Carbonyl Compounds – 2016

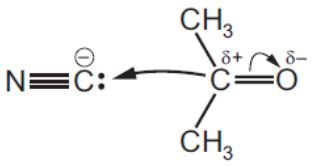
1. 9701/11/O/N/16/26

Propanone reacts with an aqueous mixture of HCN and NaCN by a nucleophilic addition mechanism.

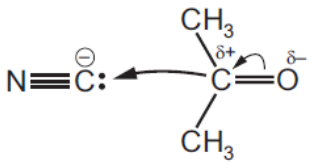
The first stage of the mechanism involves attack by cyanide ions.

Which diagram correctly represents this?

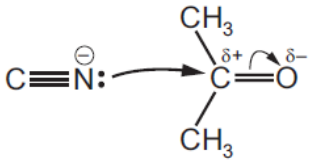
A



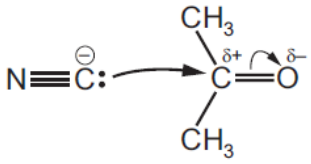
B



C

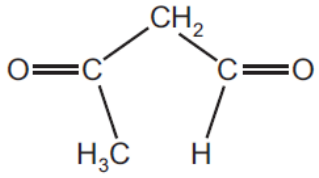


D

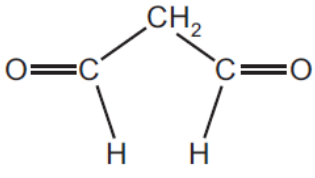


2. 9701/11/O/N/16/27

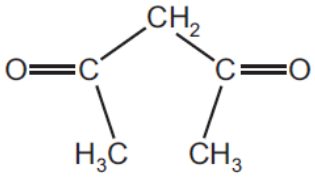
P, Q and R are carbonyl compounds.



P



Q



R

Fehling's solution can be used to help identify these compounds.

Which compounds form a red-brown precipitate on warming with Fehling's solution?

A P, Q and R **B** P and Q only **C** P only **D** Q only

3. 9701/11/O/N/16/28

Which reaction would **not** give ethanoic acid?

A heating ethanenitrile under reflux with dilute sodium hydroxide

B heating ethanenitrile under reflux with dilute sulfuric acid

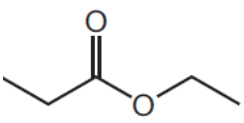
C heating ethanal under reflux with acidified sodium dichromate(VI)

D heating ethanol under reflux with acidified sodium dichromate(VI)

4. 9701/11/O/N/16/29

Which formula represents an ester that will form propanoic acid on hydrolysis with dilute sulfuric acid?

A



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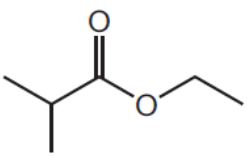

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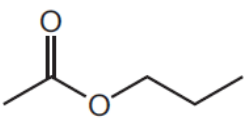
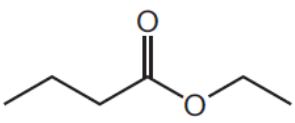
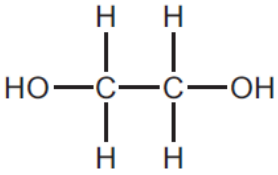


D



5. 9701/11/O/N/16/30

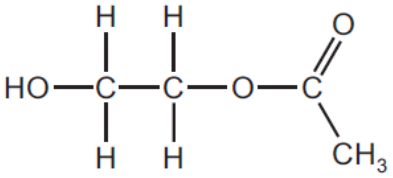
A solvent, **X**, used in printing inks has a molecular formula $C_6H_{10}O_4$. It may be made by reacting ethane-1,2-diol with ethanoic acid in the presence of an acid catalyst.



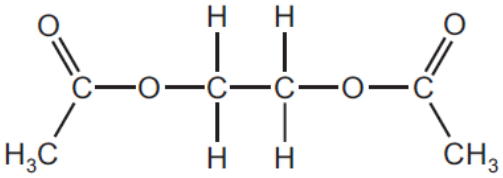
ethane-1,2-diol

What is the structure of solvent **X**?

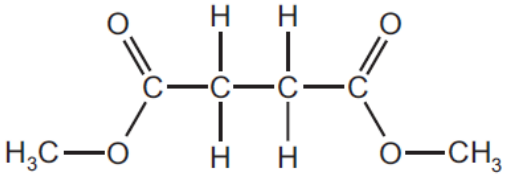
A



B



C



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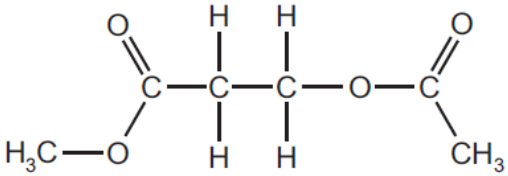
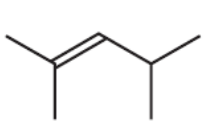


6. 9701/11/O/N/16/37

Which compounds would produce a carboxylic acid and a ketone when treated with hot, concentrated, acidified $KMnO_4$?

1



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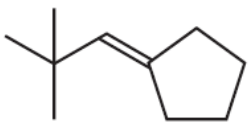

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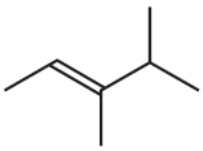
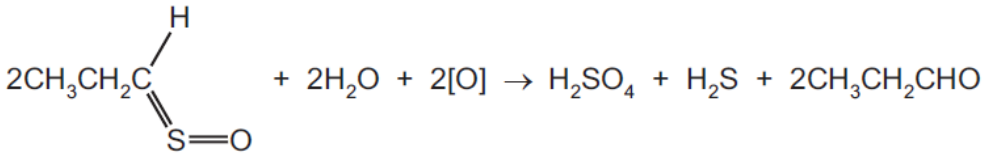


7. 9701/11/O/N/16/40

When onions are peeled in air, the reaction shown is thought to occur.



Which tests would give a positive reaction with the organic product?

1 warming with Tollens' reagent

2 warming with acidified potassium manganate(VII)

3 warming with alkaline aqueous iodine

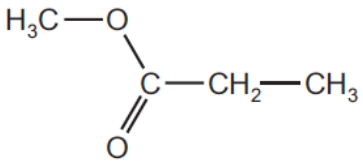
8. 9701/12/O/N/16/28

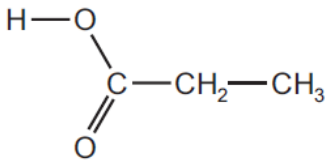
Which row correctly describes the reactivity of aldehydes and ketones?

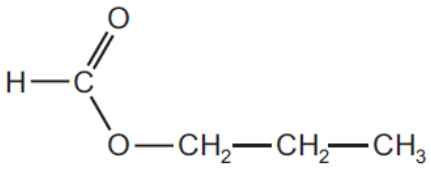
	with $NaBH_4$	with $H^+ / Cr_2O_7^{2-}(aq)$
A	both react	both react
B	both react	only aldehydes react
C	only ketones react	both react
D	only ketones react	only aldehydes react

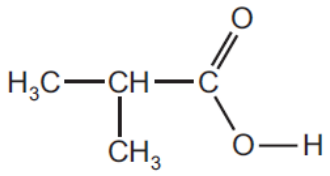
9. 9701/12/O/N/16/29

How many of the compounds shown will react with aqueous sodium hydroxide to form the sodium salt of a carboxylic acid?





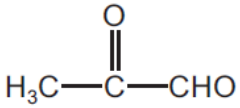




A 1 **B** 2 **C** 3 **D** 4

10. 9701/12/O/N/16/39

The compound shown is produced when sugar burns.



Which reagents would give a positive result with this compound?

1 alkaline aqueous iodine

2 2,4-dinitrophenylhydrazine

3 Fehling's solution

11. 9701/12/O/N/16/40

Which statements about the formation of a carboxylic acid are correct?

1 A carboxylic acid can be produced by hydrolysis of a nitrile.

2 A carboxylic acid can be produced by oxidation of a primary alcohol.

3 A carboxylic acid can be produced by reduction of an aldehyde.

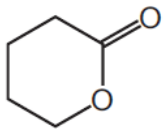
12. 9701/12/F/M/16/30

Which row of the table is correct?

	increasing number of carbon atoms ⟶			
A	ethyl methanoate	methyl propanoate	pentyl pentanoate	propyl butanoate
B	ethyl methanoate	methyl propanoate	propyl butanoate	pentyl pentanoate
C	methyl propanoate	propyl butanoate	ethyl methanoate	pentyl pentanoate
D	propyl butanoate	ethyl methanoate	pentyl pentanoate	methyl propanoate

13. 9701/11/M/J/16/27

Cyclic esters are also known as lactones. *Delta* lactone is used as a solvent and in the manufacture of polyesters.



delta lactone

From which compound could *delta* lactone be made by a single reaction?

A $HOCH_2CH_2CH_2CH_2CHO$

B $HOCH_2CH_2CH_2CH_2CO_2H$

C $HOCH_2CH_2CH_2CH_2CH_2OH$

D $HOCH_2CH_2CH_2CH_2CH_2CO_2H$

14. 9701/11/M/J/16/28

Which reagent **cannot** be used to distinguish between ethanal and propanone?

A acidified sodium dichromate(VI) solution

B alkaline aqueous iodine

C cold acidified potassium manganate(VII) solution

D Fehling's reagent

15. 9701/12/M/J/16/26

Which organic compound would **not** give **either** a yellow precipitate when treated with alkaline aqueous iodine **or** an orange precipitate when treated with 2,4-dinitrophenylhydrazine reagent?

A propanal

B propan-1-ol

C propan-2-ol

D propanone

16. 9701/12/M/J/16/27

In which reaction is the organic compound oxidised?

A $CH_3CH_2CH_2CHO$ + Tollens' reagent

B $CH_3CH_2CH_2CHO$ + $LiAlH_4$

C $CH_3CH_2CH_2OH$ + concentrated H_3PO_4

D $CH_3CO_2C_2H_5$ + dilute H_2SO_4

17. 9701/12/M/J/16/39

Propanal reacts with hydrogen cyanide to form 2-hydroxybutanenitrile. A suitable catalyst for this reaction is sodium cyanide.

$$CH_3CH_2CHO + HCN \xrightarrow{NaCN} CH_3CH_2CH(OH)CN$$

Which statements about the reaction of propanal with hydrogen cyanide are correct?

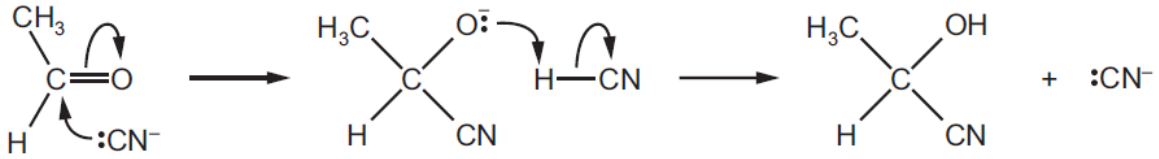
1 The sodium cyanide provides a stronger nucleophile than HCN.

2 The reaction can be classified as nucleophilic substitution.

3 The hydrogen cyanide molecule attacks the propanal molecule to form an intermediate ion.

18. 9701/13/M/J/16/38

Ethanal and hydrogen cyanide react together to form a compound used in the production of acrylic fibres. The reaction mechanism involves cyanide ions.



Which statements about this mechanism are correct?

1 CN^- acts as a catalyst.

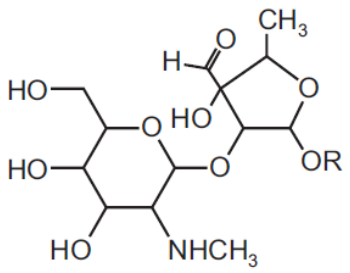
2 CN^- is a nucleophile.

3 It is an addition reaction.

19. 9701/13/M/J/16/39

Which compounds will give an orange precipitate with 2,4-dinitrophenylhydrazine reagent?

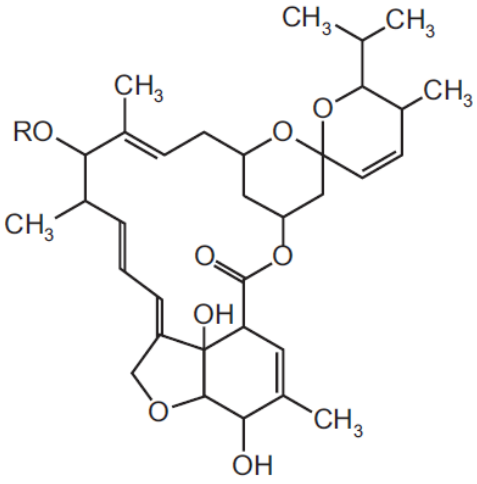
1



streptomycin

[R is an inert group]

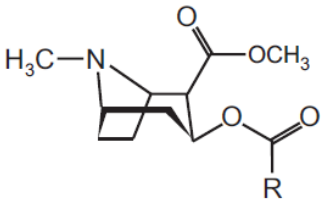
2



avermectin B_{1b}

[R is an inert group]

3



cocaine

[R is an inert group]