Efficiency Calculations – GCSE Physics

These questions are based on real-life situations involving household appliances, transport, renewable energy systems, machinery and everyday energy transfers. Some questions use efficiency calculated from energy transfers, while others use efficiency calculated from power. Read each question carefully and decide which version of the efficiency equation is needed.

1. A torch uses 120 J of electrical energy and produces 18 J of useful light energy. Calculate the efficiency of the torch.
2. A phone charger takes in 500 J of electrical energy and transfers 400 J to the phone's battery. Calculate the efficiency of the charger.
3. An electric heater transfers 9 000 J of energy and 8 100 J becomes useful thermal energy. Calculate the efficiency.
4. A cyclist consumes 25 000 J of chemical energy from food during a sprint. Only 5 000 J becomes useful kinetic energy. Calculate the efficiency of the cyclist.
5. A petrol lawnmower receives 80 000 J of chemical energy from fuel. It produces 16 000 J of useful kinetic energy. Calculate the efficiency.
6. A television has an efficiency of 80%. It receives 2 000 J of electrical energy. Calculate the useful energy output.
7. A wind turbine has an efficiency of 35%. The kinetic energy transferred to the blades is 80 000 J. Calculate the useful electrical energy produced.
8. A solar panel produces 1 200 J of useful electrical energy and operates at an efficiency of 15%. Calculate the total energy transferred to the panel by sunlight.
9. An electric car motor receives 250 000 J of electrical energy and operates at 90% efficiency. Calculate the useful kinetic energy produced.
10. A lift motor transfers 400 000 J of energy and produces 320 000 J of useful gravitational potential energy. Calculate:

a) the efficiency

b) the wasted energy.

11. A water pump receives 2 500 W of electrical power and delivers 1 750 W of useful power to moving water. Calculate the efficiency.
12. A vacuum cleaner has an input power of 1 200 W and an efficiency of 65%. Calculate the useful output power.
13. A washing machine motor provides 420 W of useful power and has an efficiency of 70%. Calculate the input power.
14. An electric drill receives 600 W of electrical power and wastes 150 W as heat and sound. Calculate the efficiency.
15. A hydroelectric generator produces 4.5 MW of useful electrical power from 6.0 MW of input power. Calculate the efficiency.
16. A factory machine operates at 85% efficiency and receives 12 000 W of power. Calculate:

a) the useful power output

b) the wasted power output.

17. A London Underground escalator motor receives 25 kW of power and delivers 18 kW of useful power. Calculate the efficiency.
18. An electric train has a useful output power of 2.4 MW and an efficiency of 80%. Calculate the input power required.
19. A wind turbine receives 5.0 MW of power from the wind and operates at 40% efficiency. Calculate:

a) the useful electrical power output

b) the wasted power.

20. A theme park ride uses a motor with an input power of 150 kW. During a test, the ride produces 120 kW of useful power.

Calculate:

a) the efficiency of the motor

b) the wasted power

c) the percentage of the input power that is wasted.