

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel Level 3 GCE

Tuesday 18 June 2024

Morning (Time: 1 hour 45 minutes) Paper reference **9CH0/02**

Chemistry
Advanced
PAPER 2: Advanced Organic and Physical Chemistry

You must have:
 Scientific calculator, Data Booklet, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – there may be more space than you need.

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets – use this as a guide as to how much time to spend on each question.
- For the question marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically, showing the points that you make are related or follow on from each other where appropriate.
- A Periodic Table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Show all your working in calculations and include units where appropriate.
- Check your answers if you have time at the end.

Turn over ►

P76896A

©2024 Pearson Education Ltd.
 F:1/1/1/1/




Pearson

- (d) The breakdown of hydrogen peroxide with iodide ions as a catalyst is the basis of the demonstration 'Elephant's Toothpaste'.

The presence of a detergent results in a rapid eruption of foam as the oxygen gas is released.

- (i) Describe the test and the positive result that confirms the gas produced is oxygen.

(1)

- (ii) The foam produced often has a slight yellow / brown colour.

Explain what causes this colour, which is **not** caused by the detergent.

(2)

Preview from Notesale.co.uk
Page 10 of 70



- (d) Bromocyclopentane forms cyclopentene when heated under reflux with a concentrated solution of potassium hydroxide in ethanol.



- (i) Explain why the solvent ethanol is treated with anhydrous sodium sulfate before use in this reaction.

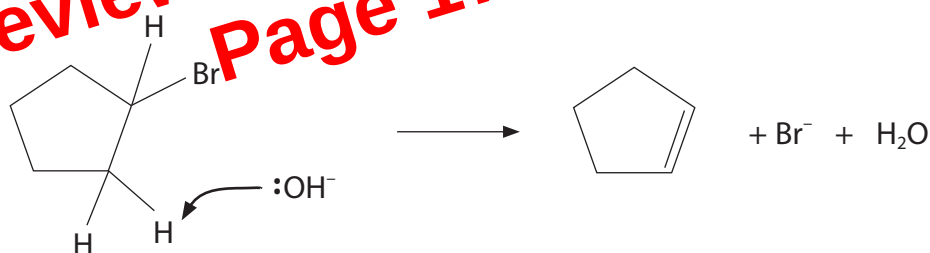
(2)

- (ii) Give the name of the reaction shown in the equation.

(1)

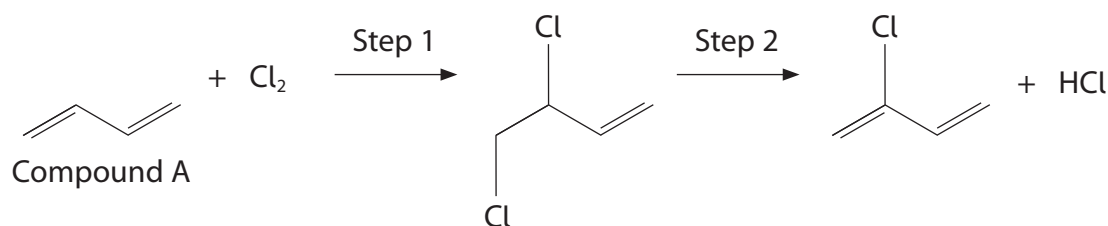
- (iii) Predict the mechanism for the reaction by adding two curly arrows.

(1)



(Total for Question 5 = 12 marks)

- (c) Chloroprene is formed by first adding chlorine, Cl_2 , to Compound A and then removing hydrogen chloride from the product of this reaction.



- (i) Explain how chlorine, Cl_2 , can act as an electrophile in Step 1 even though a chlorine molecule is symmetrical. You may find it helpful to include a diagram.

(2)

Preview from Notesale.co.uk
page 22 of 70

- (ii) Draw the mechanism for step 1. Include curly arrows, and any relevant lone pairs and dipoles.

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

Preview from Notesale.co.uk
Page 30 of 70



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

Preview from Notesale.co.uk
Page 32 of 70



General Marking Guidance

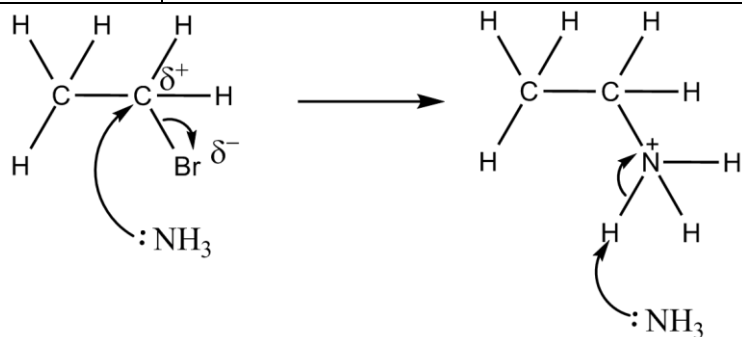
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Preview from Notesale.co.uk
Page 36 of 70

Question Number	Answer	Mark
1(a)	The only correct answer is D (2-bromo-2-methylpropane) <i>A is not correct because 1-bromobutane is a primary halogenoalkane so hydrolyses more slowly than the tertiary halogenoalkane</i> <i>B is not correct because 2-bromobutane is a secondary halogenoalkane so hydrolyses more slowly than the tertiary halogenoalkane</i> <i>C is not correct because 1-bromo-2-methylpropane is a primary halogenoalkane so hydrolyses more slowly than the tertiary halogenoalkane</i>	(1)

Question Number	Answer	Mark
1(b)	The only correct answer is C (CH_3COCl and CH_3NH_2) <i>A is not correct because the reactants will form a primary amide</i> <i>B is not correct because the reactants will not form an N-substituted amide as there is no reaction</i> <i>D is not correct because the reactants will not form an N-substituted amide as there is no reaction</i>	(1)

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	An explanation that makes reference to three of the following points: - one (molecule of) ammonia acts as a nucleophile (1) - to attack the carbon with a (partial) positive charge (1) - a (second) molecule (of ammonia) acts as a base (1) - to remove a H^+ / H ion / proton from the intermediate (1)	Correctly drawn mechanism with no reference to nucleophile and base scores 2 max (see diagram) Allow 'ammonia donates its lone pair' / 'ammonia reacts in a nucleophilic substitution reaction' Allow 'attacks the carbocation' Do not award NH_3 acting as a base in an incorrect context (e.g. with Br^-) If intermediate drawn then this must be correct Allow ammonia gains a H^+ (ion) / proton from the intermediate Ignore comments related to oxidation and reduction	(3)



1 mark for left hand side, including dipole, curly arrow from lone pair on N and arrow from bond to Br

1 mark for right hand side including structure of intermediate with charge, arrow from lone pair on NH_3 to H, and arrow from bond to N^+

Question Number	Answer	Additional Guidance	Mark
3(e)(i)	- triangle or similar shown on graph to indicate changes in x and y - calculation of gradient - units of gradient	<u>Example of calculation</u> Allow circling of points / marking of points on line For example $-11 - -6 = -5$ $0.003588 - 0.003038 = 0.00055$ $-5 \div 0.00055 = -9090.9$ Allow gradient in range -8500 to -9500, consistent with correctly determined y and x values, though gradient must be checked for calculator errors Allow TE on incorrectly determined y and x values from M1 Allow negative gradient even if values used in $\Delta y / \Delta x$ would give a positive value Ignore SF Ignore rounding errors in final value of gradient K No TE for units based on inverted axes	(3)

Question Number	Answer	Additional Guidance	Mark
8(d)(iii)	An answer that makes reference to the following points: - hydrochloric acid / HCl(aq) (1) (heat under) reflux (1)	Ignore references to concentrated / dilute Allow HCl Allow correct name or formulae of any strong acid e.g. HClO₃, H₂SO₄, Allow phosphoric acid / H₃PO₄ Allow NaOH followed by any identified strong acid Ignore H⁺ / H₃O⁺ / catalyst Mark independently	(2)

Preview from Notesale.co.uk
Page 67 of 70