1.

What is the result of the following code?

```
1:    public class Employee {
2:       public int employeeId;
3:       public String firstName, lastName;
4:       public int yearStarted;
5:       @Override public int hashCode() {
6:          return employeeId;
7:       }
8:       public boolean equals(Employee e) {
9:          return this.employeeId == e.employeeId;
10:      }
11:      public static void main(String[] args) {
12:         Employee one = new Employee();
13:         one.employeeId = 101;
14:         Employee two = new Employee();
15:         two.employeeId = 101;
16:         if (one.equals(two)) System.out.println("Success");
17:         else System.out.println("Failure");
18:    } }
```

A. `Success`

B. `Failure`

C. The `hashCode()` method fails to compile.

D. The `equals()` method fails to compile.

E. Another line of code fails to compile.

F. A runtime exception is thrown.

2

What is the result of compiling the following class?

```
public class Book {
   private int ISBN;
   private String title, author;
   private int pageCount;
   public int hashCode() {
      return ISBN;
   }
   @Override public boolean equals(Object obj) {
     if ( !(obj instanceof Book)) {

        return false;
     }
     Book other = (Book) obj;
     return this.ISBN == other.ISBN;
   }
// imagine getters and setters are here
}
```

A. The code compiles.

B. The code does not compile because `hashCode()` is incorrect.

C. The code does not compile because `equals()` does not override the parent method correctly.

D. The code does not compile because `equals()` tries to refer to a private field.

E. The code does not compile because the `ClassCastException` is not handled or declared.

F. The code does not compile for another reason.

3

What is the result of the following code?

```
String s1 = "Canada";
String s2 = new String(s1);
if(s1 == s2) System.out.println("s1 == s2");
if(s1.equals(s2)) System.out.println("s1.equals(s2)");
```

A. There is no output.

B. `s1 == s2`

C. `s1.equals(s2)`

D. Both B and C.

E. The code does not compile.

F. The code throws a runtime exception.

4

What is true about the following code? You may assume `city` and `mascot` are never `null`.

```
public class BaseballTeam {
   private String city, mascot;
   private int numberOfPlayers;
   public boolean equals(Object obj) {
      if ( !(obj instanceof BaseballTeam))
        return false;
      BaseballTeam other = (BaseballTeam) obj;
      return (city.equals(other.city) && mascot.equals(other.mascot));
   }


    public int hashCode() {
       return numberOfPlayers;
    }
// imagine getters and setters are here
}
```

A. The class does not compile.

B. The class compiles but has an improper `equals()` method.

C. The class compiles but has an improper `hashCode()` method.

D. The class compiles and has proper `equals()` and `hashCode()` methods.

5

Which of the following statements are true, assuming `a` and `b` are `String` objects? (Choose all that apply.)

A. If `a.equals(b)` is `true`, `a.hashCode() == b.hashCode()` is always `true`.

B. If `a.equals(b)` is `true`, `a.hashCode() == b.hashCode()` is sometimes but not always `true`.

C. If `a.equals(b)` is `false`, `a.hashCode() == b.hashCode()` can never be `true`.

D. If `a.equals(b)` is `false`, `a.hashCode() == b.hashCode()` can sometimes be `true`.

6

What is the result of the following code?

```
public class FlavorsEnum {
   enum Flavors {
      VANILLA, CHOCOLATE, STRAWBERRY
   }
   public static void main(String[] args) {
      System.out.println(Flavors.CHOCOLATE.ordinal());
   }
}
```

A. `0`
B. `1`
C. `9`
D. `CHOCOLATE`
E. The code does not compile due to a missing semicolon.
F. The code does not compile for a different reason.

7

What is the result of the following code? (Choose all that apply.)

```
public class IceCream {
   enum Flavors {
      VANILLA, CHOCOLATE, STRAWBERRY
   }
   public static void main(String[] args) {


      Flavors f = Flavors.STRAWBERRY;
      switch (f) {
         case 0: System.out.println("vanilla");
         case 1: System.out.println("chocolate");
         case 2: System.out.println("strawberry");
              break;
         default: System.out.println("missing flavor");
     } } }
```

A. `vanilla`
B. `chocolate`
C. `strawberry`
D. `missing flavor`
E. The code does not compile.
F. An exception is thrown.

8

What is the result of the following code?

```
1:    public class Outer {
2:        private int x = 5;
3:        protected class Inner {
4:            public static int x = 10;
5:            public void go() { System.out.println(x); }
6:        }
7:        public static void main(String[] args) {
8:            Outer out = new Outer();
9:            Outer.Inner in = out.new Inner();
10:           in.go();
11:   } }
```

A. The output is 5.
B. The output is 10.
C. Line 4 generates a compiler error.
D. Line 8 generates a compiler error.
E. Line 9 generates a compiler error.
F. An exception is thrown.

9

What is the result of the following code?

```
1:    public class Outer {
2:    private int x = 24;
3:    public int getX() {
4:       String message = "x is ";

5:       class Inner {
6:          private int x = Outer.this.x;
7:          public void printX() {
8:             System.out.println(message + x);
9:          }
10:      }
11:      Inner in = new Inner();
12:      in.printX();
13:      return x;
14:   }
15:   public static void main(String[] args) {
16:      new Outer().getX();
17:   } }
```

A. x is 0.
B. x is 24.
C. Line 6 generates a compiler error.
D. Line 8 generates a compiler error.
E. Line 11 generates a compiler error.
F. An exception is thrown.

10

The following code appears in a file named `Book.java`. What is the result of compiling the source file?

```
1:    public class Book {
2:       private int pageNumber;
3:       private class BookReader {
4:          public int getPage() {
5:              return pageNumber;
6:     } } }
```

A. The code compiles successfully, and one bytecode file is generated: `Book.class`.

B. The code compiles successfully, and two bytecode files are generated: `Book.class` and `BookReader.class`.

C. The code compiles successfully, and two bytecode files are generated: `Book.class` and `Book$BookReader.class`.

D. A compiler error occurs on line 3.

E. A compiler error occurs on line 5.

11

Which of the following statements can be inserted to make `FootballGame` compile?

```
package my.sports;
public class Football {

   public static final int TEAM_SIZE = 11;
}
package my.apps;
// INSERT CODE HERE
public class FootballGame {
   public int getTeamSize() { return TEAM_SIZE; }
}
```

A. `import my.sports.Football;`

B. `import static my.sports.*;`

C. `import static my.sports.Football;`

D. `import static my.sports.Football.*;`

E. `static import my.sports.*;`

F. `static import my.sports.Football;`

G. `static import my.sports.Football.*;`

12

What is the result of the following code?

```
public class Browsers {
   static class Browser {
      public void go() {
         System.out.println("Inside Browser");
      }
   }
   static class Firefox extends Browser {
      public void go() {
         System.out.println("Inside Firefox");
      }
   }
   static class IE extends Browser {
      @Override public void go() {
         System.out.println("Inside IE");
      }
   }
   public static void main(String[] args) {
      Browser b = new Firefox();
      IE e = (IE) b;
      e.go();
   }
}
```

A. `Inside Browser`
B. `Inside Firefox`
C. `Inside IE`
D. The code does not compile.
E. A runtime exception is thrown.

13

Which is a true statement about the following code?

```
public class IsItFurry {
   static interface Mammal { }
   static class Furry implements Mammal { }
   static class Chipmunk extends Furry { }
   public static void main(String[] args) {
      Chipmunk c = new Chipmunk();
      Mammal m = c;
      Furry f = c;
      int result = 0;
      if (c instanceof Mammal) result += 1;
      if (c instanceof Furry) result += 2;
      if (null instanceof Chipmunk) result += 4;
      System.out.println(result);
  } }
```

A. The output is `0`.
B. The output is `3`.
C. The output is `7`.
D. `c instanceof Mammal` does not compile.
E. `c instanceof Furry` does not compile.
F. `null instanceof Chipmunk` does not compile.

14

Which is a true statement about the following code? (Choose all that apply.)

```
import java.util. *;
public class IsItFurry {
   static class Chipmunk { }
   public static void main(String[] args) {
      Chipmunk c = new Chipmunk();
      ArrayList <Chipmunk> l = new ArrayList<>();
      Runnable r = new Thread();
      int result = 0;
      if (c instanceof Chipmunk) result += 1;


       if (l instanceof Chipmunk) result += 2;
       if (r instanceof Chipmunk) result += 4;
       System.out.println(result);
   } }
```

A. The code compiles, and the output is `0`.

B. The code compiles, and the output is `3`.

C. The code compiles, and the output is `7`.

D. `c instanceof Chipmunk` does not compile.

E. `l instanceof Chipmunk` does not compile.

F. `r instanceof Chipmunk` does not compile.

15

Which of the following statements are true about the `equals()` method? (Choose all that apply.)

A. If `equals(null)` is called, the method should throw an exception.

B. If `equals(null)` is called, the method should return `false`.

C. If `equals(null)` is called, the method should return `true`.

D. If `equals()` is passed the wrong type, the method should throw an exception.

E. If `equals()` is passed the wrong type, the method should return `false`.

F. If `equals()` is passed the wrong type, the method should return `true`.

16

Which of the following can be inserted in `main`?

```
public class Outer {
   class Inner { }

   public static void main(String[] args) {
      // INSERT CODE HERE
   } }
```

A. `Inner in = new Inner();`
B. `Inner in = Outer.new Inner();`
C. `Outer.Inner in = new Outer.Inner();`
D. `Outer.Inner in = new Outer().Inner();`
E. `Outer.Inner in = new Outer().new Inner();`
F. `Outer.Inner in = Outer.new Inner();`

17

What is the result of the following code? (Choose all that apply.)

```
1:    public enum AnimalClasses {
2:        MAMMAL(true), FISH(Boolean.FALSE), BIRD(false),

3:    REPTILE(false), AMPHIBIAN(false), INVERTEBRATE(false)
4:        boolean hasHair;
5:        public AnimalClasses(boolean hasHair) {
6:           this.hasHair = hasHair;
7:        }
8:        public boolean hasHair() {
9:           return hasHair;
10:       }
11:       public void giveWig() {
12:          hasHair = true;
13:       } }
```

A. Compiler error on line 2.
B. Compiler error on line 3.
C. Compiler error on line 5.
D. Compiler error on line 8.
E. Compiler error on line 12.
F. Compiler error on another line.
G. The code compiles successfully.

18

What is the result of the following code? (Choose all that apply.)

```
public class Swimmer {
   enum AnimalClasses {
      MAMMAL, FISH {
         public boolean hasFins() { return true; }},
      BIRD, REPTILE, AMPHIBIAN, INVERTEBRATE;
      public abstract boolean hasFins();
   }
   public static void main(String[] args) {
      System.out.println(AnimalClasses.FISH);
      System.out.println(AnimalClasses.FISH.ordinal());
      System.out.println(AnimalClasses.FISH.hasFins());
      System.out.println(AnimalClasses.BIRD.hasFins());
   }
}
```

A. `fish`
B. `FISH`
C. `0`
D. `1`

E. `false`
F. `true`
G. The code does not compile.

19

Which of the following can be inserted to override the superclass method? (Choose all that apply.)

```
public class LearnToWalk {
   public void toddle() {}
   class BabyRhino extends LearnToWalk {
      // INSERT CODE HERE
   }
}
```

A. `public void toddle() {}`
B. `public void Toddle() {}`
C. `public final void toddle() {}`
D. `public static void toddle() {}`
E. `public void toddle() throws Exception {}`
F. `public void toddle(boolean fall) {}`

20

What is the result of the following code?

```
public class FourLegged {
   String walk = "walk,";
   static class BabyRhino extends FourLegged {
      String walk = "toddle,";
   }
   public static void main(String[] args) {
      FourLegged f = new BabyRhino();
      BabyRhino b = new BabyRhino();
      System.out.println(f.walk);
      System.out.println(b.walk);
   } }
```

A. `toddle,toddle,`
B. `toddle,walk,`
C. `walk,toddle,`
D. `walk,walk,`
E. The code does not compile.
F. A runtime exception is thrown.

21

Which of the following could be inserted to fill in the blank? (Choose all that apply.)

```
public interface Otter {
   default void play() { }
}
class RiverOtter implements Otter {
  ----------------------------
}
```

A. `@Override public boolean equals(Object o) { return false; }`
B. `@Override public boolean equals(Otter o) { return false; }`
C. `@Override public int hashCode() { return 42; }`
D. `@Override public long hashCode() { return 42; }`
E. `@Override public void play() { }`
F. `@Override void play() { }`