

1. What is OpenMP and have you ever programmed with it?  
*Framework for programming SMPs with threads using pragmas, relies on the more basic Pthreads library for execution.*
2. What are Pthreads and have you ever programmed with them?  
*Posix thread library, provides more control over multi-threaded programming than OpenMP, but also requires more programming work.*
3. What is MPI and have you ever programmed with it?  
*Message Passing Interface, interface definition for programming distributed memory systems using the message passing paradigm. MPI has different implementations, e.g., MVAPICH, OpenMPI, etc.*
4. What are Semaphores?  
*A semaphore is a variable or abstract data type that is used for controlling access, by multiple processes, to a common resource in a parallel programming or a multi user environment.*
5. What is valgrind?  
*A tool for detecting memory leaks in C programs, highly useful!*
6. What is the memory gap or memory wall?  
*CPUs are getting faster than memory accesses at a higher pace.*
7. Upon which principles do cache memories and paging algorithms rely?  
*Spatial and temporal locality of data and code!*
8. Have you ever heard of BLAS?  
*BLAS: Basic Linear Algebra Subroutines*
9. What does RISC stand for?  
*RISC: Reduced Instruction Set Computer*
10. What is an FPGA?  
*Field Programmable Gate Array*
11. What does NUMA stand for?  
*Non-Uniform Memory Access: Typical for most modern shared memory multi-core systems, access times to different memory addresses can be quite different. In fact, modern systems are distributed shared memory systems and access times depend very much upon the location (distributed RAM block) of the data. In fact, you need to take this into account when programming such systems for efficiency.*
12. What does SMP stand for?  
*Symmetric Multi-Processing*
13. What is Instruction Level Parallelism?  
*Instruction Pipelines in all modern architectures*
14. What is cache-coherence?  
*Protocols to ensure the coherence of multiple copies of the same datum residing in different caches of a shared-memory system.*
15. What is the top 500 list?  
*List of the 500 fastest supercomputers in the world.*
16. Which are the physical limitations for chip design?  
*Mainly: Size & Heat*
17. Have you ever used gprof?  
*Very useful simple tool for profiling programs, that is, finding out in which parts they spend most of their execution time, google it!*
18. Ever heard of Amdahl's law?  
*Imposes a natural limit to the scalability of parallel codes, each parallel code will at some point be dominated by the small fraction of the code that can not be parallelized!*
19. What is the typical cause for super-linear speedups in parallel programs?  
*Improved cache efficiency, since as we use more CPUs, more cache space becomes available, and hence more data can reside in cache.*

20. What is wave-front parallelism?

*Standard approach to parallelize dynamic programming algorithms. The parallel processes update the cells of the dynamic programming matrix like a wave-front to conform with the cell update dependencies.*

#### PART II: Algorithms

1. What is a hash table?

*Data structure to map hash keys to values. If the hash function is chosen well hash table lookups take  $O(1)$  time, if it is badly chosen they can take  $O(n)$  time.*

2. What is a binary search?

*$O(\log n)$  time lookup in a sorted list of  $n$  integers.*

3. Do the names Prim and Kruskal ring a bell?

*Algorithms for minimum spanning trees.*

#### PART III: Biology

All questions will be answered in the course.