

**Table 6.22.** Estimated power output (metabolic rates) and power densities of biological cells and tissues (human, unless stated otherwise). (Using data presented in [308])

organelle, cell, or object	power output (picowatts)	volume ( $\mu\text{m}^3$ )	power density ( $\text{W}/\text{m}^3$ )
myosin muscle motor crossbridge	0.000001	$5 \times 10^{-7}$	$2 \times 10^6$
platelet (resting)	0.003–0.09	3	$0.1\text{--}3.0 \times 10^4$
red blood cell	0.008	94	$8.5 \times 10^1$
<i>E. coli</i> bacterium (basal)	0.05	2	$2.5 \times 10^2$
mitochondrion organelle	0.1–1.1	1	$0.1\text{--}1.1 \times 10^6$
platelet (activated)	0.7–7.0	3	$0.2\text{--}2.3 \times 10^6$
skin cell	1–3	1,000	$1.0\text{--}3.1 \times 10^3$
skeletal muscle (resting)	1–10	2,000	$0.5\text{--}4.9 \times 10^3$
typical tissue cell (basal)	30	8,000	$3.8 \times 10^3$
intestine/stomach cell	46–52	8,000	$5.6\text{--}6.5 \times 10^3$
neuron cell (basal)	70–110	14,000	$5.0\text{--}7.9 \times 10^3$
heart muscle cell (typical)	87–290	8,000	$1.1\text{--}3.6 \times 10^4$
skeletal muscle cell (max., voluntary)	113	2,000	$5.7 \times 10^4$
kidney cell	155–346	8,000	$1.9\text{--}4.3 \times 10^4$
neuron cell (maximum)	255–330	14,000	$1.8\text{--}2.4 \times 10^4$
typical tissue cell (maximum)	480	8,000	$6.0 \times 10^4$
skeletal muscle cell (max., tetanic)	2,300	2,000	$1.2 \times 10^6$
honeybee flight muscle cell	3,400	1,000	$3.4 \times 10^6$
heart muscle cell (maximum)	3,500–5,000	8,000	$4.4\text{--}6.3 \times 10^5$
human brain	15–25 W	$1.4 \times 10^{-3} \text{ m}^3$	$1.1\text{--}1.8 \times 10^4$
human body (basal)	100 W	$0.1 \text{ m}^3$	$1.0 \times 10^3$
human body (maximum)	1,600 W	$0.1 \text{ m}^3$	$1.6 \times 10^4$
gasoline-powered automobile	200,000 W	$10 \text{ m}^3$	$2.0 \times 10^4$
The Sun	$3.92 \times 10^{26} \text{ W}$	$1.41 \times 10^{27} \text{ m}^3$	0.28

Note that  $1 \text{ W} = 0.86 \text{ kcal/h}$ .