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# CHEMISTRY

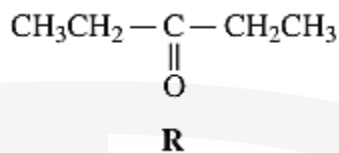
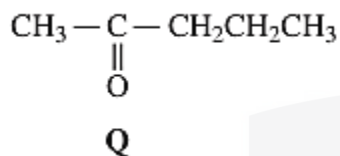
## INORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	OPTICAL ISOMERISM
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	10
TOTAL MARKS	36

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## Optical Isomerism - 1

1. Two isomeric ketones are shown below



(a) Name and outline a mechanism for the reaction of compound Q with HCN and name the product formed.

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(6)

(b) Some students were asked to suggest methods to distinguish between isomers Q and R.

One student suggested testing the optical activity of the products formed when Q and R were reacted separately with HCN.

By considering the optical activity of these products formed from Q and R, explain why this method would not distinguish between Q and R.

(3)

2. Which one of the following can exhibit both geometrical and optical isomerism?

- A.  $(\text{CH}_3)_2\text{C}=\text{CHCH}(\text{CH}_3)\text{CH}_2\text{CH}_3$
- B.  $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}(\text{CH}_3)\text{CH}_2\text{CH}_3$
- C.  $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_2\text{CH}_3)_2$
- D.  $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)\text{C}=\text{CH}_2$

(1)

3. Butanone is reduced in a two-step reaction using  $\text{NaBH}_4$  followed by dilute hydrochloric acid.

(a) Write an overall equation for the reduction of butanone using  $[\text{H}]$  to represent the reductant.

(1)

(b) By considering the mechanism of the reaction, explain why the product has no effect on plane polarised light.

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(6)

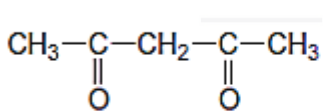
4. Which one of the following reactions will produce an organic compound that has optical isomers?

- A. dehydration of butan-2-ol by heating with concentrated sulphuric acid
- B. reduction of pentan-3-one by warming with  $\text{NaBH}_4$
- C. addition of  $\text{Br}_2$  to 3-bromopropene
- D. reduction of 2,3-dimethylpent-2-ene with  $\text{H}_2$  in the presence of a nickel catalyst

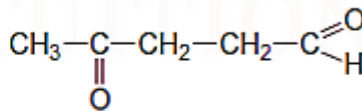
(1)

5. State how you could distinguish between compounds J and K by a simple test-tube reaction.

State how you could distinguish between J and K by giving the number of peaks in the  $^1\text{H}$  n.m.r. spectrum of each compound.



J



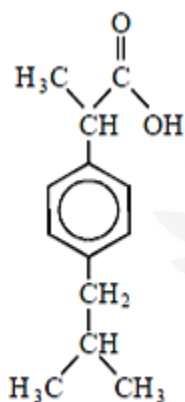
K

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(5)

6. Ibuprofen is a drug used as an alternative to aspirin for the relief of pain, fever and inflammation.

The structure of ibuprofen is shown below.



Which one of the following statements is not correct?

- A.** It has optical isomers.  
**B.** It liberates carbon dioxide with sodium carbonate solution.  
**C.** It undergoes esterification with ethanol.  
**D.** It undergoes oxidation with acidified potassium dichromate(VI).

(1)

7. Draw the structure of each of the following isomers of  $C_5H_8O_2$

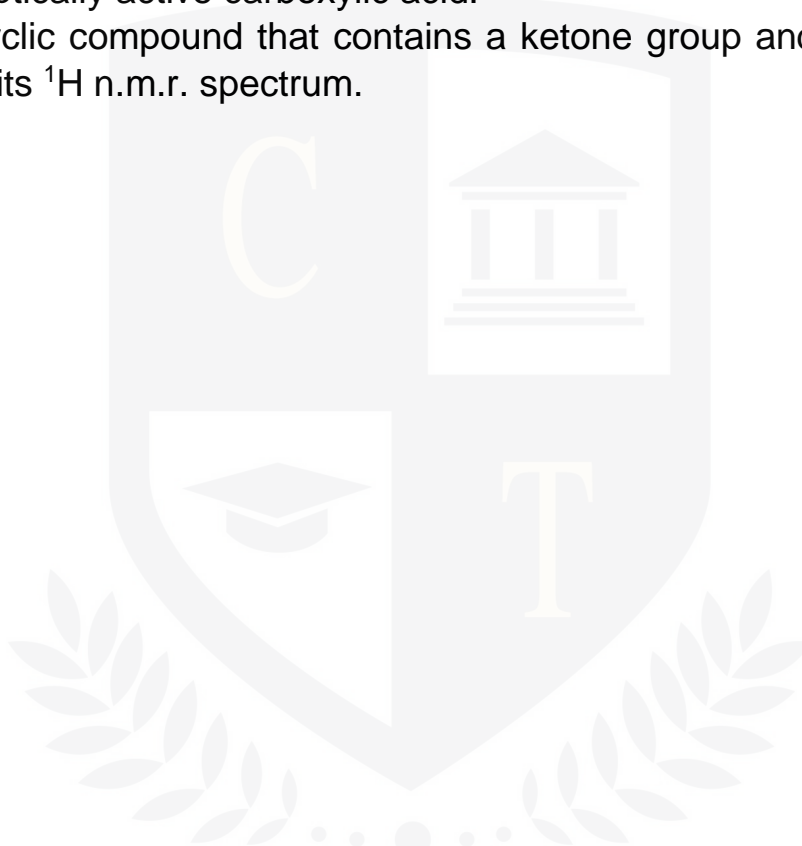
Label each structure you draw with the correct letter L, M, N, P or Q. L is methyl 2-methylpropenoate.

M is an ester that shows E-Z stereoisomerism.

N is a carboxylic acid with a branched carbon chain and does not show stereoisomerism.

P is an optically active carboxylic acid.

Q is a cyclic compound that contains a ketone group and has only two peaks in its  $^1\text{H}$  n.m.r. spectrum.



(5)

8. Which one of the following statements about but-2-enal,  $\text{CH}_3\text{CH}=\text{CHCHO}$ , is not true?

- A. It has stereoisomers.
- B. It shows a strong absorption in the infra-red at about  $1700\text{ cm}^{-1}$ .
- C. It will turn an acidified solution of potassium dichromate(VI) green.
- D. It can be dehydrated by concentrated sulphuric acid.

(1)

9. The carbonyl compound  $\text{CH}_3\text{CH}_2\text{CHO}$  reacts very slowly with HCN

Name and outline a mechanism for the reaction of  $\text{CH}_3\text{CH}_2\text{CHO}$  with HCN



10. On reduction, a racemate can be formed by

- A.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$
- B.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_3$
- C.  $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
- D.  $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CHO}$

(5)

(1)

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