

**Australian Islamic College 2018**

**ATAR Chemistry Units 3 and 4**

**Task 11 (Weighting: 5%)**

**Esters Validation Test**

Test Time: 25 minutes

Please do not turn this page until instructed to do so.

First Name	Surname

Teacher

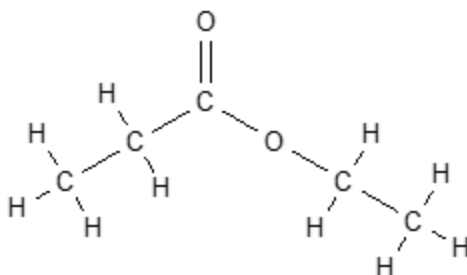
Mark / 26	Percentage

Equipment allowed: Pens, pencils, erasers, whiteout, rulers and non-programmable calculators permitted by the Schools Curriculum and Standards Authority.

1. Which of these molecules is an ester? Circle the correct answer. [1 mark]

- (a)  $\text{CH}_3\text{CHOHCH}_2\text{CH}_3$
- (b)  $\text{CH}_3\text{COCH}_3$
- (c)  $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$
- (d)  $\text{CH}_3\text{CH}_2\text{CHO}$

2. This question relates to the ester shown below.



(a) Draw the condensed structural formulae and give the names of the two organic molecules that would be required to synthesise this compound. [4 marks]

1.

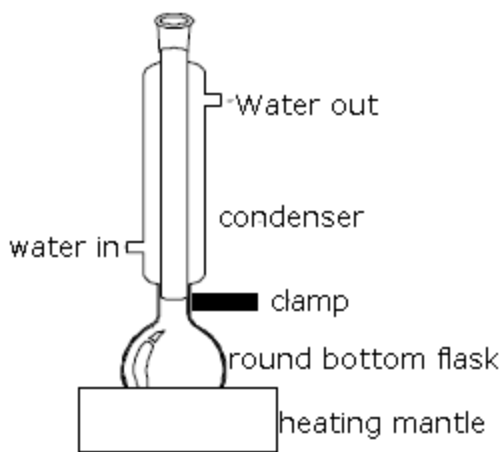
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2.

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3. Methyl salicylate (oil of wintergreen or wintergreen oil) is an organic compound with the formula  $\text{C}_6\text{H}_4(\text{OH})(\text{CO}_2\text{CH}_3)$ . Methyl salicylate was synthesised in the laboratory by combining the appropriate alcohol and carboxylic acid.
- (a) Show the reaction that occurs during the synthesis of methyl salicylate. Draw structural formulae for all organic reactants and products. [2 marks]
- (b) The test tube containing the reaction mixture was placed in a beaker of water. The beaker of water was then heated using a Bunsen burner.
- (1) Suggest why the reaction mixture was not heated directly using the Bunsen burner. [1 mark]
- (2) What was the purpose of heating the reaction mixture? [1 mark]
- c) Write observations for the reaction described above for the synthesis of oil of wintergreen. [2 marks]

- d) The reaction mixture was heated in an open test tube, however a better method would be to heat the reaction mixture in the reflux condenser shown below.



Explain the advantage of synthesising the ester using a reflux condenser. [2 marks]

- e) Concentrated sulfuric acid was used as a catalyst. Explain how a catalyst increases reaction rate. [2 marks]
- f) An additional benefit of adding concentrated sulfuric acid to the reaction mixture is that it reacts with water in the reaction mixture to form a hydrated form of sulfuric acid, thereby effectively removing water from the reaction mixture. Explain the advantage of removing water from the reaction mixture. [2 marks]

g) Identify two safety hazards associated with the synthesis of oil of wintergreen and for each explain how the risk of that hazard was minimised. [2 marks]

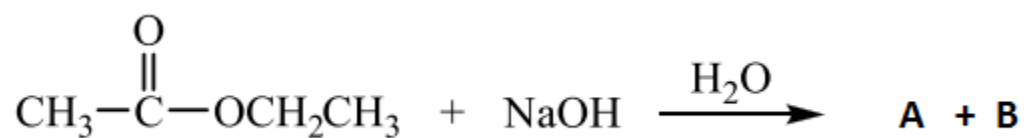
4. Esters cannot form hydrogen bonds with other ester molecules but they can form hydrogen bonds with water molecules.

(a) Explain why esters cannot form hydrogen bonds with other ester molecules. [1 mark]

(b) Draw a diagram to represent a hydrogen bond between methyl ethanoate and water. [2 marks]

5. Using structural formulae, write the equation for the saponification of a triglyceride. Show all reactants and products. You may use 'R' to represent long hydrocarbon chains. [2 marks; 1 mark off per mistake]

6. Name the products A and B produced by the reaction below. [2 marks]



Product A:

Product B:

**END OF PAPER**