DEPARTMENT OF PHYSICS & ASTRONOMY
3459 EXAM-1
10:00 - 13:00 : November 27th 2007

Please read the exam guidelines, rules, instructions and marking criteria at `http://moodle.ucl.ac.uk/mod/wiki/view.php?id=13963&page=Mid-term+exam` (linked from the *Exams and coursework* page).

This exam is worth 25% of your final mark for the course and is made up of two parts:

- 15 multiple-choice questions, worth 7.5% of your final mark;
- a programming exercise, worth 17.5% of your final mark.

You should endeavour to spend no more than 30 minutes on the multiple-choice section.

Both the answers to the multiple-choice questions (in a file called `mc.txt`) and Java source code of your solution to the programming exercise should be uploaded using Moodle under the section headed “Exam 1”.

DEPARTMENT OF PHYSICS & ASTRONOMY
3459 EXAM-1
PROGRAMMING EXERCISE

You will write Java classes and methods to read data from three URLs, analyse the data and present the results.

The file at
`http://www.hep.ucl.ac.uk/undergrad/3459/exam-data/samples.dat`
contains details of a set of mineral samples. Each line contains data for a single sample. These are, in order:

- the ID code of the site where the sample was found;
- the abbreviation for the type of mineral;
- the mass of the sample in grammes (g);
- the volume of the sample in cubic centimetres (cm^3).

The file at
`http://www.hep.ucl.ac.uk/undergrad/3459/exam-data/minerals.dat`
contains the abbreviation and the full name for each mineral. The file at `http://www.hep.ucl.ac.uk/undergrad/3459/exam-data/sites.dat` contains the ID code and full name of each site.

You should write a program using appropriate classes and methods to

- read the data from the three URLs and store them in suitable collection objects;
- determine the mineral with the largest mean density (mass/volume) calculated as the mean of the individual sample densities, printing to the screen:
  - the full name of the mineral;
  - the value of its mean density;
- determine the site where the largest total mass of Benthamite was found, printing to the screen:
  - the full name of the site;
  - the value of the total mass.

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3459 EXAM-1
MULTIPLE CHOICE

You should endeavour to spend no more than 30 minutes on the multiple-choice section.

DO NOT WASTE TIME CODING THE QUESTIONS TO GET THE ANSWERS

You should enter your answers to the multiple-choice questions into a text file called `mc.txt` created using a text editor such as WordPad. The file should have the following format:

```
YOUR NAME
01 a
02 b
03 c
...
14 b
15 a
```

There is exactly one correct answer to each question.

Q1. If the following code fragment were executed; what would be printed to the screen ?

```
int j=0;
for (int i=0; i<5; i++) {
     j=i;
}
System.out.println(j);
```

(a) `0`
(b) `4`
(c) `5`
(d) `6`

Q2. If the following code fragment were executed; what would be printed to the screen ?

```
boolean x = true;
int k = 0;
while (x) {
     k = k + 1;
     x = (k < 5);
}
System.out.println(k);
```

(a) 0
(b) 4
(c) 5
(d) 6

Q3. If the following code fragment were executed; what would be printed to the screen ?

```
byte b = 12;
byte one = 1;
for (int ibit = 7; ibit >=0; ibit--){
     if ( (b>>ibit & one) == 1 ) byteAsBinaryString += "1";
     else byteAsBinaryString += "0";
}
System.out.println(byteAsBinaryString);
```

(a) 00000001
(b) 12
(c) 1
(d) 00001100

Q4 If the following code fragment were executed; what would be printed to the screen

```
String j = "one"; int i = 2;
System.out.println(j+i);
```

(a) `12`
(b) `one2`
(c) `j+i`
(d) `3`

Q5. If the following code fragment were executed, what would be printed to the screen?

```
int a[] = {1, 4, 9, 16};
System.out.println(a[4]);
```

(a) `1,4,9,16`
(b) `4`
(c) `16`
(d) `java.lang.ArrayIndexOutOfBoundsException: 4`

Q6. The following code fragment:

```
float x = Float.parseFloat("ten");System.out.println(x);
```

when compiled and executed will result in the following:

(a) A compilation error
(b) `10.0` being printed to the screen
(c) `ten` being printed to the screen
(d) The program crashing and a `NumberFormatException` being thrown

Q7. If the following code fragment were executed, what would be printed to the screen?

```
HashMap data = new HashMap();
data.put("1","one");
data.put("one","2");
System.out.println(data.get("one"));
```

(a) `1`
(b) `one`
(c) `2`
(d) nothing since an error will occur

Q8. Which of the following would NOT be a valid line of code (i.e. would result in a compilation error) when incorporated inside an existing class ?

(a) `public void func1(int i) {return i*2;}`
(b) `public int func2() {return 3;}`
(c) `private static float func3(int i) {return 2.0f; }`
(d) `public void func4(double x) {}`

Q9. If the following code fragment were executed, what would be printed to the screen?

```
public class MyClass {
  private int counter;
  public MyClass(int val) {counter=val;}
  public void set(int val) {counter=val;}
  public void print() {System.out.println(counter);}
  public static void main(String[] args) {
    MyClass p1 = new MyClass(1);
    MyClass p2 = p1;
    p2.set(3);
    p1.print();
  }
}
```

(a) `1`
(b) `2`
(c) `3`
(d) `p1`

Q10. If the following code fragment were executed, what would be printed to the screen?

```
public class Useless {
   private int x=1;
   private static int y=2;
   public void setX(int i) {x=i;}
   public void setY(int i) {y=i;}
   public void print() {System.out.println(x+" "+y);}
   public static void main(String[] args) {
     Useless p1 = new Useless();
     Useless p2 = new Useless();
     p1.setX(3);
     p2.setY(4);
     p1.print();
   }
}
```

(a) `1 2`
(b) `3 4`
(c) `3 2`
(d) `5`

Q11. Which of the following will successfully create an instance of the Vector class and add an *Integer* element:

(a) `Vector v = new Vector(99); v[1]=99;`
(b) `Vector v = new Vector(); v(1)=99;`
(c) `Vector v = new Vector(); v.addElement(99);`
(d) `Vector v = new Vector(100); v.addElement("99");`

Q12. Which of the following would not be a valid line of code (i.e. would result in a compilation error) if inserted after the `"//here"` line?

```
public class Example {
  public void funcA() {System.out.println("funcA");}
  public static void funcB() {System.out.println("funcB");}
  public static void main(String[] args) {
    Example ex = new Example();
    // here
  }
}
```

(a) `funcB();`
(b) `funcA();`
(c) `ex.funcA();`
(d) `Example ex2 = ex;`

Q13. What will the following piece of code print to the screen ?

```
StringTokenizer s = new StringTokenizer("hello 12 92 x1");
StringBuffer sb = new StringBuffer();
while (s.hasMoreTokens()) {
    sb.append(s.nextToken().charAt(1));
}
System.out.println(sb);
```

(a) `sb`
(b) `e221`
(c) `h19x`
(d) `hello`

Q14. The statement:

```
int[] counts = new int[26];
```

(a) Creates an array object that can hold up to 26 whole numbers.
(b) Creates an array object that can hold up to 27 whole numbers (positions 0 through 26)
(c) Creates a pointer to an integer array, but doesn't actually allocate any memory for it. A maximum size of 26 numbers is set for later use.
(d) Creates a Vector object, initially with enough memory allocated to hold 26 numbers. But this is extended automatically when more numbers are added.

Q15. If the following code fragment were executed, what would be printed to the screen?

```
public class Useless {
   int[] array = new int[4];
   try {
       int element10 = array[10];
   } catch (Exception e) {
       System.out.println("Exception!");
   } finally {
     System.out.println("Finally");
   }
}
```

(a) Nothing
(b) `Exception!`
(c) `Exception!`
`Finally`
(d) `Finally`

END OF PAPER