Chemistry spec notes flashcard

Reduce waste + pollution Higher yield The work of the chemical Industry IA Jobs Fine Transport workers: Brings materials into the plant Research chemists: Investigate the best method Production chemists: " Scale up" the methods Analytical chemists: Test the purity of samples and see if it measure up to standards. Technical team: Monitor data + conditions Chemical process 1) These raw materials are converted into chemicals and purified into feedstock after being heated and compressed. Crude oil 2)Air 3) Water 2) The synthesis takes place in the reactor and is converted into the product 0 Energy s released. Some CRY'S take place in high temp.

So need heat energy Uses catalyst 3) The mixture of chemicals is separated into: Product, by-products, unchanged material (recycled). Heat energy is produced as a by-product b/c so it is used to make steam in the exchanger 0 saves money + energy 4) The product is analyses to monitor purity. Products made from synthesis Basic organics Petrochemicals Pigments, paint, dyes Pharmaceutical Specialist chemicals Innovations in green chemistry B Regulations are put in place for the storing and transporting of chemicals.

Hazard humbly and sealed containers prevent harm from coming to people + environment. Preventing pollution: 1) New method 2) Use renewable + cost effective resources Green chemistry benefits: 1) Increases efficiency 2) Reduces cost 3) Avoid risks Reducing use of petrochemicals, e.

G. Crude oil, will be more sustainable. Rather, you should ferment renewable plant material using bacteria 0 produces MELANIN ACID produces corona 0 used for clothes Advantages Disadvantages Renewable Takes up land meant

for food Energy needed to produce more fertilizers + for harvesting Fewer emissions Saves crude oil Yields Yield – efficiency of method

Compares quality with predicted quality High yield = good but doesn’t mean that process is “ green”. Working out percentage yield E.

G. Log of Cacao is heated for minis. The product is 4. G of Cacao. What is the percentage yield? 1.

Formula: cacaos (s) cacao (s) + CA(g) Atoms that end up in the product are referred to as green. Waste products are brown. 2. Find RFM: cacao= 40+ cacao 16= 56 so, logos Cacao produces gag of Cacao.

3. Theoretical Yield: 56/xx 5. G [from log of cacao] 4. % yield: Actual yield / theoretical yield 4. 8 / 5.

6 x Atom economy = the efficiency 0 how much product ends up as reactant

Formula: RAM of product / RAM of reactant x 100 E. G. cacao(s) cacao (s) +CA(g) RAM = 100 RAM= 56 RAM= 44 Avoiding hazardous chemicals Need to replace toxic reactant with safer alternatives. Copper catalyst means that process runs under milder conditions = save energy + costs.

Energy efficiency Heat energy is used for: 1) drying 2) reactions 3) process waste 4) separate + purify To prevent energy loss, must: Install efficient insulation in pipes + stop steam from escaping leaking valves Exothermic reactions release energy which is used to make steam to generate electricity = NO BILLS for extra energy

Catalyst Catalysts speed up CRY'S for the DESIRED product NOT the unwanted product. PROS of catalysts Reduces waste Lower temp. Required 0 good for environment Saves energy Need to find ways to lower energy demand. Bucolically – enzymes produced by microorganisms Operates within limited temp.

+ pH range 0 any higher = denatured Petrochemical route has more steps = more energy + money spent Heat exchangers have two materials flowing in opposite directions. The hot material is cooled by the colder one. Recycling Install distillation units to separate desired chemicals from waste gases.

This will reduce waste.

Convert old polymer to monomer 0 re-polymerase pure monomer Need to remove harmful chemicals from air / water / landfills. Closed loop – use waste material to manufacture the same product + there is no loss in quality Open loop – waste is recovered to manufacture lower quality product Not as good value but cuts down on the amount of fresh feedstock required Designing new catalysts Wrap organic structure around metal ion to make a new catalyst. Catalyst for making polyester: Wrap citrate ions around titanium ions to produce a polymer.

This titanium can be seed as antimony to replace toxic metals.

You need to think about the size+ shape of the molecules, as well as the interaction with electrons. PRO's of new catalysts More efficient b/c less catalyst is needed to make a fixed amount of polymer The new catalyst metals aren't toxic New catalyst 0 new polymers Sustainable development –

meeting needs of present without compromising needs of future Green chemistry – long term sustainability + short term impacts on health + environment The Alaskan – a family of hydrocarbons AAA 15/06/13 Physical properties 1) Oily 2) insoluble doesn’t mix with H2O

States: Gas: 4 carbon atoms Combustion 3) less dense than H2O, mainly gases 4) Insoluble – Liquid: 4 – 17 carbon atoms Solid: 17+ carbon atoms Hydrocarbons + burning 0 Carbon dioxide + water When there is a lack of oxygen: Hydrocarbons + burning 0 Carbon monoxide + soot Alaskan don’t react with aqueous reagents e. G. Acids or alkali’s. This is because they are saturated – their C – H and C – C bonds are difficult to break = highly UN-reactive. The formula CNN (an+2), where n = no of carbon atoms, can be used to determine the formula for each alkaline.

E. G.

To find propane: ACH (ex. +2) = CHI The Alikeness The alikeness are unsaturated and are more reactive b/c of the C = C double bond.

The double bond allows them to melt and form into different things e. G. Plastic Alcohols have similar properties b/c they have the OH at the end. The formula CNN (an+1) OH, where n = no of carbon atoms, can be used to determine the formula for each alcohol.

Alcohol (contains hydrocarbons) + burning 0 Carbon dioxide + water Properties Good solvent – Can dissolve in compounds that water can’t Soluble in water Liquid at room temp. Evaporate + volatile (give of fumes). Intermolecular forces are trotter with the-OH functional group; other

molecules can Join to the alcohol easily. Alaskan are gases so their intermolecular forces are less strong. Flammable – catches a clean flame.

B/c it is pure, can be used as fuel High boiling point An alcohol can become a water molecule or an alkaline when you replace the – H atom. Alcohols are liquids whereas Alaskan are gases. This shows that attractive forces between alcohol molecules (intermolecular) are stronger than the forces in Alaskan.

This is b/c the – OH group gives the molecules a greater tendency to cling together – eke water. The C – O + O – H are more reactive than the C – C + C – H in Alaskan.

However, ethanol boiling point is lower than water. This is because ethanol molecules have a greater mass than water molecules BUT the attraction between the hydrocarbon parts is weak. Ethanol molecules have more tendencies to stick to each other than Alaskan but fewer tendencies to stick to each other compared to water. B/c the – OH group allows other molecules to cling together; alcohol and water can mix together.

But if hydrocarbon length is too long the oiliness of the alcohol will nominate and it will be too difficult to mix. Only the hydrogen atom in the – OH is involved in the reaction. The hydrogen atoms linked to the carbon (C -H) are inert or UN-reactive. An + H2O 0 Noah + H2O (+ squeaky POP) An + CHOUGH O Ana + H2O An ionic bond is formed between the positive sodium and negative oxygen. E. G.

CHOUGH + An 0 Achaean + H2O The production of ethanol B Principles of green chemistry must be applied to the process + modifications must be made if necessary.

Fermentation PRO’s of fermentation Renewable feedstock – e. G. Waste plant material – maize, sugar cane. Un-fermented arts used as animal food 21st century = further developments 0 more parts CAN be fermented Agricultural waste / sludge can be fermented CON’S of fermentation Lots of land needed May need the space for human foods Some parts can’t be fermented Reaction Cellulose polymers from feedstock are heated with acid to break it down into simple sugars.