Introductory Concepts

1. Java is a computer language.
Question a. How does Java source code differ from machine code?
Answer: Java source code is written in a high-level language which the computer cannot understand. While machine code is written in machine language that the computer can directly understand. Java source code can be compiled into machine code.

Question b. How does byte code differ from machine code?
Answer: The Java compiler translates Java program into bytecode which is not the machine language for any particular computer but for a virtual machine. A virtual machine is similar to all typical computers and the bytecode is general. Then, the interpreter JVM translates and executes bytecode into machine code for actual computers.

2. A Java program consists of classes, methods, and objects.
Question a. What is a class?
Answer: Java is an object-oriented programming language. Objects of the same kind have the same data type and belong to the same class. A class defines a type or kind of object; it is a blueprint for objects.

Question b. What is a method?
Answer: A class contains methods. The actions that an object can take are called behaviors and each behavior is defined by a piece of Java code called a method.

Question c. What is an object?
Answer: An object is a program construction that has attributes and can perform certain actions known as behaviors. An object in a program may represent a real-world object or may be an abstraction.

Question d. What is inheritance? Include an example.
Answer: Inheritance is a way of organizing classes. Common attributes and behaviors can be defined once and applied to a whole collection of classes. The structure is like a hierarchical tree. For example, the class Ballgame represents sports played by all kinds of balls. The classes Basketballgame, Footballgame and Volleyballgame inherit the property of playing games by balls, but add more properties or restrictions. In the three classes, the types of the balls are different. Inheritance enables the programmer to avoid the repetition of programming instructions for each class. So, each of the three classes has the same property of belonging to ball games, and it is described only once.

3. What variable type would you use to store the following types of information?
a. Population of Urbana – int
b. Distance from Chicago to Miami – float (unit: kilometer)

c. Distance from Chicago to the Sea of Tranquility – double
d. Distance from Chicago to the Voyager I space probe – double
e. If someone has a driver license? – boolean
f. Date of birth – String or int
g. Gender – char
h. ISBN / Barcode – String
i. Exchange rate of US dollar to Euro – double
j. Thickness of a human hair (in inches) – double

4. Answer:

```
import java.util.Scanner;
public class SyntaxError
{
      public static void main(String[] args)
     {
           System.out.println("Enter two numbers to multiply.");
//the original statement leaves out double quotes
           Scanner keyboard = new Scanner(System.in);
// the original statement leaves out a semicolon
           int n1 = keyboard.nextInt() ;
           int n2 = keyboard.nextInt() ;
//the original statements leave out the declaration of variables
           int product = n1 * n2 ;
           System.out.println("The product is "+ product) ;
//the comma should be changed into plus operator
//the format of the double quotes seems not correct
     }
}
```

5. Answer:

a. Error: The value of depth did not be obtained from keyboard input. Because the initial value of depth is set as zero, the final value of the volume will always be zero. Another statement should be added after the width input statement. That is:

```
height = keyboard.nextInt() ;
width = keyboard.nextInt() ;
depth = keyboard.nextInt();
int volume = height * width * depth;
System.out.println("The volume is" + volume) ;
```

b. The type of height, width, depth and volume should be changed into double and “nextInt()” should be changed into “nextDouble()”. That is:

```
import java.util.Scanner;
public class SemanticError {
```

```
    public static void main(String[] args) {
        double height = 0 , width = 0 , depth = 0;
        System.out.println("Enter the height, width, and depth of");
        System.out.println("a box and I will computer the volume.");
        Scanner keyboard = new Scanner(System.in);
        height = keyboard.nextDouble() ;
        width = keyboard.nextDouble() ;
        depth = keyboard.nextDouble();
        double volume = height * width * depth;
        System.out.println("The volume is" + volume) ;

    }

}
```