Disassembly of a Single Use Camera

A. Identify each of the above functional components in the sample camera
   a. Lens- Image Forming
   b. Shutter mechanism- Controlling the exposure of the film to the light path
   c. Film-Image sensing and recording
   d. Viewfinder- Image viewing
   e. Film transport and counter mechanism- image sensor
   f. Electronic Flash- light source
   g. Energy Cell- source for electric power
   h. Housing assembly (frame) - keep parts together and inside

B. How parts and components are arranged and how the camera works
   Parts and components are composed to maximize the space inside the frame, minimizing the overall size of the camera. There is the lens which is put in the middle and the flash which is on the front side of the camera. All the pieces are placed on the camera strategically to improve usability and comfortability. Because the trigger is on the top with the view finder it allows the user to easily take pictures without too much of a hassle. The circuit board is placed right next to the flash to minimize the amount of wire needed within the circuit. The manufacturer made sure that the parts were placed to minimize the amount of materials needed most likely because of economic reasons. This allows for a compact single use camera. The camera works because of a chemical reaction that occurs when light hits the film. When the shutter opens up the film is rapidly exposed to the light and thus imprints an image onto the film. Using flash also helps to bring more light into the film which produces a clearer picture.

C. Materials used for parts and assembly and disassembly
   The entire camera, besides the circuitry, is made from a heavy duty ABS Plastic, that was injection molded to fit the parts. This molding process makes the already strong plastic, even stronger and able to take a fair amount of abuse. Even after taking apart the camera and putting it back together several times, no pieces have broken or fractured, even on the outer casing, the part of the camera that goes through the most stress during disassembly and reassembly. The flash circuitry is made from standard circuitry materials, which are the hardest and most durable parts of the entire system.

D. Subsystems and Functions of all parts
The single use camera is made possible by the conjunction of all of the following parts and systems and would not function correctly without one of any of these parts. I will be addressing each of the systems as they are depicted below and describe their relation to each of the other systems that make the camera function.

Depicted here are the front, back, film canister, and battery covers which make up the housing assembly of the camera. The housing assembly is what keeps all of the camera’s components together and safe from unintended external forces. It serves no other purpose than to hold and protect the camera’s internal components.
In the upper left hand corner of the picture is the user interface for the camera. This interface interacts with the user (mechanically), the film canister (mechanically), and the mechanical assembly (mechanically).

In the lower left hand corner of the picture is the mechanical assembly. This assembly interacts with the user assembly (mechanically), the lens assembly (mechanically), the feedback interface (mechanically), and the flash circuit (mechanical/electrically).

In the upper right hand corner of the picture is the feedback interface. This interface interacts with the user (visually) and the mechanical assembly (mechanically).

In the lower right hand corner of the picture is the lens assembly. This assembly interacts with the mechanical assembly (mechanically).
In the upper left hand corner of the picture is the optic pieces. These pieces interact with the user (visually).

In the upper right hand corner of the picture is the electronic assembly. This assembly interacts with the user (mechanically/electrically and visually) and the mechanical assembly (mechanically/electrically).

On the bottom of the picture is the plastic internal assembly molding. This piece acts like the housing assembly to hold the pieces in place, but only internally - not externally.

E. which parts are reused and which are recycled

Plastic parts of the camera are designed to go through the camera ten times. This is kept track of by a counter that is built into the electronics. The parts are separated by color and the polystyrene plastic is separated from the metal. Plastic parts that are not able to be used again are ground down into pellets and remolded into new parts. The enclosure is ground down and recycled because it can get scratched and damaged during use. 86% of the camera's material is reused each time. One billion single use Kodak cameras have been reclaimed for recycling and the rate of recycling for single use cameras is 84%. This is the highest rate for any U.S. consumer product.
F. energy, material, and signal processing on a functional flow chart

**Single Use Camera Flow Chart**

Disassembly Questions

1. Estimated Cost? \( \approx \$5 \)

2. Is all the packaging necessary? The outer plastic packaging helps to keep dust and other debris from entering the packaging and getting in the camera. It also displays some warnings as to electrical shock and radiation, and tells the user that the camera is not waterproof and is meant for indoor use. The cardboard box on the inside of the packaging is perhaps unnecessary.

3. How is the shutter set ready to expose the film? Explain how the system works from the instant you wind up the shutter to the time the film frame is exposed. As the user of the camera winds the wheel, it spins the film into the canister under the wheel. This sets the frame of the film directly in line with the opening that is blocked by the shutter. As the film...
moves into position, the small holes on the film wind a small piece on a spring. When this piece is completely wound up it will pop upward and get stuck in the winding mechanism. Now the frame of the film and the shutter is in place and primed. When the user pushes the button on the top of the camera, the piece gets unstuck from the mechanism. This causes the spring to unwind. In the process the small piece hits the shutter mechanism thus exposing the film. After it is exposed, the act of winding the camera again seals the film into the canister, shielding it from light which can ruin it. The flash feature of the camera is utilized when you push the button on the front of the camera casing. Pushing this button charges a capacitor on the circuit board in the camera. When the capacitor is fully charged, an LED that is visible from the top of the camera will light up. Then, when the user presses the button on the top of the camera, the shutter mechanism will push together two leads that will cause the energy in the capacitor to run through the flash bulb right as the film is exposed.

4. The joining method in the camera is just friction, as far as we can see, there is no glue used in the camera. All of the pieces just fit together very tightly. They are joined this way to keep as small amount of stress on the pieces as possible.

5. This camera is different than a normal multi use camera because a normal camera is made to be much more reliable and last much longer. Normal cameras are usually made with metal parts and are built on a rock solid platform, unlike the disposable cameras. These disposable cameras are meant to be reused to take up to 300 pictures, then they become unreliable, while normal cameras can be used thousands of times and still work.

6. As far as assembly goes, it is pretty complicated, but not impossibly so. For servicing, it couldn’t be any more simple to take out the spent cartridge. All you have to do is take out two pieces on the bottom and remove the back cover, then just take out the cartridge. As far as reuse, the camera should be able to be fitted with another film cartridge 2 times after its original use, then disposed of.

Camera System’s Life Cycle-outer casing

- The casing is important in the consumer use section of the life cycle because it is the only thing the consumer sees in the final product.
- The plastic casing is made in a factory by pouring plastic into a mold and assembled through an assembly line.
- The outer casing is recycled after each use because it can get scratched or damaged. The plastic is melted down into pellets and remolded.
- The case was made this way to encase all the parts and cut down on the amount of plastic used. It is also manufactured to fit nicely in the hands of the consumer.
- A possible redesign could be to put a groove into the mold on the front of the camera for your fingers to rest so that they do not interfere with the operation or function of the lens or the flash.