**1–10: JVM, Memory & Language Core**

**1.** Which memory area stores method local variables and call information?  
A) Heap  
B) Stack  
C) Method area  
D) Native method stack  
✅ **Answer:** B

**2.** The *string constant pool* is part of which memory area?  
A) Heap  
B) Stack  
C) PermGen / Metaspace  
D) Thread area  
✅ **Answer:** A (stored in Heap since Java 7)

**3.** The intern() method of String:  
A) Creates a new String in pool  
B) Returns canonical representation from pool  
C) Always creates a new object  
D) None  
✅ **Answer:** B

**4.** Which garbage collector is best suited for low-latency applications in Java 15+?  
A) CMS  
B) G1  
C) ZGC  
D) Parallel GC  
✅ **Answer:** C

**5.** volatile keyword ensures:  
A) Atomicity  
B) Visibility  
C) Ordering only  
D) Both A and B  
✅ **Answer:** B

**6.** When does a class get loaded by JVM?  
A) During compilation  
B) When referenced for the first time  
C) At JVM startup  
D) At object creation only  
✅ **Answer:** B

**7.** Which classloader loads JDK internal classes like java.lang.\*?  
A) ApplicationClassLoader  
B) ExtensionClassLoader  
C) BootstrapClassLoader  
D) CustomClassLoader  
✅ **Answer:** C

**8.** Which statement about finalize() is true?  
A) Guaranteed to run before object is garbage collected  
B) Can resurrect an object  
C) Runs immediately after System.gc()  
D) Deprecated since Java 9  
✅ **Answer:** D

**9.** Which of these can cause a ClassNotFoundException but not a NoClassDefFoundError?  
A) Missing .class at runtime after compilation  
B) Classpath mismatch  
C) Lazy loading of class  
D) Dynamic loading via Class.forName()  
✅ **Answer:** D

**10.** Which tool inspects bytecode in a .class file?  
A) javap  
B) javadoc  
C) javac  
D) jlink  
✅ **Answer:** A

**🧵 11–20: Threads, Concurrency, and Synchronization**

**11.** Thread.yield() does what?  
A) Stops current thread  
B) Suggests to scheduler to pause current thread  
C) Terminates thread  
D) Waits for other threads  
✅ **Answer:** B

**12.** Which of these is *not* thread-safe?  
A) Vector  
B) Hashtable  
C) ArrayList  
D) ConcurrentHashMap  
✅ **Answer:** C

**13.** The synchronized keyword locks on:  
A) Class object for static methods  
B) Current object for instance methods  
C) Both depending on context  
D) None  
✅ **Answer:** C

**14.** What happens if a thread calls wait() without owning the object monitor?  
A) Waits indefinitely  
B) Compiles fine  
C) Throws IllegalMonitorStateException  
D) Ignored silently  
✅ **Answer:** C

**15.** ReentrantLock allows:  
A) Non-reentrant locking  
B) Fair locking  
C) Only one thread to hold lock  
D) Lock escalation  
✅ **Answer:** B

**16.** CountDownLatch can be reused.  
✅ **Answer:** False

**17.** Which interface provides result-returning asynchronous computation?  
A) Runnable  
B) Callable  
C) Future  
D) Thread  
✅ **Answer:** B

**18.** What’s true about ForkJoinPool?  
A) Uses work-stealing  
B) Blocks threads manually  
C) Executes only sequential tasks  
D) Is deprecated  
✅ **Answer:** A

**19.** Which of these belongs to java.util.concurrent package?  
A) CopyOnWriteArrayList  
B) Vector  
C) Hashtable  
D) TreeSet  
✅ **Answer:** A

**20.** Which method checks if a thread is alive but not terminated?  
A) isRunning()  
B) isAlive()  
C) activeCount()  
D) getState() == RUNNING  
✅ **Answer:** B

**🔤 21–30: Streams, Generics, and Functional Programming**

**21.** Stream operations are:  
A) Always lazy  
B) Always eager  
C) Lazy until terminal operation  
D) Never parallelizable  
✅ **Answer:** C

**22.** map() in Stream API is used to:  
A) Filter elements  
B) Transform elements  
C) Reduce elements  
D) Collect to list  
✅ **Answer:** B

**23.** What does flatMap() do?  
A) Combines multiple streams into one  
B) Maps single elements  
C) Sorts elements  
D) Filters nested lists only  
✅ **Answer:** A

**24.** Optional.ofNullable(null) returns:  
A) Optional.empty  
B) NullPointerException  
C) null  
D) None  
✅ **Answer:** A

**25.** In generics, what does <T extends Number> mean?  
A) T can be Number or subclass  
B) T must be Number only  
C) T can be any object  
D) T must be primitive  
✅ **Answer:** A

**26.** Wildcard <? super T> allows:  
A) Reading T only  
B) Writing T only  
C) Both read and write safely  
D) None  
✅ **Answer:** B

**27.** Streams are part of:  
A) java.util.stream  
B) java.io.stream  
C) java.nio  
D) java.util.concurrent  
✅ **Answer:** A

**28.** What does reduce() in streams do?  
A) Aggregates elements  
B) Filters elements  
C) Collects into list  
D) Maps values  
✅ **Answer:** A

**29.** Collectors.toMap() throws IllegalStateException when:  
A) Keys are duplicated  
B) Values are null  
C) Stream is empty  
D) Collector is parallel  
✅ **Answer:** A

**30.** Which is *not* a functional interface?  
A) Predicate  
B) Supplier  
C) Comparator  
D) ArrayList  
✅ **Answer:** D

**💾 31–36: I/O, NIO, Reflection, and Serialization**

**31.** Serialization is used to:  
A) Convert object to byte stream  
B) Convert byte stream to object  
C) Transfer class metadata  
D) Create deep copy  
✅ **Answer:** A

**32.** The serialVersionUID is used to:  
A) Identify class version during serialization  
B) Control JVM memory allocation  
C) Manage object identity  
D) None  
✅ **Answer:** A

**33.** Which package contains NIO classes?  
A) java.io  
B) java.nio  
C) java.stream  
D) java.net  
✅ **Answer:** B

**34.** Which method loads a class dynamically?  
A) loadClass()  
B) Class.forName()  
C) newInstance()  
D) ClassLoader()  
✅ **Answer:** B

**35.** Reflection can be used to:  
A) Modify private fields  
B) Create objects dynamically  
C) Invoke private methods  
D) All of the above  
✅ **Answer:** D

**36.** Which I/O class supports character encoding directly?  
A) FileInputStream  
B) FileReader  
C) InputStream  
D) BufferedInputStream  
✅ **Answer:** B

**🧠 37–40: New Features (Java 9–17)**

**37.** The var keyword in Java:  
A) Is a reserved keyword  
B) Can be used for method parameters  
C) Infers local variable type  
D) Can be used in fields  
✅ **Answer:** C

**38.** Which module contains most core packages in Java 9?  
A) java.base  
B) java.core  
C) java.lang  
D) java.util  
✅ **Answer:** A

**39.** Records in Java are:  
A) Mutable data carriers  
B) Immutable classes with boilerplate code auto-generated  
C) Interfaces  
D) Enums  
✅ **Answer:** B

**40.** sealed classes restrict:  
A) Visibility  
B) Inheritance to specific subclasses  
C) Method overriding  
D) Object creation  
✅ **Answer:** B