

Methods we use to generate electricity

1. (a) gas 1
oil 1
- (b) (both) use steam to drive a turbine 1
accept (both) use turbines to drive generators
*do **not** accept both have a turbine /generator / use steam*
must describe a step in the process
accept heat / thermal energy transformed to kinetic / electrical energy
- (c) 140 (°C) 2
correct answer only
allow 1 mark for method clearly shown on graph
accept a cross or other indication at correct position on the line
accept correct description
accept even if numerical answer is incorrect
- (d) any **one** from: 1
*do **not** accept answers purely in terms of disadvantages of other methods except for fossil fuels are running out*
- very large energy source / reserves
 - no polluting / harmful gases produced
accept named gas CO₂ SO₂ NO_x
accept reduces harmful carbon emissions
 - reduces carbon emissions
accept does not contribute to global warming
 - no fuel needed
 - energy is free
 - can generate energy for a long time
accept energy available for a long time
 - renewable (energy source)
 - fossil fuels are running out
accept it saves fossil fuels / non-renewable
accept reduces the amount of fossil fuels being burnt
accept a named fossil fuel
Better for the environment / environmentally friendly insufficient
it is cheaper is insufficient
2. (a) (i) any **one** from: 1
- coal *do **not** accept fossil fuels*
 - oil *accept diesel*
 - (natural) gas
accept biofuel or a named biofuel eg wood / straw
accept household / industrial waste owtte

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(ii)	0.3	2
	<p>accept 30%</p> <p>if 2 marks not awarded then:</p> <p>allow 1 mark for 30 (without %)</p> <p>allow 1 mark for 0.3 with a unit or %</p> <p>allow 1 mark for identification of energy input and output eg. 20 sq input and 6 sq output</p> <p>or 4 sq input and 1.2 sq output</p> <p>or 40 sq input and 12 sq output even if subsequent working incorrect</p> <p>allow 1 mark for correct expression of 1.2 over 4</p> <p>or 12 over 40</p> <p>or 6 over 20 (squares)</p>	
(iii)	(nuclear) fission	1
	<p>accept fission provided it is not fusion</p>	
(b)	(i)	1
	<p>small proportion of <u>energy</u> / <u>power</u> is wasted</p> <p>accept little / less <u>energy</u> / <u>power</u> / <u>heat</u> is wasted</p> <p>do not accept it wastes no <u>energy</u> / <u>power</u></p> <p>or transfers most / more / a lot of <u>energy</u> <u>power</u> usefully</p>	
	(ii)	1
	<p>it decreases the current / uses low current</p> <p>or it increases the voltage / potential difference</p> <p>accept <i>pd</i> for potential difference</p> <p>or uses high voltage / potential difference</p> <p>smaller the current the smaller the energy loss</p>	1
(c)	(i)	1
	<p>as a control</p> <p>accept to make a comparison</p> <p>do not accept fair test on its own</p>	
	(ii)	1
	<p>so people know how much data the link was based on</p> <p>accept idea that larger numbers are better</p> <p>or people can <u>judge</u> the significance / reliability of the link</p> <p>do not accept significance / reliability on its own</p> <p>ignore reference to accuracy</p>	
	(iii)	1
	<p>other possible factors may be responsible</p> <p>or have not been investigated</p> <p>named factor</p> <p>eg environment / genetic</p>	1
	(iv)	1
	<p>first box ticked plus reason</p> <p>acceptable reason such as so people know there may be a risk as soon as possible / so that other scientists can use findings</p> <p>or second box plus reason</p> <p>acceptable reason such as no point to worry / confuse / panic people (until the research has been confirmed)</p> <p>accept idea that it may lead to wrong advice</p> <p>do not accept in case they are wrong</p>	

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3. (a) only accept answers in terms of the argument of the nuclear power scientist
- any **three** from: 3
- produces a lot of energy for a small mass of fuel **or** is a concentrated energy source
accept amount for mass
 - it is reliable **or** it can generate all of the time
 - produces no pollutant gases
accept named gas or greenhouse gases
*do **not** accept no pollution*
 - produces only a small volume of (solid) waste
accept amount for volume
 - advances in technology will make fuel reserves last much longer
accept an argument in terms of supply and demand
- (b) any **one** from: 1
- may leak into the ground /environment
 - geological changes
accept earthquakes etc
 - may get into the food chain
*do **not** accept answers in terms of property prices or 'damages the environment'*
 - over time if location not correctly recorded it may be excavated
- (c) any **three** from: 3
- overall add no carbon dioxide to the environment
accept do not add to global warming
accept they are carbon neutral
 - power companies can sell electricity at a higher price
accept power companies make more profit
 - opportunity to grow new type crop
accept specific examples e.g. growing plants in swamps
accept extends the life of fossil fuel reserve
 - more jobs
 - more land cultivated **or** different types of land utilised
- [7]
4. (a) 2005 1
- (b) any **two** from: 2
- reserves of coal / oil / gas are being depleted
 - demand (for energy) is growing at a faster rate than total (energy) supply
 - traditional fuels will not be able to meet future demands
- (c) (i) greenhouse effect / global warming 1
- (ii) acid rain 1

- (d) (large / heavy) nucleus hit by a neutron 1
 splits into (smaller) nuclei and neutron(s) (and energy) 1
- (e) (i) no
 even if all the suitable land were used the total power would be insufficient 1
marks are awarded for reasons
 land available for turbines = 120 km² so maximum number of turbines 720 1
 maximum power available 144 MW 1
allow 1 mark for total number of turbines required would create noise / visual pollution
allow 1 mark for an answer yes with reasons in terms of reduced CO₂ and / or reduced transport
- (ii) contact manufacturers / use the internet 1
accept any sensible way of collecting relevant data

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5. (a)

Energy Source	Advantage	Disadvantage	
Solar Energy	provides sufficient for heat energy during summer or non polluting	none/little In winter	2
Energy from Wind	most available when most needed or non-polluting	large number needed	2
Natural Gas	could supply all needs including transport	drilling for gas difficult	2
Diesel Oil	provides all energy needs at all times	polluting	2

- (b) diesel / natural gas 1
 reliable source all year 1

[10]