

Energy forms, changes and sources

Grade 6 science (Year 7 · Class 6) · Worksheet answers

Each answer gives the form of energy, the calculation and the result with its unit in bold. Check that your energy chains show every stage and that your percentages are worked out from useful energy divided by total energy.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS3

Problem 1 Name the form

1. **Kinetic**.
2. **Thermal**.
3. **Light**.
4. **Electrical**.
5. **Chemical** (stored in the food).

Problem 2 Joules

1. The **joule, J**.
2. $2.5 \times 1000 = \mathbf{2500\ J}$.
3. $4000 \div 1000 = \mathbf{4\ kJ}$.

Problem 3 Renewable or not?

Renewable: wind, biogas, sunlight.

Non-renewable: coal, natural gas, oil.

Problem 4 A battery fan

1. **Chemical** energy.
2. **Electrical** energy.
3. **Kinetic** energy (moving blades and air).

Problem 5 Wind turbine chain

1. A: **kinetic** (moving air).
2. B: **kinetic** (spinning blades).
3. C: **electrical**.
4. D: **light** (with some thermal energy as waste).

Problem 6 Law of conservation

1. Energy cannot be created or destroyed, only transferred or transformed.
2. The chemical energy was **transformed into light and thermal energy** (mostly thermal), which spread into the surroundings. It did not disappear.

Problem 7 Wasted energy of a lamp

1. $60 - 6 = 54$ J.
2. It is **thermal** energy (the bulb gets hot).

Problem 8 Useful percentage

1. Filament: $10 \div 100 \times 100 = 10$ %. LED: $8 \div 10 \times 100 = 80$ %.
2. The **LED lamp** wastes less (20 % compared with 90 %).

Problem 9 Comparing appliances

1. Kettle 100 J, charger 10 J, motor 50 J.
2. Kettle $900 \div 1000 = 90$ %; charger $40 \div 50 = 80$ %; motor $150 \div 200 = 75$ %.
3. The **electric kettle** (90 %).

Problem 10 More kinetic energy

1. At 10 m/s: **faster means more kinetic energy**.
2. The **truck** has more kinetic energy because it has a much greater mass at the same speed.

Problem 11 Bicycle dynamo

1. Chemical (food) → kinetic (pedals and dynamo) → electrical → light (and thermal).
2. Pedalling faster gives the dynamo more kinetic energy each second, so more electrical energy reaches the lamp and it gives out **more light**.

Problem 12 Motorbike engine

1. $200 - 50 = 150$ J.
2. $50 \div 200 \times 100 = 25$ %.
3. It spreads into the surroundings (air and the engine parts get hot) and cannot be used again.

Problem 13 Sources of electricity

1. $30 + 15 + 5 + 35 + 15 = 100$ units.
2. Renewable = hydro + wind + solar = 50 units, so $50 \div 100 \times 100 = 50$ %.
3. **Coal** (or natural gas).

Problem 14 Spot the error

1. Energy cannot be created, so a panel cannot make energy from nothing.
2. **A solar panel transforms light energy from the Sun into electrical energy.**

Problem 15 Solar charger

1. $4 \div 20 \times 100 = \mathbf{20\%}$.
2. $4 \times 60 = \mathbf{240\text{ J}}$.

Problem 16 Two-stage chain

1. 80 % of 40 J = $0.80 \times 40 = \mathbf{32\text{ J}}$.
2. $32 \div 100 \times 100 = \mathbf{32\%}$.
3. $100 - 32 = \mathbf{68\text{ J}}$ (60 J at the power station and 8 J in the lamp).

Problem 17 Saving energy with LEDs

1. $6 \div 7.5 \times 100 = \mathbf{80\%}$.
2. Filament: $60 \times 3600 = 216\,000\text{ J} = \mathbf{216\text{ kJ}}$. LED: $7.5 \times 3600 = 27\,000\text{ J} = \mathbf{27\text{ kJ}}$.
3. $216 - 27 = \mathbf{189\text{ kJ}}$ saved.

Problem 18 Missing energy in a phone

1. $x = 100 - 25 - 5 = \mathbf{70\text{ J}}$.
2. $(25 + 5) \div 100 \times 100 = \mathbf{30\%}$.
3. 70 % of the energy is transformed into thermal energy, which warms the phone and the air around it.

Problem 19 Power for a farm

1. **Solar panels** are a good choice: sunshine is plentiful and free, and there is no fuel to buy or carry. Solar is renewable and makes no smoke, while diesel is non-renewable and wind is too weak.
2. Store energy in batteries during the day: the chemical energy in the batteries is transformed back into electrical energy for the lamps at night.

Problem 20 Food energy on a ride

1. 25 % of 400 = $0.25 \times 400 = \mathbf{100\text{ kJ}}$.
2. $400 - 100 = \mathbf{300\text{ kJ}}$.
3. $500 \div 100 = \mathbf{5\text{ bananas}}$.