Possible Additional Questions for Physics Test - Solutions

X1. (6 points) List three ways light can be polarized.

1. **Passing through a polarizing filter made by stretching a polymer film.**
2. **Reflection in air off a medium of greater index of refraction like water or glass.**
3. **Scattering off of molecules at right angles to the light source and observer.**

X2. (10 points) When we used a battery to break up water into hydrogen and oxygen gas and then exploded them, energy is conserved, but was transformed in a variety of ways. Fill in each blank space with one of the following types of energy: Chemical, Mechanical, Electrical, Heat, Light, Sound

__**chemical**__ energy within the battery was converted to __**electrical**__ energy flowing through the wires going to the electrodes in the water dish.

That energy broke apart the water molecules into hydrogen and oxygen gas which have more __**chemical**__ energy than the original water from which they came. After placing the igniter with its thin wire section into the bag with the hydrogen and oxygen gas, a tiny amount of battery energy was used to blow apart the thin wire and cause a spark.

The resulting explosion released the stored __**chemical**__ energy of the gases, converting it to __**mechanical**__ energy that splashed the water, __**light**__ energy that we could see, and __**sound**__ energy that we could hear. All other energy was converted to __**heat**__ energy.

To recharge the batteries, I later needed to take __**electrical**__ energy from the wall outlet to replenish the __**chemical**__ energy within the battery.

X3a. (5 points) What fault in an power drill can make it dangerous to use if the drill is connected to an old-fashioned two-wire outlet.

If the "hot" lead of the drill power accidentally becomes connected to the drill body, the person holding the drill might be sufficiently grounded to receive the electrical current and be electrocuted.

X3b. (5 points) How does three-wire house wiring help reduce this danger?

The third wire is attached to the body of the drill. In the event of an accidental connection between the "hot" wire to the drill body, this third wire will be a preferable connection to ground rather than through the person holding the drill. The accidental connection would then cause the circuit breaker to open.

X3c. (5 points) How does a ground-fault breaker reduce the danger further?

The ground-fault breaker trips if some of the "hot" wire current does not return via the "low" wire. Thus, if it shorted to the grounded case or through a person instead of returning via the "low" wire, the ground-fault breaker would open the circuit. A ground fault breaker will trip at a relatively safe 6 mA level whereas an ordinary breaker will only trip at 15 or 20 A.