11.1 Spectroscopic Identification

Question Paper

Course	DP IB Chemistry
Section	11. Measurements & Data Processes
Topic	11.1 Spectroscopic Identification
Difficulty	Easy

Time allowed: 20

Score: /10

Percentage: /100

Question 1

Which of the following statements about propanal, CH_3CH_2CHO, and propanone, CH_3COCH_3 is **not** correct?

The compounds have:

A molecular ion peaks at different mass to charge ratios

B different fragmentation patterns in the mass spectrum

C absorption in the infrared spectrum due to the carbonyl group

D a different fingerprint region in the infrared spectrum

[1 mark]

Question 2

Nitrogen trichloride has the formula NCl_3. A sample was found to contain only ^{14}N, and chlorine atoms with mass numbers 35 and 37.

Which of the following is an **incorrect** ion and mass/charge ratio responsible for the molecular ion peaks found in the mass spectrum of nitrogen trichloride?

	ion	*m/e*
A	$N(^{35}Cl)_3^+$	119
B	$N(^{35}Cl)_2{}^{37}Cl^+$	121
C	$N^{35}Cl(^{37}Cl)_2^+$	123
D	$N(^{37}Cl)_2^+$	125

[1 mark]

Question 3

Which of the following cannot be obtained from an infrared spectrum?

A the molecular mass

B the presence of C=O bonds

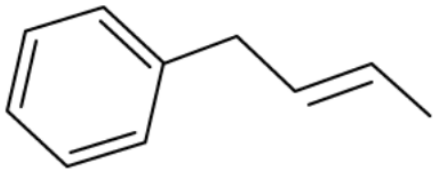
C the presence of O-H bonds

D the identity of a compound through comparison with other spectra

[1 mark]

Question 4

What is the **index of hydrogen deficiency** (**IHD**) for the molecule shown below?



A 1

B 2

C 4

D 5

[1 mark]

Question 5

What information can be determined from the infrared spectrum of a molecule?

A The number of hydrogens

B The number of hydrogen environments

C The type of bonds present

D The relative molecular mass

[1 mark]

Question 6

Which of the following bonds will produce strong absorptions in the infrared part of the electromagnetic spectrum?

I. C-N

II. O=O

III. C=O

A I and II only

B I and III only

C II and III only

D I, II and III

[1 mark]

Question 7

Which of the following is true about the fingerprint region in the IR spectrum of alcohols?

A The fingerprint region is where single bonds can be identified in the IR spectrum

B The fingerprint region is unique to every molecule

C The fingerprint region does not provide useful information about molecules

D A functional group can be identified from the fingerprint region

[1 mark]

Question 8

Which of the following statements is correct about spectroscopic techniques for organic molecules?

A Information about bond vibrations can be deduced from mass spectroscopy

B The values of carbon–hydrogen bond lengths can be found from ^{1}H NMR spectroscopy

C The number of hydrogen atoms can be determined from infrared spectroscopy

D Information about molecular structure can be found from mass spectroscopy

[1 mark]

Question 9

In the ^{1}H NMR spectrum of 3-methylbutan-1-ol what is the ratio of the peak areas under each signal?

A 6 : 1 : 2 : 2 : 1

B 3 : 3 : 1 : 5 : 1

C 6 : 1 : 5 : 1

D 3 : 3 : 1 : 2 : 3

[1 mark]

Question 10

Which of the following types of spectroscopic identification will involve bond fission in organic molecules?

A Nuclear magnetic spectroscopy

B Infrared spectroscopy

C Mass spectrometry

D X-ray crystallography

[1 mark]