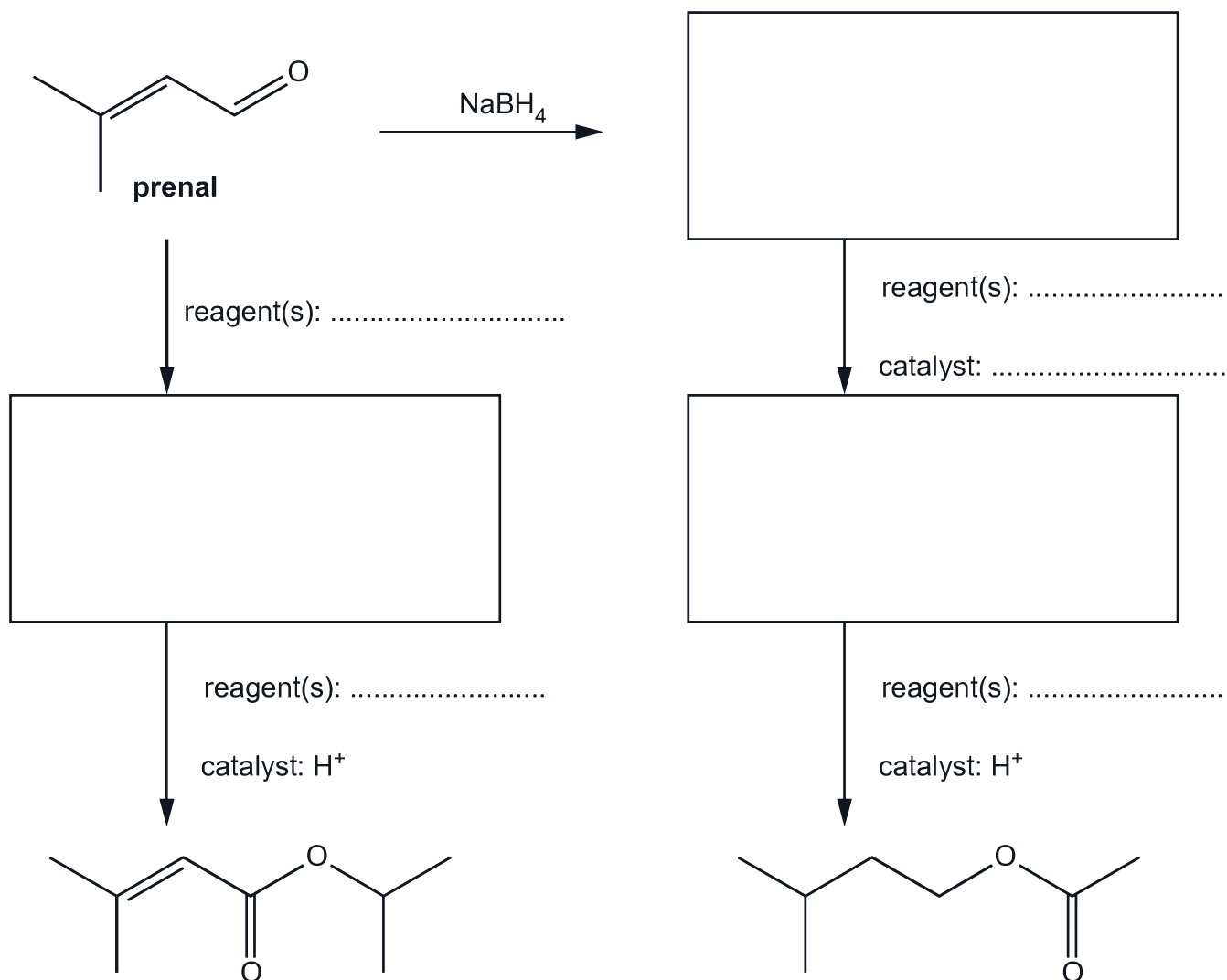
Prenal, shown below, is used in the synthesis of some pharmaceuticals.



19(a)(i) What is the systematic name for prenal?

[1 mark]

19(a)(ii) Complete the flowchart below for the synthesis of two compounds starting from prenal.



[7 marks]

Draw your answer on the figure above.

19(b) A student intends to synthesise compound A using the two-stage route below.



Plan a two-stage synthesis to prepare 5.44 g of compound A starting from (chloromethyl)benzene, $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$. Assume that the overall percentage yield of compound A from (chloromethyl)benzene is 25%.

In your answer, include the mass of $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$ required, reagents, and equations where appropriate.

Purification details are not required.

[6 marks]

Source: OCR A-Level Chemistry A past papers. Reproduced for revision at whiteboardchemistry.com.

Mark scheme:

whiteboardchemistry.com/revision/exam-questions/ocr-a-level-chemistry/pdf/carbon-carbon-bond-formation-and-synthesis-mark-scheme.pdf