

GCSE Physics: Energy resources & waves

Foundation-tier practice for AQA 8463 and Edexcel 1PH0 (grades 1–5). Includes short-answer recall, a calculation and an extended-response evaluate question. Mark scheme on page 2.

England

Foundation tier

AQA / Edexcel

A4 · 2 pages

FOUNDATION-TIER COMMAND WORDS

State / Give: short answer, no explanation needed. **Describe:** say what happens (no reasons).

Explain: give reasons (because...). **Calculate:** show working and include units. **Evaluate:** weigh up evidence for and against, then reach a conclusion.

QUESTIONS

Q1 ★ · Radioactivity (2 marks)

State one difference between contamination and irradiation by a radioactive source. (1 mark)

Give one way a worker in a nuclear facility can reduce their exposure to ionising radiation. (1 mark)

Q2 ★ · Waves (3 marks)

A water wave has a frequency of 5 Hz and a wavelength of 0.4 m. Calculate the speed of the wave. Give the unit.

Q3 ★★ · Electromagnetic waves (6 marks)

Microwaves and infrared are both used in everyday devices. Describe one use of each, and explain how the properties of each type of wave make it suitable for that use.

Q4 ★★★ · Evaluate (6 marks)

A town is choosing between building a new wind farm or a new gas-fired power station to generate electricity. Evaluate the use of wind power compared with burning gas for generating

MARK SCHEME PAGE 2

Q1 · Radioactivity

Contamination = radioactive material gets onto or into the object/person (continues to irradiate from inside/on the surface); irradiation = the object is exposed to radiation from an external source but does not itself become radioactive. [1 mark for a correct contrasting statement]

Reduce exposure, any one of: wear lead/protective shielding; increase distance from the source; reduce time of exposure; use remote handling / tongs, wear a dosimeter and limit dose. [1 mark]

Q2 · Wave speed

$v = f \times \lambda$ [M1 selecting correct equation] = 5×0.4 [M1 substitution] = **2 m/s** [A1 value + unit].
Unit m/s required for A1.

Q3 · Electromagnetic waves (6 marks, levelled)

Level 3 (5–6): both waves covered with a correct use AND a linked property explanation for each; logical and well-linked.

Level 2 (3–4): both addressed but one explanation incomplete, OR one fully + one partially.

Level 1 (1–2): simple statements with little/no linked property explanation.

Indicative content. Microwaves: heated food in an oven (absorbed by water molecules); OR satellite / mobile communication (pass through atmosphere). Infrared: thermal imaging (emitted by warm objects); TV remote controls (short range, line of sight); cooking grills (absorbed and cause heating).

Model answer: Microwaves are used in microwave ovens because they are absorbed by water molecules in food, transferring energy that heats the food quickly. Infrared is used in thermal imaging cameras because all warm objects emit infrared, so the camera detects the radiation given off and produces an image showing temperature differences.

Q4 · Evaluate wind vs gas (6 marks, levelled)

Level 3 (5–6): detailed, balanced evaluation with advantages AND disadvantages of BOTH options, leading to a justified conclusion.

Level 2 (3–4): some relevant points on both options; limited balance or no conclusion.

Level 1 (1–2): simple statements, one-sided.

Wind advantages: renewable; no fuel cost; no CO₂ or air pollution when running. Wind disadvantages: only generates when windy (intermittent / unreliable); high initial build cost; visual and noise impact; lower power output per site. Gas advantages: reliable, on-demand; high, controllable power output. Gas disadvantages: non-renewable (finite); releases CO₂ (climate change) and pollutants; ongoing fuel cost.

Model answer (Level 3): Wind power is renewable and once built has no fuel cost and produces no carbon dioxide while running, so it does not contribute to climate change or air pollution. However, wind is intermittent (it only generates when the wind blows) and has a high initial build cost. A gas power station is reliable and can produce a large, controllable output to meet demand at any time, but gas is a finite fossil fuel and releases carbon dioxide and pollutants. Overall, for