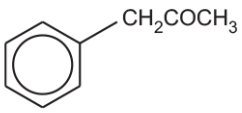
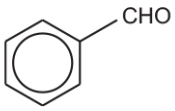
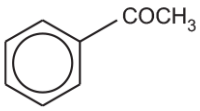
Aromatic Compounds

1. Which compound(s) could be prepared by reacting benzene with an acyl chloride in the presence of a halogen carrier?

1 

2 

3 

A 1, 2 and 3
B Only 1 and 2
C Only 2 and 3
D Only 1

Your answer ☐ **[1]**

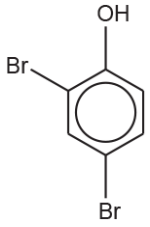
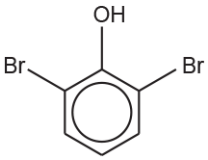
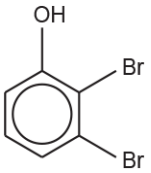
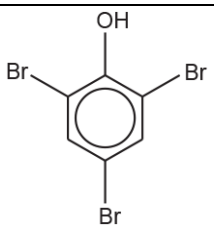
2. Which one of the following reacts with ethanoic acid **and** with phenol?

A Aqueous potassium hydroxide
B Bromine
C Calcium carbonate
D Methanol and an acid catalyst

Your answer ☐ **[1]**

3. Phenol reacts with bromine.

Which is the **least** likely organic product?

A	
B	
C	
D	

Your answer ☐ **[1]**

4. Which chemical(s) can react with phenol?

1 Potassium hydroxide
2 Ethanoyl chloride
3 Nitric acid

A 1, 2 and 3
B Only 1 and 2
C Only 2 and 3
D Only 1

Your answer ☐ **[1]**

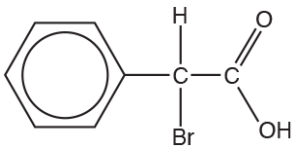
5. Which statement(s) support(s) the delocalised model for the structure of benzene?

1 All carbon–carbon bonds have the same length.
2 The enthalpy change of hydrogenation of benzene is less exothermic than expected.
3 Bromine reacts with benzene less readily than with cyclohexene.

A 1, 2 and 3
B Only 1 and 2
C Only 2 and 3
D Only 1

Your answer ☐ **[1]**

6. Which of the following could react with the compound below to form a carbon–carbon bond?

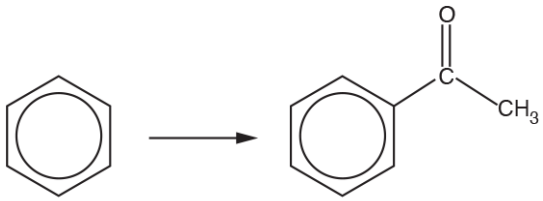


1 CH_3Cl and $AlCl_3$
2 KCN in ethanol
3 CH_3OH and H_2SO_4

A 1, 2 and 3
B Only 1 and 2
C Only 2 and 3
D Only 1

Your answer ☐ **[1]**

7. Benzene reacts with an organic reagent in the presence of a halogen carrier to form phenylethanone.



phenylethanone

Which organic reagent is required?

A CH_3CH_2OH
B CH_3CHO
C CH_3COCl
D CH_3COOH

Your answer ☐ **[1]**

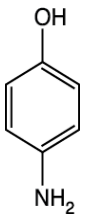
8. Which reagent could be used to distinguish between CH_3CH_2OH and C_6H_5OH?

A $AgNO_3(aq)$ in ethanol
B CH_3COCl
C $Na_2CO_3(aq)$
D Bromine water

Your answer ☐

[1]

9. The compound shown below can be prepared from phenol.



Which reagent(s) is/are required?

A Concentrated NH_3
B Dilute NH_3
C Dilute HNO_3 and then concentrated HCl /Sn
D Dilute HNO_3 and then $NaBH_4$

Your answer ☐

[1]

10. What is the number of sigma bonds in a benzene molecule?

A 3
B 6
C 9
D 12

Your answer ☐

[1]

11. A student adds bromine water to a solution of phenol.

What would the student see during this reaction?

A. Bromine water goes from orange to green.
B. Bromine water goes from orange to colourless and a white precipitate is formed.
C. There is no reaction.
D. Bromine water goes from orange to colourless and the solution fizzes.

Your answer ☐

[1]

12. What is the mechanism for the nitration of benzene?

A. Nucleophilic addition
B. Nucleophilic substitution
C. Electrophilic addition
D. Electrophilic substitution

Your answer ☐

[1]

13. Which of the following support(s) the delocalised model for benzene rather than the Kekulé model?

1: Benzene is less reactive than cyclohexene

2: A benzene molecule has a planar, hexagonal structure

3: The enthalpy change of hydrogenation of benzene is more exothermic than predicted from the Kekulé structure

A. 1, 2 and 3
B. Only 1 and 2
C. Only 2 and 3
D. Only 1

Your answer ☐

[1]

14. Bromine is reacted separately with nitrobenzene and phenylamine.

Which organic products are likely to form?

	Product from nitrobenzene	Product from phenylamine
A	2-bromonitrobenzene	2-bromophenylamine
B	2-bromonitrobenzene	3-bromophenylamine
C	3-bromonitrobenzene	2-bromophenylamine
D	3-bromonitrobenzene	3-bromophenylamine

Your answer ☐

[1]

15. Two chemical tests are carried out on an aqueous solution of an aromatic organic compound **Y**.

The results of the tests are shown below.

Test	$Br_2(aq)$	$Na_2CO_3(aq)$
Observation	decolourised	effervescence

What is the minimum number of C atoms in **Y**?

A. 6
B. 7
C. 8
D. 9

Your answer ☐

[1]

END OF QUESTION PAPER

Mark scheme – Aromatic Compounds (MCQ)

Question			Answer/Indicative content	Marks	Guidance
1			**C**	1 (AO1.2)	
			Total	**1**	
2			**A**	1 (AO1.1)	
			Total	**1**	
3			**C**	1 (AO 1.2)	
			Total	**1**	
4			**A**	1 (AO 1.1)	**Examiner's Comments** This question proved difficult. Many candidates correctly deduced that all three chemicals would react with phenol and selected A. Some candidates did not recognise that phenol would react with HNO^3 without the need for a catalyst and selected B. Other candidates did not consider the weak acidity of phenol and selected C.
			Total	**1**	
5			**A**	**1**	**Examiner's Comments** The bonding in benzene is well known by candidates at this level and most correctly selected A as their response.
			Total	**1**	
6			**B**	**1**	**Examiner's Comments** Candidates found this question difficult, presumably as it involved reactions of different functional groups within the same compound. Many candidates identified B as the correct response. The most common incorrect responses were C and D.
			Total	**1**	
7			**C**	**1**	**Examiner's Comments** Almost all candidates identified C

					(CH_3COCl) as the reagent required for this reaction.
			Total	**1**	
8			**D**	1	
			Total	**1**	
9			**C**	1	
			Total	**1**	
10			**D**	1	
			Total	**1**	
11			B	1	
			Total	**1**	
12			D	1	
			Total	**1**	
13			D	1	
			Total	**1**	
14			C	1	
			Total	**1**	
15			B	1	
			Total	**1**	