1. What are some differences between the debugging mode and run mode of the AVR simulator? What do you think are some benefits of each mode?

   Debugging mode performs a line-by-line simulation, while run mode will run the program continuously. Debugging mode is a good way to allow the user to take control of the simulation. It is also easy to verify data registers and memory in this mode. New buttons given to the user here include “Step Into” which runs line by line, but steps into subroutine calls. “Step Over” is the same as the previous, but treats subroutines as a single instruction. “Step Out” puts the simulation in run node for the subroutine, and pauses after. “Run to Cursor” will run until wherever the user places their cursor. Lastly, “Reset” resets to the first instruction of the program. Run mode is useful for analyzing the end result of the program, while Debugging mode is useful for analyzing the intermediate states, and removing bugs.
2. What are breakpoints, and why are they useful when you are simulating your code?

   Breakpoints will have the simulation stop or pause and go into a line-by-line mode. This is useful because it can allow the debugger to examine exactly what is happening, the values variables hold, the memory being used, etc. around problematic sections of code.
3. Explain what the I/O View and Processor windows are used for. Can you provide input to the simulation via these windows?

   IO shows the current state using all the configuration registers associated with the chip. Bit values and address can be found here. Input is also simulated in this window. On the other hand, the Processor tab displays the pointer registers XYZ and status register.
4. The ATmega128 microcontroller features three different types of memory: data memory, program memory, and EEPROM. Which of these memory types can you access by using the Memory window of the simulator?
   a. Data Memory only
   b. Program memory only
   c. Data and program memory
   d. EEPROM only
   e. All three types

References:

Atmel Studio and ATmega128 A Beginner’s Guide