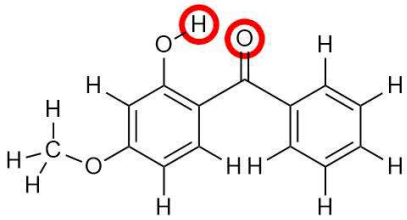
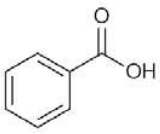
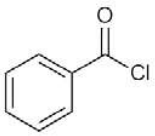
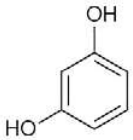
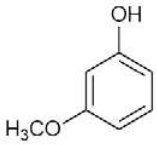
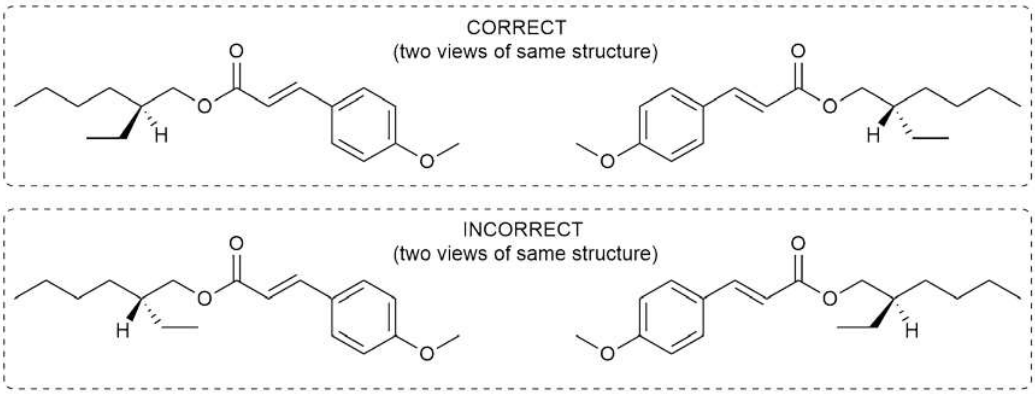
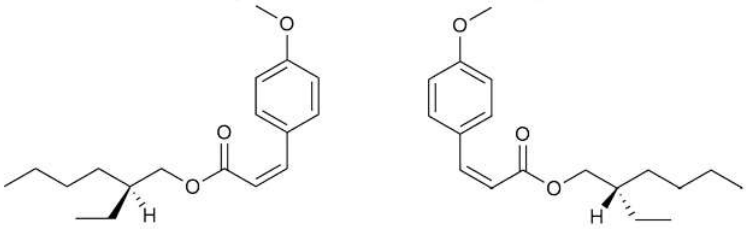
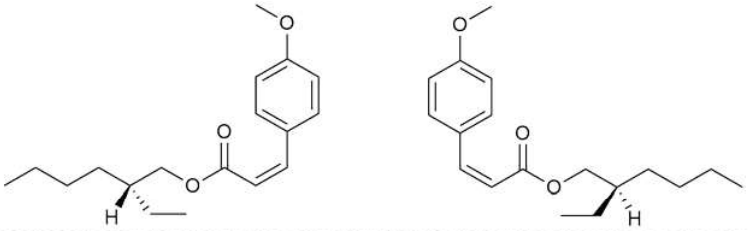
3.	This question is about sun cream			Mark
(a)	ester	aldehyde	ketone ✔	☑
	carboxylic acid	ether ✔	phenol ✔	
	Must all be correct for mark.			
(b)				☑
	Only these two atoms must be circled for the mark.			
(c)	**A** 		**B** 	☑ ☑ ☑ ☑
	C 		**D** 	
	One mark each. No ECF to be awarded as there is sufficient information to work backwards as well as forwards.			
(d)	(i) 			☑
	Double bond must be unambiguously trans. Stereochemistry of chiral centre must be clearly indicated as of (S) configuration (as drawn in the CORRECT views) and not of (R) configuration (as drawn in the INCORRECT views). Abbreviations are allowed as long as groups are unambiguously defined.			

(ii)

CORRECT
(two views of one correct structure)



(two views of other correct structure)



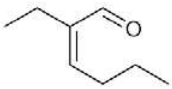
Double bond must be unambiguously cis. No marks if trans. Stereochemistry of chiral centre can be either S or R but must be drawn unambiguously. Abbreviations are allowed as long as groups are unambiguously defined.

☑

(e)

E

F



No ECF. Accept both cis and trans isomers or if sterochemistry drawn as undefined.

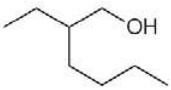
One mark each.

☑

☑

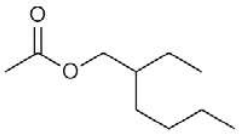
(f)

G



*No stereochemistry required. ECF can be awarded only if structure has no alkene or carbonyl functional groups and is consistent with the structure of **F** (having been reduced) or consistent with the stucture of **H** (the alcohol to make the ester).*

H



No ECF. No stereochemistry required.

One mark each.

☑

☑

(g)

The same molecular formula ✔

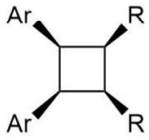
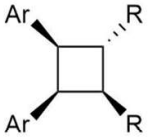
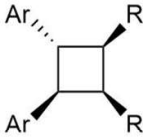
The same melting points

Rotate plane-polarised light in the same direction

If any other answer ticked then no marks.

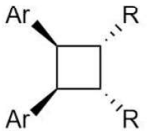
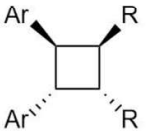
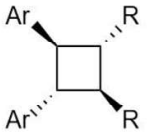
☑

(h) (i)

Substituents on the same face	Truxinates	
Four		
Has enantiomer?	YES **NO**	
Three		
Has enantiomer?	**YES** NO	**YES** NO

All must be correct for mark.

(ii)

Substituents on the same face	Truxinates	
Two		
Has enantiomer?	YES **NO**	**YES** NO
Two (continued)		
Has enantiomer?	**YES** NO	YES NO

The structures are worth two of the three marks. The structures can be in any order. Three correct structures and one blank box is worth two marks. Two correct structures and two blank boxes is worth one mark. Three correct structures and one incorrect structure or duplicated structure is worth one mark. All other combinations are worth zero marks for this part.

The YES/NO for enantiomers are worth one of the three marks. Must all be correct for the mark. Every structure they have drawn must have the correct YES/NO for that structure. (NB Any structure with a plane of symmetry or a centre of inversion does not have an enantiomer and so is a NO, others are YES). This means ECF is being awarded for the chirality mark, i.e. if the YES/NO are consistent for every structure they have drawn they get the mark.

Total out of 17 **17**