

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 CO<sub>2</sub> SO<sub>2</sub> NO<sub>x</sub>*  
*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*

[6]

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

[12]

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 km<sup>2</sup> 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 CO<sub>2</sub> and / or reduced transport*
- (ii) contact manufacturers / use the internet 1  
*accept any sensible way of collecting relevant data*

[11]

5. (a)

Energy Source	Advantage	Disadvantage	
Solar Energy	provides sufficient for heat energy during summer <b>or</b> non polluting	none/little In winter	2
Energy from Wind	most available when most needed <b>or</b> 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]