INKCHEMISTRY FLASHCARDS

Organic analysis

Unit C19 · 40 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions to learn and misconceptions to correct. These cards, and a check-yourself question for every lesson, run on the website with spaced-repetition scheduling, at inklearning.co.uk/chemistry/flashcards.

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DEFINITION

Define: Functional group.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: Tollens' reagent.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: Fehling's solution.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: Molecular ion.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: Precise relative molecular mass.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: 2,4-Dinitrophenylhydrazine.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: Triiodomethane test.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: Fragmentation.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

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DEFINITION

An aqueous solution of $[Ag(NH_3)_2]^+$ that is reduced to silver by an aldehyde, giving a silver mirror, but does not react with a ketone.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

The atom or group of atoms in a molecule that is responsible for its characteristic chemical reactions.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

The ion formed when a molecule loses one electron, M^+; its m/z gives the relative molecular mass.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

An alkaline solution of a copper(II) complex that is reduced by an aldehyde to a brick-red precipitate of copper(I) oxide.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Brady's reagent, which gives a yellow or orange precipitate with an aldehyde or a ketone; the melting point of the purified precipitate identifies the carbonyl compound.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

The relative molecular mass calculated from the precise masses of the most abundant isotopes, given to four decimal places.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

The breaking of a molecular ion into a positive ion and a neutral radical, of which only the ion is detected.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Warming with iodine and aqueous sodium hydroxide; a pale yellow precipitate of CHI_3 shows a CH_3CO group or a $CH_3CH(OH)$ group.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

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DEFINITION

Define: Base peak.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: M+1 peak.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

SPOT THE ERROR

Say what is wrong with this claim:

If a compound turns acidified dichromate green, it has to be an alcohol.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

Define: Infrared spectroscopy.

INFRARED SPECTROSCOPY

DEFINITION

Define: Absorption.

INFRARED SPECTROSCOPY

DEFINITION

Define: Wavenumber.

INFRARED SPECTROSCOPY

DEFINITION

Define: Transmittance.

INFRARED SPECTROSCOPY

DEFINITION

Define: Bond vibration.

INFRARED SPECTROSCOPY

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DEFINITION

The small peak one m/z unit above the molecular ion, from molecules containing one carbon-13 atom; its height relative to M gives the number of carbon atoms.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

The tallest peak in a mass spectrum, given a relative abundance of 100.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

A technique that identifies the bonds in a compound from the wavenumbers of infrared radiation that they absorb.

INFRARED SPECTROSCOPY

SPOT THE ERROR

Acidified dichromate turns green with anything that reduces it, and aldehydes do, going to carboxylic acids. Green says only that something was oxidised. A second test is needed: no silver mirror with Tollens' reagent rules out an aldehyde. A tertiary alcohol gives no colour change at all.

TEST-TUBE REACTIONS FOR FUNCTIONAL GROUPS ...

DEFINITION

The reciprocal of the wavelength, $1/\lambda$, measured in cm^{-1}; it is proportional to the frequency of the radiation.

INFRARED SPECTROSCOPY

DEFINITION

The removal from the beam of infrared radiation whose frequency matches the vibration frequency of a bond, seen as a dip in transmittance.

INFRARED SPECTROSCOPY

DEFINITION

The stretching or bending of a covalent bond at a natural frequency set by the bond strength and the masses of the bonded atoms.

INFRARED SPECTROSCOPY

DEFINITION

The percentage of the incident infrared radiation at a given wavenumber that passes through the sample.

INFRARED SPECTROSCOPY

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DEFINITION

Define: Fingerprint region.

INFRARED SPECTROSCOPY

DEFINITION

Define: Greenhouse gas.

INFRARED SPECTROSCOPY

DEFINITION

Define: Global warming.

INFRARED SPECTROSCOPY

SPOT THE ERROR

Say what is wrong with this claim:

Every peak on an infrared spectrum belongs to a bond, so I should label all of them.

INFRARED SPECTROSCOPY

DEFINITION

Define: Chemical environment.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Define: Chemical shift.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Define: TMS.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Define: Nuclear spin.

PROTON AND CARBON-13 NMR SPECTROSCOPY

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DEFINITION

A gas whose molecules absorb infrared radiation emitted from the Earth's surface and re-emit it, warming the lower atmosphere.

INFRARED SPECTROSCOPY

DEFINITION

The region of an infrared spectrum below 1500 cm^{-1}, whose pattern of absorptions is unique to a compound.

INFRARED SPECTROSCOPY

SPOT THE ERROR

Only the peaks above about 1500 cm^{-1} are assigned to bonds: O–H, N–H, C–H, C=O, C=C. Below 1500 cm^{-1} the absorptions of the carbon skeleton overlap, and that part of the spectrum is compared with a known spectrum as a whole, not read peak by peak.

INFRARED SPECTROSCOPY

DEFINITION

The rise in the mean temperature of the Earth's surface and lower atmosphere caused by increasing concentrations of greenhouse gases.

INFRARED SPECTROSCOPY

DEFINITION

The position of an NMR absorption relative to the TMS peak, δ, measured in parts per million (ppm).

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

A set of atoms in a molecule that are bonded to identical surroundings, so they absorb at the same chemical shift.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

The property of some nuclei, including every nucleus with an odd number of nucleons such as ^{1}H or ^{13}C, that lets them align with or against an applied magnetic field.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Tetramethylsilane, $Si(CH_3)_4$, the reference compound whose single peak is defined as $\delta = 0$.

PROTON AND CARBON-13 NMR SPECTROSCOPY

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DEFINITION

Define: Shielding.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Define: Integration ratio.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Define: Spin-spin splitting.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Define: Deuterated solvent.

PROTON AND CARBON-13 NMR SPECTROSCOPY

SPOT THE ERROR

Say what is wrong with this claim:

The number of peaks in a proton NMR spectrum is the number of hydrogen atoms in the molecule.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

Define: Stationary phase.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: Mobile phase.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: Adsorption.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

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DEFINITION

The ratio of the areas under the peaks in a proton NMR spectrum, equal to the ratio of the numbers of hydrogens in each environment.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

The reduction in the magnetic field felt by a nucleus caused by the electrons around it; a less shielded nucleus absorbs at a higher chemical shift.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

A solvent such as $CDCl_3$ in which ^1H atoms are replaced by deuterium, so that it gives no peaks in a proton NMR spectrum.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

The splitting of an NMR peak into lines by the hydrogens on adjacent carbon atoms, n neighbouring hydrogens giving n + 1 lines.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

The phase that does not move, on or in which the components of a mixture are held, such as silica on a TLC plate.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

SPOT THE ERROR

Each peak is one environment, not one atom. Ethanol has six hydrogens in three environments, CH_3, CH_2 and OH, so three peaks, and the area under each is in proportion to the number of hydrogens in it, 3 : 2 : 1. Splitting then adds detail: the CH_3 peak is a triplet because of the two neighbouring CH_2 hydrogens.

PROTON AND CARBON-13 NMR SPECTROSCOPY

DEFINITION

The holding of molecules on the surface of a solid by intermolecular forces.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

The liquid or gas that moves through or over the stationary phase and carries the components with it.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

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DEFINITION

Define: Rf value.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: Solvent front.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: Eluent.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: Retention time.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: Carrier gas.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: Calibration curve.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

Define: HPLC.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

SPOT THE ERROR

Say what is wrong with this claim:

A spot with the same Rf as a known compound must be that compound.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

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DEFINITION

The furthest point reached by the solvent on a chromatogram, marked as soon as the plate is removed from the tank.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

The distance moved by a component divided by the distance moved by the solvent front, both measured from the baseline.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

The time taken for a component to pass from the injection point to the detector in gas chromatography.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

The solvent run continuously through a chromatography column as the mobile phase, carrying the components down it.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

A graph of peak area against concentration for standards of known concentration, from which the concentration in a sample is read.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

The unreactive gas, usually helium or nitrogen, that is the mobile phase in gas chromatography.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

SPOT THE ERROR

Many compounds share an Rf in one solvent, because Rf only summarises a balance between adsorption on the plate and solubility in the solvent. A match is consistent with identity, not proof of it. Running the plate in a second solvent, or comparing a mass spectrum, is needed before the spot can be named.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

DEFINITION

High-performance liquid chromatography, in which a liquid mobile phase is pumped at high pressure through a column packed with very small particles of stationary phase.

CHROMATOGRAPHY: TLC, COLUMN AND GAS

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