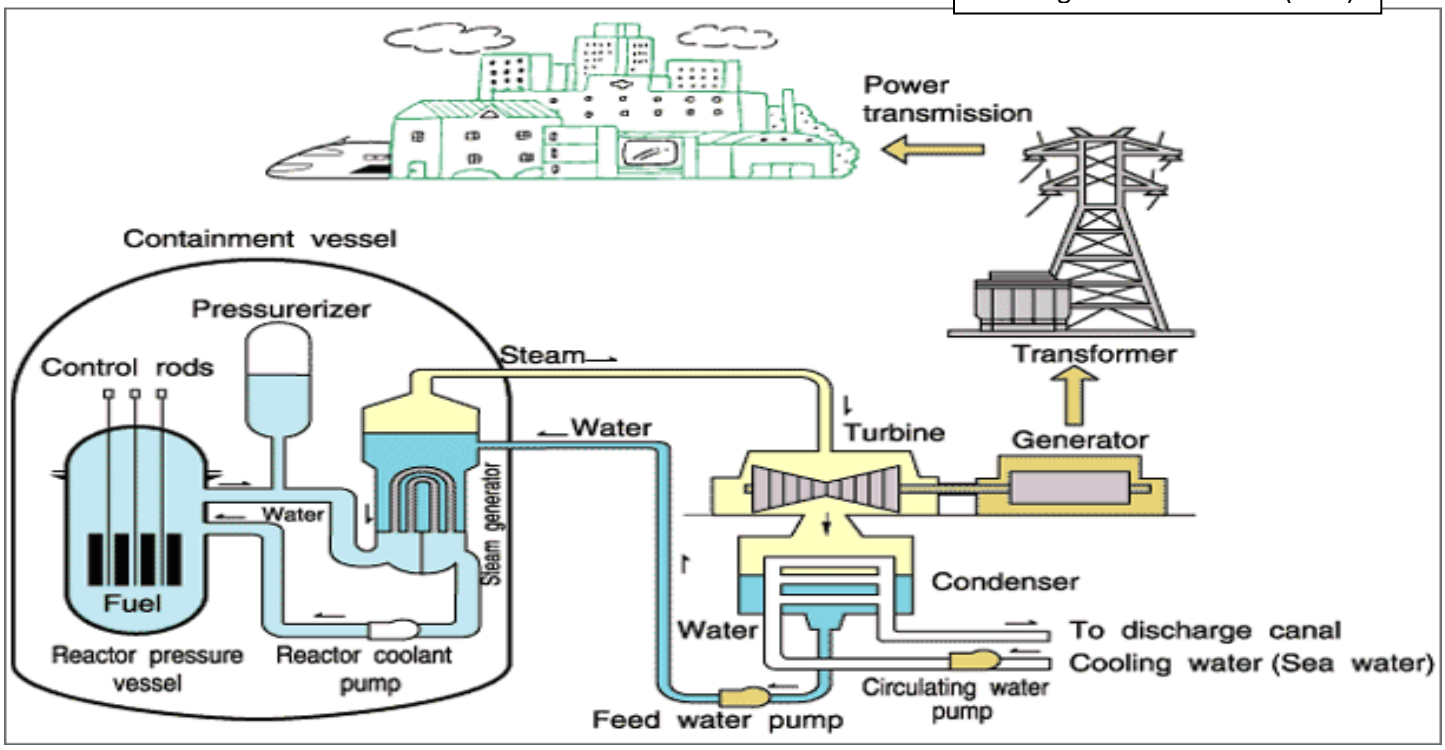
Name_____ Date_____ Mail Box_____ NOTES

Pressurized Water Reactor aka - Light Water Reactor (LWR)



1. How many separate compartments must energy move through in this system before electricity is produced?

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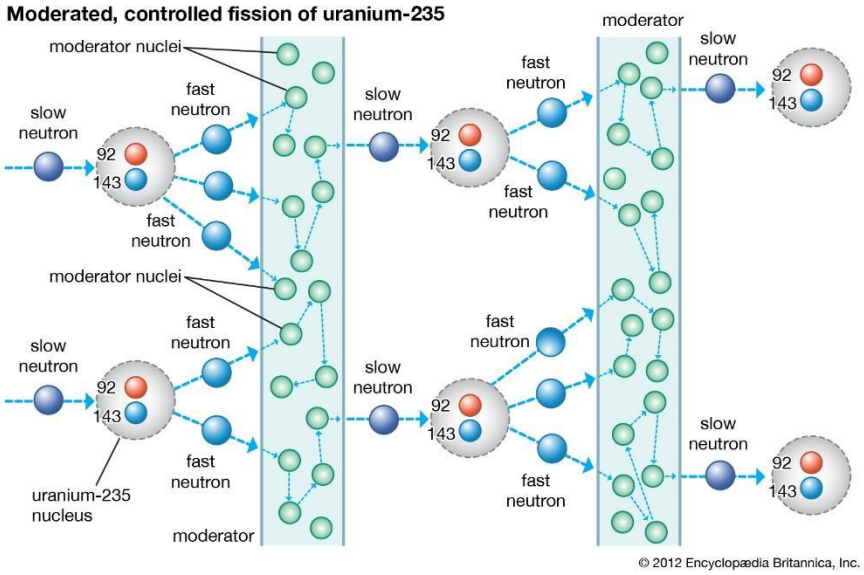
Look closely at the diagram here. The ***moderator*** in this case is water and the control rods.

2. Debate/ discuss what happens to the slow neutron if the moderator (water) boils off, drains from the tank or is not actively circulated or the rods are raised stuck in the up position?



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3. **(Compare and Contrast)** List three design features that are engineered differently in a MSR from that of a LWR (seen above) or pressurized water reactor that could be debated are advantageous.

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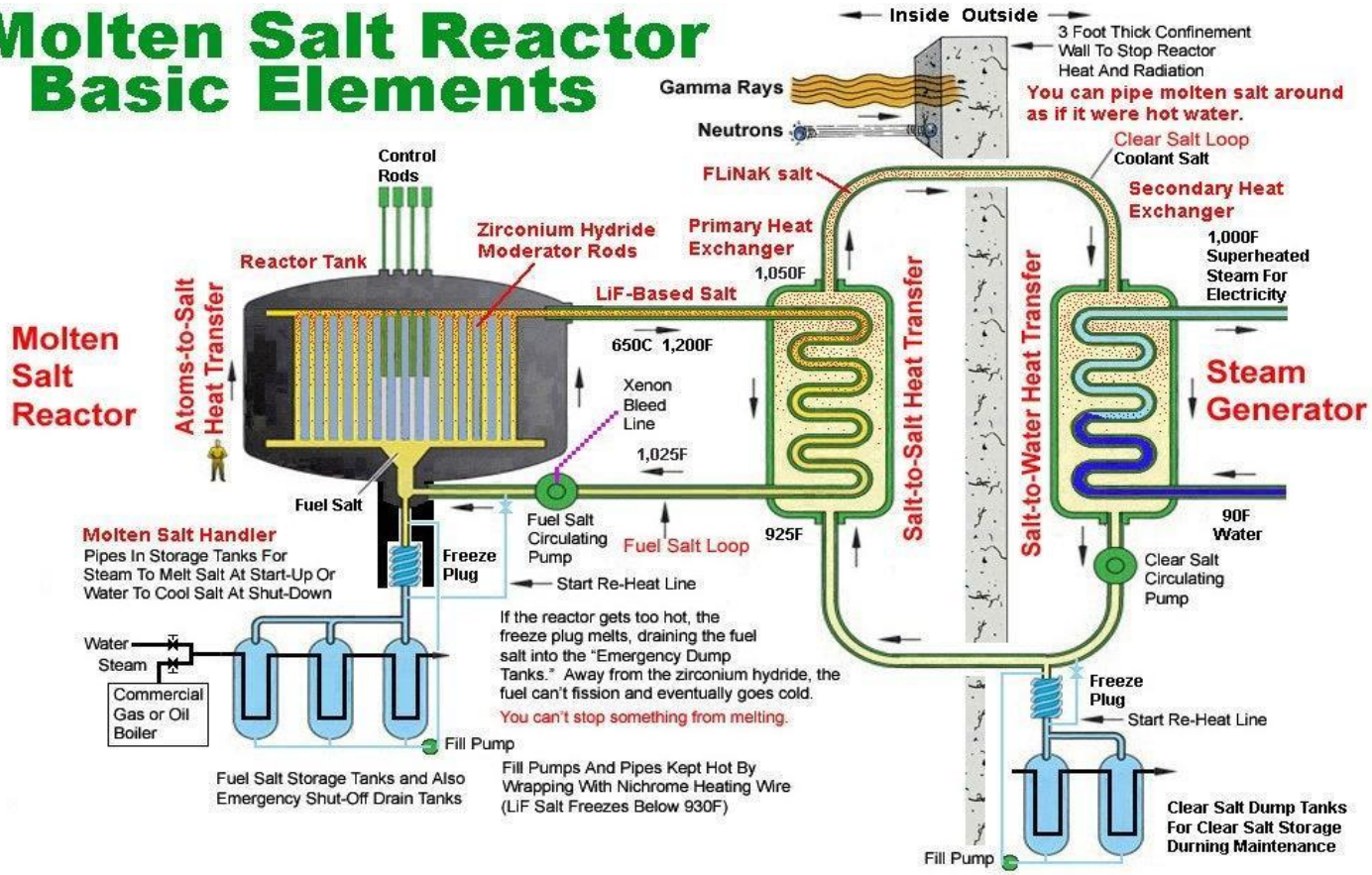
_____(See next pg then come back to this) #2



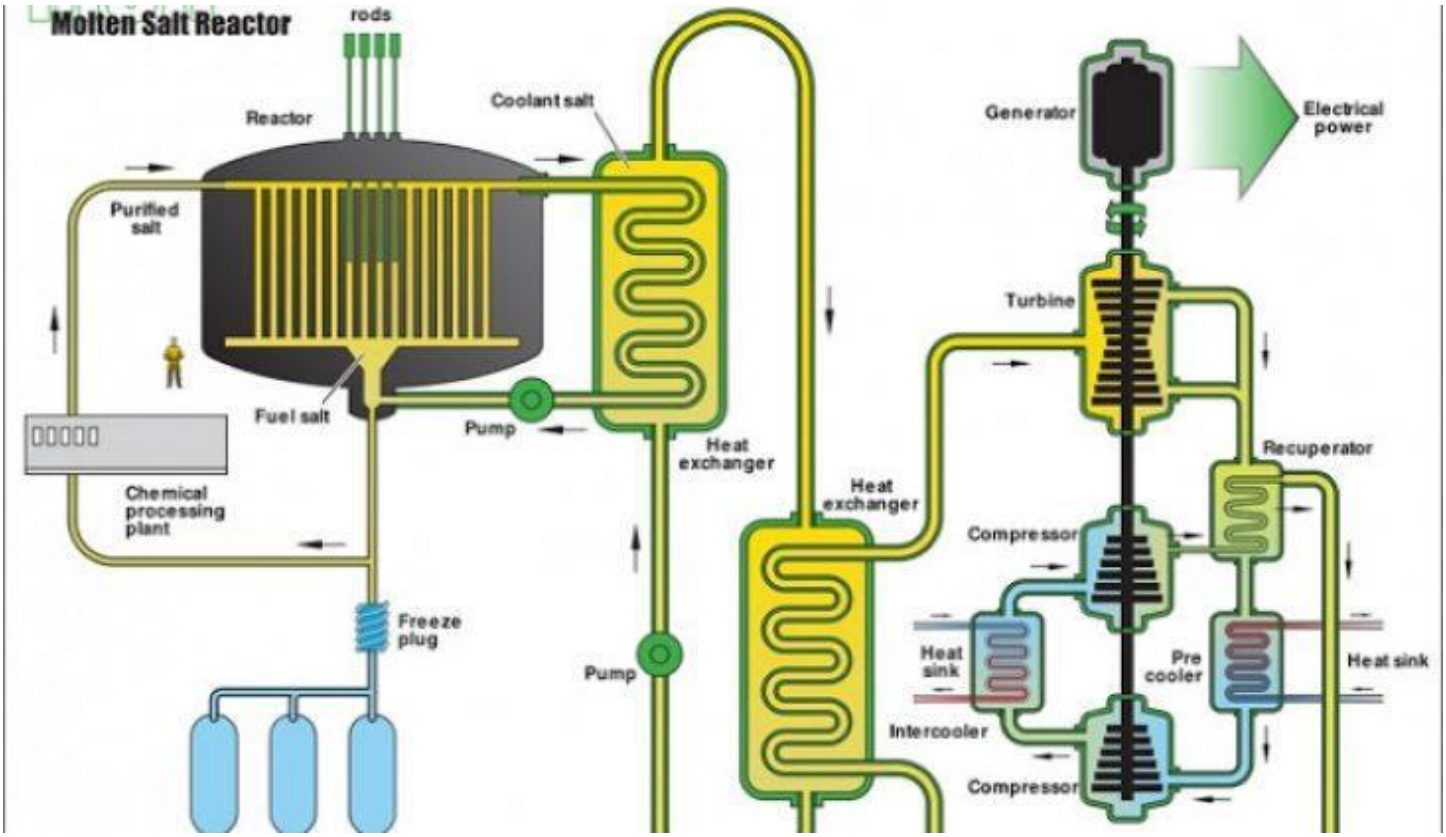
A molten salt reactor (MSR) is a version of a nuclear fission reactor in which the main nuclear coolant and fuel itself is made up of a mixture of molten salt. Salt being the solvent and uranium the solute to form a solution. Uranium pellets are dissolved in a molten salt and liquefied, allowing them to flow through the system. They are kept safe inside the reactor now as a mixture rather than as rods of uranium pellets as an LWR.

MSRs run at higher temperatures than water cooled reactors and maintain a low vapor pressure during flow control. It is suggested that MSRs are engineered more simplistically making replacement parts and manufacture easier and ultimately cheaper to maintain. Safety is argued to be higher because no excess reactivity and high thermal expansion. Minimal volatilities of the lower radioactivity of the fuel is what contributes to this. Passive safety components exist too and include pool structures below the reactor, which, includes a freeze plug. If this plug melts, it allows the overly heated reactor to drain into containment storage. The mixture is self-shielding with only the fuel tubes needing to be replaced due to high neutron flux. Some chemistry adjustments must be periodically made, but the salt chemistry of uranium chloride maintains a low redox. This means that the tendency of the uranium chloride to acquire electrons from or lose electrons to an electrode and thereby be reduced or oxidized is reasonably low.

Some MSRs can be optimized to run on the world's massive accumulation of nuclear waste from conventional solid fuel water cooled reactors, or to run on the world's obsolete or life cycled nuclear arms. This could potentially provide incentives for disarmament. With other modifications MSRs can be designed to run on thorium, a more weakly radioactive element in contrast to uranium, but, which is estimated to be three times more abundant on earth.

4. **(Compare and Contrast)** How is the fuel in a MSR fundamentally different than a LWR?

Debate, discuss, elaborate:


Molten Salt Reactor
rods
Reactor
Coolant salt
Purified salt
Fuel salt
Pump
Heat exchanger
Chemical processing plant
Freeze plug
Pump
Heat exchanger
Generator
Electrical power
Turbine
Recuperator
Compressor
Heat sink
Pre cooler
Heat sink
Intercooler
Compressor