- 1 The atomic mass of the hydrogen atom is (1 amu). The atomic mass of the helium atom is (4 amu). The hydrogen gas consists of molecules of H<sub>2</sub>. The helium gas consists of molecules of He. At any given temperature and pressure, the number of the molecules of an ideal gas per volume is the same for all ideal gases. Assuming that hydrogen and helium behave like ideal gases, what is the density of helium divided by the density of hydrogen, at the same temperature and the same pressure?
- **2** In some conditions, the flow rate (volume per time) of water through a tube is proportional to the radius of the tube to the power 2.5. The flow rate through a tube of radius r is Q. The total flow rate through a collection of 4 tubes of radius (r/2) is Q'. This is equal to 4 times the flow rate through a tube of radius (r/2). What is (Q'/Q)?
- **3** The electric power consumption of a household is 180 kilo Watt hours per month. How many Watts is this power consumption?
- **4** An adult human needs 9 mega Joules per day to survive. Fat produces 9 kilo calories per gram. One calorie is about 4 Joules. If the needed energy is to be produced by fat, how much fat per day is needed?
- **5** Kepler's third law states that for anything in an orbit around the sun, the ratio of (the semi major axis cubed) to (the period squared) is a constant. For (nearly) circular orbits, the semi major axis is essentially the distance to the sun. Suppose that something at the distance equal to 4 astronomical units is orbiting the sun. The astronomical unit is the distance of the earth to the sun. How many years is the period of that thing?
- **6** Good luck

## English for special purposes

Please write the answers in boxes and return only the answer sheet.

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