Core Science 221, Section 1   **NAME:**

Homework 3: Scientific Notation, Energy and Power Units, Some Energy and Power Examples, The R/P Ratio: Homeworks are due as posted on the course web site. Enter the answer to the multiple-choice questions on the answer table beside the number corresponding to the question. There may be gaps in the table when full-answer questions appear in the homework. You only need to hand in the table for the multiple-choice questions. Solutions will be posted eventually after the due date.

Answer Table   # Name:

	a	b	c	d	e		a	b	c	d	e
1.	O	O	O	O	O	31.	O	O	O	O	O
2.	O	O	O	O	O	32.	O	O	O	O	O
3.	O	O	O	O	O	33.	O	O	O	O	O
4.	O	O	O	O	O	34.	O	O	O	O	O
5.	O	O	O	O	O	35.	O	O	O	O	O
6.	O	O	O	O	O	36.	O	O	O	O	O
7.	O	O	O	O	O	37.	O	O	O	O	O
8.	O	O	O	O	O	38.	O	O	O	O	O
9.	O	O	O	O	O	39.	O	O	O	O	O
10.	O	O	O	O	O	40.	O	O	O	O	O
11.	O	O	O	O	O	41.	O	O	O	O	O
12.	O	O	O	O	O	42.	O	O	O	O	O
13.	O	O	O	O	O	43.	O	O	O	O	O
14.	O	O	O	O	O	44.	O	O	O	O	O
15.	O	O	O	O	O	45.	O	O	O	O	O
16.	O	O	O	O	O	46.	O	O	O	O	O
17.	O	O	O	O	O	47.	O	O	O	O	O
18.	O	O	O	O	O	48.	O	O	O	O	O
19.	O	O	O	O	O	49.	O	O	O	O	O
20.	O	O	O	O	O	50.	O	O	O	O	O
21.	O	O	O	O	O	51.	O	O	O	O	O
22.	O	O	O	O	O	52.	O	O	O	O	O
23.	O	O	O	O	O	53.	O	O	O	O	O
24.	O	O	O	O	O	54.	O	O	O	O	O
25.	O	O	O	O	O	55.	O	O	O	O	O
26.	O	O	O	O	O	56.	O	O	O	O	O
27.	O	O	O	O	O	57.	O	O	O	O	O
28.	O	O	O	O	O	58.	O	O	O	O	O
29.	O	O	O	O	O	59.	O	O	O	O	O
30.	O	O	O	O	O	60.	O	O	O	O	O

1. What is $3.0 \times 10^7 \times 7.0 \times 10^3$?

    a) 21×10^{11}.   b) 2.1×10^{10}.   c) 2.1×10^{11}.   d) 3×10^{10}.   e) 7×10^4.

2. What is $(6.0 \times 10^7)/(2.0 \times 10^{14})$?

    a) 1.2×10^{22}.   b) 1.2×10^{21}.   c) 12.0×10^{21}.   d) 3.0×10^{-7}.   e) 3.0×10^7.

3. "Let's play *Jeopardy!* For \$100, the answer is: A megajoule."

    What is _____, Alex?

    a) 10^6 J   b) 10^{-6} J   c) 10^3 J   d) 10^9 J   e) 10^{24} J

4. "Let's play *Jeopardy!* For \$100, the answer is: It is a creature whose size scale is of order a decimeter."

    What is a/an _____, Alex?

    a) human   b) wolf   c) blue whale   d) E. coli bacterium   e) guinea pig

5. The food calorie is a weird unit. **1 FOOD CALORIE** is actually 1000 calories or 1 kcal. Now **1000 FOOD CALORIES** is about:

    a) 4 J.   b) 4 kJ.   c) 4 MJ.   d) 4 ZJ.   e) 4 YJ.

6. What is 1 electrical horsepower in SI units? **HINT:** Think about light bulb power or small household electrical motor power.

    a) 746 cW.   b) 7.46 W.   c) 746 W.   d) 746 MW.   e) 746 GW.

7. Circa year 2009, humankind numbered about 6.8 billion and used about 16 TW of commercial power. Approximately what was/is the power per capita?

    a) 0.5 W.   b) 2 W.   c) 30 W.   d) 200 W.   e) 2000 W/capita.

8. The overwhelmingly dominant source of energy for the biosphere (entire world of living things on Earth which somewhat patchily envelops the Earth in a thin sheath) is:

    a) geothermal power.   b) nuclear power stations.   c) solar power.   d) thermal power stations.   e) horse power.

9. Visible light is:

    a) only a small part of the electromagnetic spectrum.
    b) not in the electromagnetic spectrum.
    c) is the inverse of the electromagnetic spectrum.
    d) is not electromagnetic radiation.
    e) only green in color.

10. The solar constant is _____ on average (and it does not very much from average) and the average insolation is about _____.

    a) 170 W/m²; 1366.5 W/m²   b) 170.5 W/m²; 170 W/m²   c) 1366.5 W/m²; 1370 W/m²
    d) 1366.5 W/m²; 170 W/m²   e) 1366.5 MW/m²; 170 MW/m²

11. "Let's play *Jeopardy!* For \$100, the answer is: Approximately the ratio of total solar power reaching the Earth's surface to total world commercial power circa year 2008."

    What is _____, Alex?

    a) 0.5   b) 2   c) 6   d) 550   e) 5500

12. "Let's play *Jeopardy!* For \$100, the answer is: The rate of energy expended (i.e., power expended) by an animal in a state of complete rest, several hours after the last feeding (about 12 hours for humans) and in a comfortable temperature setting."

    What is _____, Alex?

    a) metabolic rate (MR)   b) basal metabolic rate (BMR)   c) metabolic scope (MS)
    d) barometric metabolic rate (BMR)   e) Basil Rathbone rate (BRR)

13. For typical humans, BMR is in range _____ and necessary food power is in the range _____ .

     a) 55–90 W; $\sim$ 100–200 W   b) $\sim$ 100–200 W; 55–90 W   c) 55–90 W; $\sim$ 55–90 W
     d) $\sim$ 100–200 W; 100–200 W   e) 1 hp; 2 hp

14. What animal has the largest sustained metabolic scope?

     a) Etruscan shrews.   b) Guinea pigs.   c) Humans.
     d) Canids (i.e., wolves, Cairn terriers, etc.).   e) Felids.

15. "Let's play *Jeopardy*! For \$100, the answer is: It is approximately the energy content of ethanol (commonly called alcohol in alcoholic beveridges)."

     What is _____ , Alex?

     a) 3 joules/hectogram   b) 3 megajoules/hectogram   c) 3 gigajoules/hectogram
     d) 3 zetajoules/hectogram   e) 3 yotajoules/hectogram

16. The resource reserve divided by the production rate of the resource for any resource is called the:

     a) PR quotient.   b) PRDBP ratio.   c) R/P ratio.   d) P/R ratio.   e) PR factor.

17. As of year 2009, the estimated reserve of oil (petroleum) is/was about 1300 Gbl (a Gbl is a gigabarrel). The annual rate of oil production/consumption (circa 2008) is/was about 30 Gbl/year. Approximately what is/was the current estimated R/P ratio for oil?

     a) 1300 years.   b) 30 years.   c) 1 week.   d) 100 years.   e) 43 years.

18. Circa year 2006 the world proved coal reserve amounted to about 9×10^{14} kg. Much more coal probably exists, but not in the proved (i.e., very well verified) deposits. The annual rate of coal production/consumption (circa 2007) is/was about 6×10^{12} kg/year. Approximately what is/was the current estimated R/P ratio for coal?

     a) 9×10^{14} years.   b) 6×10^{12} years.   c) 6.7×10^{-3} years.   d) 150 years.   e) 15 years.