1. Which of the following are correctly written in scientific notation?
   1. 3.0 x 105
   2. 0.56 x 109
   3. 0.103 x 103
   4. 15 x 10-5
   5. 5.6 x 10-8
   6. 4 x 102
   7. 0.345 x 10-2
2. Write each number in scientific notation.
   1. 13,030,000
   2. 418,000
   3. 25,024,000
   4. 4,500,000
   5. 20,000
   6. 870,000,000
   7. 0.0325
   8. 0.0000564
   9. 0.00092
   10. 0.001002
   11. 0.00006
   12. 0.00965784
3. Write each number in scientific notation.
   1. Lightest blue whale: 418,000 lb
   2. Thinnest glass: 0.00098 in.
   3. Lightest bird egg: 0.0128 oz.
   4. Diameter of thinnest copper wire: 0.0005 in.
   5. Mass of Earth’s atmosphere: 5,700,000,000,000,000 tons
   6. Amount of gold in Earth’s crust: 120,000,000,000,000 metric tons

**Homework**

1. Which of the following are correctly written in scientific notation?
   1. 0.5 x 104
   2. 15 x 109
   3. 3.5567 x 10-7
   4. 1 x 106
   5. 5.04 x 10-4
   6. 0.05 x 10-2
   7. 6.788432 x 108
2. Write each number in scientific notation.
   1. 4,566,000
   2. 17,000,300
   3. 35,000
   4. 1,078,000,000
   5. 4,560,700
   6. 943,000,000,000
   7. 0.000578
   8. 0.004598732
   9. 0.000000558744
   10. 0.0001000358
   11. 0.00045805
   12. 0.000000000000851
3. Write each number in scientific notation.
   1. Mass of smallest insect, a parasitic wasp: 0.00000492 g
   2. Speed of light: 300,000,000 m/sec
   3. Mass of a dust particle: 0.000000000753 kg
   4. Distance from Earth to the Sun is approximately: 149,600,000 km
   5. Earth’s circumference: 40,000,000 m
   6. Distance between the Sun and Neptune: 4,497,100,000 km

**Converting to Standard Form**

**Classwork**

1. Write each number in standard form.
   1. Temperature at the Sun’s core: 1.55 x 106 K
   2. Lowest temperature ever in a lab: 2 x 10-11 K
   3. Radius of the neon atom is about 3.5 x 10-11 meters
   4. Radius of Earth’s orbit: 1.5 x 1011 meters
   5. Avagadro’s number: 6.022 x 1023
   6. Weight of a paper clip: 1.1 x 10-3 lb.
2. Write each number in standard form:
   1. 7.5 x 105
   2. 9.765 x 10-10
   3. 1.27 x 10-8
   4. 4.56 x 106
   5. 3.0 x 10-6
   6. 6.785168 x 108
   7. 8.00045 x 10-4

**Homework**

1. Write each number in standard form.
   1. Width of a human hair:7.5 x 10-5 meter
   2. Distance between Jupiter and the Sun: 4.836 x 1011
   3. Charge on a Proton/Electron: 1.602176 x 10-19 C
   4. Faraday constant: 9.649 x 104
   5. Number of bits on a computer hard disk (as of 2010): 1 x 1013 GB
   6. Wavelength of green light: 5.5 x 10-7 m
2. Write each number in standard form:
   1. 8.445 x 10-4
   2. 5.256544 x 109
   3. 1.0 x 10-5
   4. 7.45207 x 108
   5. 2.67 x 10-5
   6. 6.0005 x 106
   7. 4.00896 x 10-3

**Comparing Numbers in Scientific Notation**

**Classwork**

1. Place the appropriate inequality symbols between the following numbers:
   1. 9.5 x 104 8.2 x 107
   2. 6.231 x 107 2.34 x 103
   3. 4.567 x 10 -2 7.32 x 105
   4. 1.0 x 10-4 2.0 x 10-5
   5. 5.66 x 10-7 6.54 x 10-9
   6. 8.32 x 10-6 7.236 x 10-11
   7. 4.52 x 104 7.532 x 104
   8. 6.5431 x 108 6.32 x 108
   9. 3.5 x 10-6 1.0 x 10-6
   10. 4.509 x 1010 3.45 x 1010
2. Order the following sets of numbers from least to greatest.
   1. 2.3 x 103 4.5 x 105 7.8 x 102 1.3 x 104
   2. 4.0 x 109 5.0 x 107 6.0 x 1010 7.0 x 105
   3. 4.3 x 104 7.5 x 10-2 1.9 x 106 3.3 x 10-4
   4. 2.5 x 10-12 5.5 x 10-25 8.2 x 102 9.5 x 10-9
   5. 5.4 x 104 3.2 x 104 9.9 x 104 2.1 x 104
   6. 9.2 x 10-5 8.2 x 10-6 9.2 x 10-6 8.2 x 10-5

**Multiplying and Dividing with Scientific Notation**

1. Evaluate the following. Express the result in scientific notation.
   1. (3.0 x 10-5)(2.0 x 109)=
   2. (4.0 x 103)(5.0 x 105)=
   3. (6.0 x 10-5)(3.0 x 108)=
   4. (1.5 x 108)(3.2 x 10-4)=
   5. (2.7 x 10-3)(1.1 x 108)=
   6. (1.3 x 10-4)(2.0 x 10-6)=
   7. (8.4 x 106)÷(2.0 x 103)=
   8. (9.3 x 108)÷(3.0 x 10-2)=
   9. (5.4 x 1010)÷(2.0 x 104)=
   10. =
   11. =
   12. =
2. A tiny space inside a computer chip has been measured to be 2.56 x 10-6 meters wide, 1.4 x 10-7 meters long, and 2.75 x 10-4 meters high. What is its volume?
3. In one year about 478 billion telephone calls were placed by 145 million United States telephone subscribers. What was the average number of calls placed per subscriber?
4. Evaluate the following. Express the result in scientific notation.
   1. (3.0 x 10-5)(3.0 x 108)=
   2. (4.0 x 102)(4.0 x 107)=
   3. (7.0 x 10-3)(6.0 x 106)=
   4. (1.2 x 107)(2.2 x 10-3)=
   5. (2.0 x 10-4)(7.1 x 109)=
   6. (4.4 x 10-7)(3.0 x 10-3)=
   7. (6.6 x 108)÷(2.0 x 104)=
   8. (2.7 x 106)÷(3.0 x 10-4)=
   9. (7.5 x 1012)÷(2.0 x 105)=
   10. =
   11. =
   12. =
5. A tiny space inside another computer chip has been measured to be 3.5 x 10-7 meters wide, 1.8 x 10-8 meters long, and 6.45 x 10-5 meters high. What is its volume?
6. The point on a pin has a diameter of approximately 1 x 10-4 meters. If a neon atom has a diameter of about 7.0 x 10-11 meters, about how many neon atoms could fit across the diameter of the point of a pin?

**Answer Key**

1. A, E, F
2. 1. 1.303 x 107
   2. 4.18 x 105
   3. 2.5024 x 107
   4. 4.5 x 106
   5. 2 x 104
   6. 8.7 x 108
   7. 3.25 x 10-2
   8. 5.64 x 10-5
   9. 9.2 x 10-4
   10. 1.002 x 10-3
   11. 6 x 10-5
   12. 9.65784 x 10-3
3. 1. 4.18 x 105
   2. 9.8 x 10-4
   3. 1.28 x 10-2
   4. 5 x 10-4
   5. 5.7 x 1015
   6. 1.2 x 1014
4. C, D, E, G
5. 1. 4.566 x 106
   2. 1.70003 x 107
   3. 3.5 x 104
   4. 1.078 x 109
   5. 4.5607 x 106
   6. 9.43 x 1011
   7. 5.78 x 10-4
   8. 4.598732 x 10-3
   9. 5.58744 x 10-7
   10. 1.000358 x 10-4
   11. 4.5805 x 10-4
   12. 8.51 x 10-13
6. 1. 4.92 x 10-6
   2. 3 x 108
   3. 7.53 x 10-10
   4. 1.496 x 108
   5. 4 x 107
   6. 4.4971 x 109
7. 1. 1550000
   2. .00000000002
   3. .000000000035
   4. 150000000000
   5. 602200000000000000000000
   6. .0011
8. 1. 750000
   2. .0000000009765
   3. .0000000127
   4. 4560000
   5. .000003
   6. 678516800
   7. .000800045
9. 1. .000075
   2. 483600000000
   3. .0000000000000000001602176
   4. 96490
   5. 10000000000000
   6. .00000055
10. 1. .0008445
    2. 5256544000
    3. .00001
    4. 745207000
    5. .0000267
    6. 6000500
    7. .00400896
    8. <
    9. >
    10. <
    11. >
    12. >
    13. >
    14. <
    15. >
    16. >
    17. >
11. 1. 7.8 x 102, 2.3 x 103, 1.3 x 104, 4.5 x 105
    2. 7.0 x 105, 5.0 x 107, 4.0 x 109, 6.0 x 1010
    3. 3.3 x 10-4, 7.5 x 10-2, 4.3 x 104, 1.9 x 106
    4. 5.5 x 10-25, 2.5 x 10-12, 9.5 x 10-9, 8.2 x 102
    5. 2.1 x 104, 3.2 x 104, 5.4 x 104, 9.9 x 104
    6. 8.2 x 10-6, 9.2 x 10-6,8.2 x 10-5, 9.2 x 10-5

13.

a. 6 x 104

1. 2 x 109
2. 1.8 x 104
3. 4.8 x 104
4. 2.97 x 105
5. 2.6 x 10-10
6. 4.2 x 103
7. 3.1 x 1010

i. 2.7 x 106

j. 3.5 x 10-3

k. 5 x 10-5

l. 6 x 103

1. 9.856 x 10-17
2. 3.296 x 103
3. 1. 9 x 103
   2. 1.6 x 1010
   3. 4.2 x 104
   4. 2.64 x 104
   5. 1.42 x 106
   6. 1.32 x 10-9
   7. 3.3 x 104
   8. 9 x 109
   9. 3.75 x 107
   10. 2 x 10-10
   11. 6 x 10**-5**
   12. 6 x 105
4. 4.0635 x 10-19
5. 1.428571 x 106