



F12.5 Technology and the environment

Technology and society · GCSE · OCR J277 1.6.1, AQA 8525 3.8, Edexcel
1CP2 5.1.1 · about 15 min

What this lesson is about

Making, running and disposing of devices: materials, data centres, e-waste and what helps.

- Making it
- Running it
- Throwing it away

Questions

5 marks in all

1. When is most of a phone's carbon footprint created? [1 mark]

- ☐ A While it is being manufactured
- ☐ B While it is charging
- ☐ C While it is being recycled
- ☐ D While it is in a shop

Answer: A. Mining and manufacture dominate, which is why keeping a device longer helps most.

2. What is e-waste? [1 mark]

- ☐ A Discarded electrical and electronic devices
- ☐ B Wasted electricity
- ☐ C Spam email
- ☐ D Unused files

Answer: A. It is the fastest growing household waste stream.

3. Why are data centres an environmental concern? [1 mark]

- ☐ A They use a great deal of electricity, much of it for cooling
- ☐ B They are noisy
- ☐ C They take up farmland only
- ☐ D They use no electricity

Answer: A. The carbon depends on how that electricity is generated.

4. 15 devices of 60 W run for 3 hours. How many kWh is that? [1 mark]

Answer: 2.7. $60 \times 3 \times 15 = 2700 \text{ Wh} = 2.7 \text{ kWh}$.

5. How does efficient code help the environment?

[1 mark]

- ☐ A It does the same job with less processing, so less electricity
- ☐ B It makes files smaller only
- ☐ C It needs more servers
- ☐ D It has no effect

Answer: A. Multiplied across every machine that runs it, the saving is real.

The task: the classroom's footprint

For each device in `devices` (a name, its watts, and how many hours it runs a day), work out the energy for a 190-day school year across `count` of them. Print `<name>: <kwh> kWh` rounded to 1 decimal place, then at the end `total: <kwh> kWh`, `cost: £<n>` at 28p a unit rounded to 2 decimal places, and `carbon: <n> kg CO2` at 190 g a unit, rounded to the nearest whole number.

```
# the two lines every program starts with: the commands, then the robot
from bugbot import *
connect()

days = 190
count = 15                      # how many of each device the class has
# name, watts, hours a day
devices = [("laptop", 50, 5), ("robot charging", 8, 1), ("projector", 220, 4)]
```

The hint students can ask for: Energy for one device is its watts times its hours times the days times how many there are, converted from watt-hours to kilowatt-hours. Add them up, then turn the total into money and into carbon with the rates given.

A solution

```
from bugbot import *
connect()
days = 190
count = 15
devices = [("laptop", 50, 5), ("robot charging", 8, 1), ("projector", 220, 4)]
total = 0
for name, watts, hours in devices:
    kwh = watts * hours * days * count / 1000
    total = total + kwh
    print(f"{name}: {kwh:.1f} kWh")
print(f"total: {total:.1f} kWh")
print(f"cost: £{total * 0.28:.2f}")
print(f"carbon: {round(total * 190 / 1000)} kg CO2")
```

Any program that meets the task's checks is marked correct in the simulator; this is one way, not the only way.