Have membrane not derived from cell's endomembrane system

Membrane structure sets up small-volume compartment for proton gradient (inter membrane space for mito and inside thylakoid for chloro

General Observations: Both chloroplasts and mitochondria appear to be derived from bacteria

Have own (circular) DNA

Have own ribosomes and tRNA

CO2 fixed from air by RuBisCo Electrons from NADPH are used to reduce these molecules

Yes, can be used for glucose but also everything else. Remember plants are limited for growth if they don't have enough water, nitrogen or phosphorous (also require other trace minerals in much lower amounts).

each cycle adds a carbon; main product is G3P (three carbon simple sugar)

Calvin Cycle in stroma of chloroplast

Remember there is circular flow (no NADPH made and no oxygen released. Probably won't come up in essay

NADPH **Photosynthesis.** Linear flow. Electrons excited by light carried **From** electron Transport **To** Calvin cycle to reduce carbon and make carbohydrates.

NADH + H+ or FADH2: respiration Carries electrons **From** food mostly harvested carbons in Citric Acid Cycle **To** electron transport

High-energy electrons carried by nucleotide cofactors

Electron transport: ReDox reactions that move protons across membrane (this should probably be the pivotal point in your essay)

Oxygen

Photosynthesis: electrons in reaction center excited by light are fed into electron transport. These are replaced by oxidizing oxygen in water, releasing free O2 (released protons help in gradient

Respiration: use oxygen as final (low-energy) acceptor of electrons. Form water with H+ also in the area (helps with proton gradient)

Carbons from food oxidized, CO2 released. Electrons to NAD+ (make NADH)

Yes, can come from glucose but also from other carbon sources. Fed in by Acetyl-CoA

Citric Acid Cycle in matrix of mitochondria

Energy Metabolism (photosynthesis and respiration)

Also produce NADH which can feed into ETS

Fermentation (lactic acid or ethanol) regenerates NAD+ if oxygen not available or otherwise limited to anaerobic respiration

Glycolysis If it comes up. Break down sugar into simpler carbon units fed into Citric Acid Cycle

Investment phase (two ATP spent on the way to making a high-energy phosphorylated sugar)

Payoff phase (get 4 back via substrate level phosphorylation for net gain of 2)

ATP Synthase

Driven by Proton Gradient (need a membrane to maintain gradient)

Uncoupling agents make path for protons that doesn't allow ATP synthesis. This can be good (thermogenin in brown fat cells) or bad (toxins that kill cells).