Alcohols, Phenols and Ethers

Q.No.	Question			Marks	
32	 In a science quiz the following two statements were displayed: Statement 1 - Reaction L: Anisole reacts with excess hydrogen chloride to form phenol and methyl chloride. Statement 2 - Reaction M: Anisole reacts with propanoyl chloride to form methoxypropiophenone. The question asked to the teams for a 10-point bonus points were: What is the bond that cleaves in Reaction L and what is the directive property of the methoxy group in Reaction M? The table below shows the answers given by four teams: 				
	Team	In reaction L the bond that cleaves	In reaction M methoxy group is		
	Red	Aryl oxygen bond	meta, para directing		
	Blue	Alkyl oxygen bond	only ortho directing		
	Green	Alkyl oxygen bond	ortho, para directing		
	Yellow	Aryl oxygen bond	ortho, meta directing		
	Which team is correct? (A) Team red (B) Team blue (C) Team green (D) Team yellow [Skill: Understanding]				
33	An aqueous solution of butan-1-ol has a pH than an aqueous solution of				
	[Skill: Mecha	nical]			

34	Phenol reacts with bromine under different sets of conditions to form different products.	2+1+2	
	(a) Write the reaction of phenol reacting with bromine in:		
	(i) polar solvent		
	(ii) non-polar solvent.		
	(b) In one of the reactions stated in (a), a mixture of products 'P' and 'Q' is formed. Identify the major product with a reason.		
	(c) Three different brominated products are obtained due to bromination of phenol under different conditions as stated in (a). Arrange them in the increasing order of boiling point with a reason.		
	[Skill: Understanding]		

Marking Scheme

Q No.	Rubric	Marks				
32	Correct Answer: C The alkyl oxygen bond breaks in reaction L as aryl oxygen bond is more stable and in reaction M the methoxy group is ortho para directing as in the resonating structures, the electron density at ortho and para position are increased.					
	 A: Students choosing this option may lack the understanding that the alkyl oxygen bond breaks in reaction L as aryl oxygen bond is more stable and in reaction M the methoxy group is ortho para directing as in the resonating structures, the electron density at ortho and para position are increased. B: Students choosing this option may lack the understanding that the alkyl oxygen bond breaks in reaction L as aryl oxygen bond is more stable and in reaction M the methoxy group is ortho para directing as in the resonating structures, the electron density at ortho and para position are increased. 					
	D: Students choosing this option may lack the understanding that the alkyl oxygen bond breaks in reaction L as aryl oxygen bond is more stable and in reaction M the methoxy group is ortho para directing as in the resonating structures, the electron density at ortho and para position are increased.					
33	An aqueous solution of butan-1-ol has a <u>lower</u> pH than an aqueous solution of butan-2-ol.	1				
	[Accept any other valid answer.]					
34	(a) (i) $\downarrow \qquad \downarrow \qquad$					
	(ii)					
	$ \begin{array}{c} OH \\ \hline \\ $					
	Minor Major					
	[1 mark + 1 mark]					
	(b) p-bromo phenol is the major product. [0.5 marks]					
	The para position is electronically more stable and less sterically hindered than the ortho position, making substitution at the para position more favourable. [0.5 mark]					

(c) The increasing order of boiling points	s of the three brominated products is: 2	
ortho-bromophenol< para-bromo phenol-	<2,4,6-tribromophenol [0.5 marks]	
Ortho-bromophenol has the lowest boilin bonding.	ng point due to intramolecular hydrogen	
para-bromophenol has higher boiling poi hydrogen bonding.	nt than ortho due to stronger intermolecular	
2,4,6-Tribromophenol has the highest bo weight and the greater strength of interm atoms.	iling point due to the increased molecular olecular forces resulting from multiple bromine	
[0.5 marks for each explanation]		