Mark schemes

1

(a) grid

accept any unambiguous indication

1

(b) (i) A (only)

1

(ii) D (only)

1

(c) more than

accept any unambiguous indication

1

[4]

2

(a) (i) an unreliable energy source

1

(ii) a predictable energy source

1

(b) plant / grow (at least) one new tree

1

(c) greater than 4 %

1

[4]

3

(a) (i) France

1

(ii) any **one** from:

- different homes have different appliances(*)
- different homes have different numbers of appliances(*)
  (*) accept all homes are different
- standby power not the same for all appliances
- some people will switch appliances off
  accept named appliances
  accept people waste different amounts of energy
- homes have different numbers of residents
- can't measure every (individual) home
  accept any sensible suggestions
  *do **not** accept answers in terms of accurate / precise etc*

1

(b) (i) increases amount of energy wasted
accept (encourages) people to leave appliances on (standby)
accept increases it

1

(ii) any **two** from:

- less electricity needed / generated
- fewer power stations needed
- less coal is burned
  *do **not** accept coal is non-renewable / running out*
  answers in terms of fuel stocks neutral
- less pollutant gases produced
  accept named gases
  accept harmful for pollutant
  accept greenhouse gases
  accept reduce / slow / stop global warming
  accept reduces acid rain

2

(c) joule

1

(d) (i) 6800
*accept £68 for **3** marks an answer of 68 gains **2** marks*
*allow **2** marks for correct substitution ie 400 × 17*
*allow **1** mark for obtaining 400*
*answers of 7480, 4760, 12920, 4080 gain **2** marks*

3

(ii) a small . . . . . electricity

1

[10]

4 (a) decrease in oil

PLUS

any **one** from:

- increase in (proportion of) coal
- increase in (proportion of) nuclear
- increase in (proportion of) gas

must have decrease in (proportion of) oil <u>and</u> increase in (proportion of) coal / nuclear / gas

1

(b) (i) (nuclear) fission

accept fision

*do **not** accept any answer that looks like fusion*

1

(ii) <u>water</u> heated to produce (high pressure) steam

1

<u>steam</u> turns turbine which drives generator

1

(iii) any **two** from:

- produces no pollutant gases

  accept named gas or greenhouse gases
  accept no atmospheric pollution
  accept harmful for pollutant
  accept does not contribute to global warming

  *do **not** accept no pollution on its own*
  *do **not** accept better for the environment unless qualified*

- it is reliable **or** can generate all of the time

- concentrated energy source **or** produces a lot of energy from a small mass

- produces only small volume of (solid) waste

- fossil fuels will last longer

  accept a named fossil fuel
  accept fossil fuels are running out

  *do **not** accept fossil fuels are non-renewable unless qualified*

- will need to buy less fuel from other countries

  accept no new fossil fuel power stations needed

  *do **not** accept it is cheap*
  *do **not** accept import less electricity*

2

(iv) it is / can be radioactive

*do **not** accept answers in terms of kills cells / cancer*

or emits radiation (from the nuclei)

accept emits gamma (rays)

1

(c) coal (burning) power stations / burning coal produces carbon dioxide

they refers to coal-burning power stations

accept sulfur dioxide / nitrogen oxides for CO_2

1

(increased) CO_2 increases / contributes to / causes global warming / greenhouse effect

mention of ozone layer negates this mark

*do **not** accept CO_2 warms atmosphere*

1

[9]

5 (a) any **two** from:

- (burning) fossil fuels produces greenhouse gases / pollutant gases / acid rain / leads to global warming
  accept a named fossil fuel
  accept a named pollutant gas
- nuclear fuels produce dangerous waste
  accept radioactive for dangerous
  accept reference to dangers of nuclear fuels
- fossil fuels are non-renewable
  accept running out of fuels
- renewable energy resources produce no pollutant gases
- large amounts of energy are available
  accept renewable won't run out
- running costs are low
  accept any reasonable benefit of renewables
  accept any reasonable drawback of non-renewables
  *do **not** accept better for the environment on its own*

2

(b) **R U S T**

all in correct order
*allow **2** marks for 2 correct*
*allow **1** mark for one correct*

3

[5]

6 (a) (i) small proportion of energy / power is wasted
accept little / less energy / power / heat is wasted
*do **not** accept it wastes no energy / power*

or transfers most / more / a lot of energy power usefully

1

(ii) it decreases the current / uses low current

or *it* increases the voltage / potential difference

accept pd for potential difference

1

or uses high voltage / potential difference

smaller the current the smaller the energy loss

accept power / heat for energy

1

(b) (i) as a control

accept to make a comparison

*do **not** accept fair test on its own*

1

(ii) so people know how much data the link was based on

accept idea that larger numbers are better

or

people can <u>judge</u> the significance / reliability of the link

*do **not** accept significance / reliability on its own*

ignore reference to accuracy

1

(iii) other possible factors may be responsible

1

or have not been investigated

named factor eg environment / genetic

1

(iv) first box ticked plus reason

acceptable reason such as so people know there may be a risk as soon as possible / so that other scientists can use findings

or second box plus reason

acceptable reason such as no point to worry / confuse / panic people (until the research has been confirmed)

accept idea that it may lead to wrong advice

*do **not** accept in case they are wrong*

1

[8]

7 (a) gas

1

oil

1

(b) (both) use steam to drive a turbine

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

1

(c) 140 (°C)

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

2

(d) any **one** from:

*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_2 SO_2 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

1

[6]

8 (a) (i) replaced faster than it is used

accept replaced as quick as it is used

accept will never run out

*do **not** accept can be used again*

1

(ii) any **two** from:

two *sources required for the mark*

- wind
- waves(*)
- tides(*)

  *(*)do **not** accept water / oceans*
  accept OTEC
- fall of water

  accept hydroelectric
- biomass
- geothermal

  accept a named biomass / biofuel eg wood

1

(b) (i) any **two** from:

- increases from 20° to 30°
- reaches maximum value at 30°
- then decreases from 30°
- same pattern for each month

  *accept peaks at 30° for **both** marks*
  *accept goes up then down for **1** mark*
  ignore it's always the lowest at 50°

2

(ii) 864

*an answer of 108 gains **2** marks*
*allow **1** mark for using 720 value <u>only</u> from table*
*allow **2** marks for answers 852, 816, 768, 825*
*allow **1** mark for answers 106.5, 102, 96, 103 (.125)*

3

(c) the solar cells will not meet demand at all times of the year / day

accept to maintain a constant supply of electricity / energy

or to make up the shortfall in energy required at certain times of the year

or to be able to sell surplus electricity (to the National Grid)

accept to provide energy at night
*do **not** accept because it's cloudy on it's own*

1

[8]

9 (a) only accept answers in terms of the argument of the nuclear power scientist any **three** from:

- 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 <u>gases</u>

  *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

3

(b) any **one** from:

- 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

1

(c) any **three** from:

- 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

3

[7]

10 (a) (i) grid
accept any way of indicating correct answer

1

(ii) increases voltage
accept any way of indicating correct answer

1

(iii) 230 V
accept any way of indicating correct answer

1

(iv) reduce
accept any way of indicating correct answer

1

(b) (i) increases the temperature
accept make it hotter / heat goes into the air
accept convection currents
accept sensible comment eg sound energy / it buzzes
ignore pollutes the air

1

(ii) less than 100%

1

[6]

11 (a) coal

1

(b) fossil fuels can be used to generate electricity at any time

if more than 2 boxes ticked, mark incorrect boxes first

1

a few large power stations can generate the electricity for a million homes

1

(c) (i) no fuel is burnt

accept a named fuel

accept nothing is burnt

accept does not use (fossil) fuel

1

(ii) kinetic

1

(iii) any **two** from:

- cause noise pollution
- cause visual pollution

accept causes pollution for 1 mark

- need concrete for bases
- new roads / infrastructure needed
- may interfere with TV / radio / mobile phone signals
- dangerous to birds
- do not generate all of the time

accept generates only when the wind blows

*do **not** accept 'generate when the wind blows'*

- need a lot of generators

*do **not** accept 'take up a lot of space / land'*

- high initial / capital costs
- reduces house prices

2

[7]

12 (a) (i) national grid

1

(ii) increases voltage / potential difference

accept decrease current

accept step-up / boosts the voltage

*do **not** accept increases energy / power / current*

ignore reference to voltage going through

1

(iii) any **two** from:

- reduce current

  ignore increased voltage / pd

- reduces energy loss / power loss (from cables)

  accept reduces heat loss

  *do **not** accept stops energy loss*

- increases efficiency (of distribution)

2

(b) any **one** from:

- produces pollutant gases

  accept produces carbon dioxide / sulfur dioxide / nitrogen oxides

  accept global warming / greenhouse effect / carbon emissions / air pollution / acid rain

  ignore ozone layer

  *do **not** accept carbon monoxide*

- produces solid waste / ash / smoke

  accept global dimming

  ignore produces pollution

1

(c) (i) any **two** from:

any two valid points gains the marks

- using renewable energy
  accept don't use up non-renewable / fossil fuels
  accept named fuels
- non-renewable fuels can be used for other processes
- no pollutant gases produced
  accept the opposite of (b)
  ignore no pollution
- land can still be used for farming
  ignore economic issues

2

(ii) any **two** from:

- cause noise pollution
- cause visual pollution
  accept spoils the landscape
  accept sunlight flicker
- may interfere with TV / radio / mobile phone signals
- need to put in new infrastructure
  accept new roads needed
- not reliable owtte
- dangerous to birds
- lots of concrete needed for the bases
  or
  producing cement is environmentally damaging
  accept reduces house prices
  ignore any references to cost / jobs / number required
  ignore takes up a lot of land
  accept reference to obstruction of shipping etc. if clear reference tooffshore wind farm

2

[9]

13 (a) gas

1

(b) fuel burning stations produce electricity at any time / all the time

accept fuel available all the time

1

wind generator can only produce when the wind is strong enough

accept it's not always windy

1

(c) no fuel is burnt **or** no fuel is used **or** uses only energy from wind **or** does not emit harmful gases / soot / smoke

*do **not** accept wind is natural / environmentally friendly / renewable*
*answer must be in terms of wind, **not** negative of fuel burning*
specific examples of gases CO_2, SO_2,
acid rain and greenhouse gases can be accepted
ozone negates credit

1

[4]

14 (a) generator

accept dynamo
accept alternator

1

(b) (i) 1400

ignore units

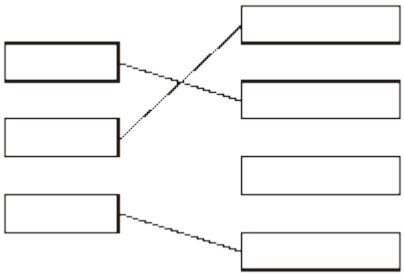
1

(ii) 0.3 or 30%

*any incorrect unit penalise **1** mark*
*allow **1** mark for the correct use of 600*
***or** 0.3% **or** 30*

2

(c) **1** mark for each correct link



if more than 3 lines are drawn, mark only
3 lines starting with those that are incorrect

3

(d) (i) 110

no tolerance

1

(ii) 12

no tolerance

1

(iii) wind speed may be too low to operate the generator

accept wind may not always blow
accept power depends on wind speed
accept does not generate if wind speed is too high
accept does not generate if wind speed is above 12 (m/s)
accept does not generate if wind speed is below 1.6 (m/s)
accept it is unreliable
*do **not** accept answers referring to cost only*

1

[10]

15 (a) hydrogen converted to helium

1

(nuclear) fusion

1

((small) loss in mass) which is converted to large amount of energy

1

(b) (i) any **two** from

it is running out/ takes millions of years/finite

***not** non renewable*

*allow acid rain **do not** allow waste*

pollution **or** problem with CO_2 production

allow a specific example

more responsible to use fossil fuels for (important) chemical functions

2

(ii) any **three** from

need lots of land for generators **or** many generators needed

generators may not be conveniently located

uncertainty of supply

accept the wind may not always blow

social resistance **or** visual pollution

noise pollution

high initial costs

(possible) interference with (local) radio and TV signals

3

[8]

16 (a) internal **or** thermal **or** heat **or** kinetic **or** movement

electrical

*both answers required for **one** mark*

1

(b) (i) Sun **or** solar

*do **not** accept sunshine*

1

(ii) any **one** of the follow:

- wind turbines produce no (gaseous) pollutants
- wind turbines use renewable energy
- wind turbines produce no (solid) waste
- reduced running costs

*do **not** allow safety*

1

a supporting statement **or** comparison **or** explanation

1

[4]

17 (a) (i) 3

1

(ii) 1

accept a definition of frequency ignore units

1

(iii) hertz

1

(b) straight line in correct direction

judge by eye (from 'a' of waves to 's' of across) ignore arrow
accept equal angles shown on waves

1

(c) (i) gets smaller

1

(ii) kinetic

accept movement

1

(iii) renewable

1

[7]

18 (a) (i) photosynthesis for growth

accept plants require sunlight for growth

1

plants change into coal

any mention of animals negates second mark

1

(ii) burning

*do **not** accept heating*

accept combustion

1

(b) (i) heat

1

(ii) less heat radiated into space

accept increased insulation round earth

accept reflects heat back to earth

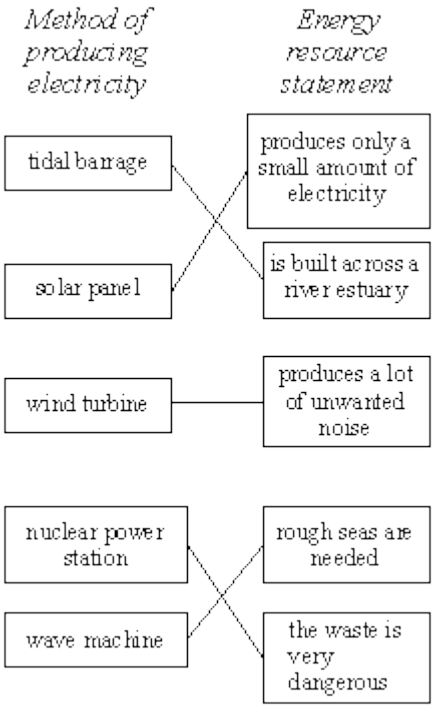
accept greenhouse effect

*accept traps heat **or** energy*

1

[5]

19 (a) (i) correct links shown



4

*1 link for **1** mark*
*2 links for **2** marks*
*3 links for **3** marks*
4 *links for **3** marks*
5 *links for **4** marks*
*do **not** credit if more than one link goes to **or** from any box*

(ii) nuclear (power station)

*do **not** accept power station*

1

(b) (i) heat from the Sun

1

(ii) kinetic

1

(iii) insufficient wind (to turn turbine)

accept wind does not always blow

*do **not** allow it does not always work or it is switched off*

*do **not** accept wind in wrong direction*

1

[8]

20 any **one** from:

*basic idea of reduced use of fuels to heat homes **or** offices **or** shops for **1**st mark*

less (heat) energy wasted (to the environment)

reduced demand for fuels to heat homes etc

simply re-quoting figures gets no credit

1

any **one** from:

*idea of less pollution for the **2**nd mark*

reduced (air) pollution

*do **not** accept no pollution*

fewer power stations required **or** less electricity needs to be produced

less (fossil) fuels being burnt (in power stations)

reduced greenhouse effect

reduced global warming

1

[2]

21 (a) (i) sources of energy

for 1 mark

(ii) wood coal
oil
gas

all correct gains 2 marks
3 correct gains 1 mark

3

(b) geothermal nuclear
tides
wind
solar

all correct gains 2 marks
4 correct gains 1 mark

2

(c) non-renewable fuels cause pollution (or reverse)
conserve/limit use of coal/gas/oil;
so supplies last longer/renewable sources can be replaced

any 2 from 4 for 1 mark each

2

[7]

22 (i) reduces

for 1 mark

1

(ii) less heat/energy/power wasted (in power lines)

for 1 mark

1

(iii) for safety

for 1 mark

1

[3]

23 To gain marks the candidate must

1. Select one option — Advantages) Max 4

2. State 8 valid advantages/disadvantages/relevant comparisons with either of the alternatives — Disadvantages) Min 1 Comparisons)
If no A or D or C then Max 4
No option then Max 4

Look for As, Ds for chosen scheme.
Then for Cs compared with A/D for chosen scheme.

Below are listed some of the relevant mark scoring points.

	Advantages	Disadvantages
Wind	Land available to North	Initial cost
	No pollution	Many windmills/much land
	Close/low transmission costs	Calm day problem
	No fuel costs	Few long term jobs
	Renewable energy resource	
Coal	Waste land to North	Pollution
	Prevailing wind to East	Initial costs
	Good road/rail transport	Fuel costs
	Close/low transmission costs	Non-renewable energy
	Save coal industry	Resource
	Overall labour intensive	
Hydroelectric	No pollution	Possible drought
	Mountains/lake/river nearby	Distant/transmission costs
	No fuel costs	Few jobs created
	Renewable energy source	Possible expensive underground transmission cable
		Construction of dam affects environment

[8]

24 (a) 90% of 2.1011
2.16.1011

2

(b) (i) Can be located anywhere
Continuous output
Sustain coal industry
any 2 for 1 mark each

(ii) Low running cost
No atmospheric pollution
Gives calm coastal waters
any 2 for 1 mark each

(iii) High installation costs – built in sea
Coast environmental damage – wildlife disturbance
Time dependence – need dropping tide
any 2 for 1 mark each
(1 for a valid disadvantage, 1 for reason)

6

[8]

25 coal has chemical energy
when burnt heat/energy produced longest
used to boil water/make steam sequence
used to turn turbine(s)
which now have ke
turbine(s) turn generator(s)
(where (ke) transferred electrical energy)
(or electrical energy produced)
any 5 for 1 mark each

[5]

26 the higher the voltage the smaller the current
small current gives small energy loss
in the form of heat
(or efficiency greater, or energy/heat losses low – gets 1)
for 1 mark each

[3]

27 (a) (i) much ash produced
acid rain
global warming/greenhouse effect
any 2 for 1 mark each

2

(ii) landscaping/road building*
removal of exhaust gases*
use alternative source not producing
CO_2* (*sequential (i))
for 1 mark each

2

(b) (i) $E = 5 \times 10^8 \times 3600 \times 24$ J/day
$\times 4$ (for 4 generators) (sequential on $P \times t$) $= 1.73 \times 10^{14}$ (J/day)
for 1 mark each

3

(ii) $2.66 \times 10^{10} \times 18\,829 = 4.86 \times 10^{14}$
for 1 mark each

2

(iii) Eff = output/input
Eff = 1.73/4.86
Eff = 0.36 or worked to a percentage
for 1 mark each

3

(c) (i) boiler – heat to surroundings
turbine – not all steam energy used/heat/sound lost to surroundings
generator – heat in wires/coils/heat to surroundings
transformer – heat in wires/coils/heat to surroundings
any 1 for 1 mark

1

(ii) energy spread out/diluted
as surroundings become warmer/energy lost as heat
difficult to use for further useful energy/transfers
any 2 for 1 mark each

2

[15]

28 (a) m*ust give one advantage and one disadvantage of each to get 4 marks and 2 further scoring points*

Advantages and disadvantages relevant to:
(1) health risk
(5) cost
(6) environmental factors
(7) transport/ storage
e.g. common coal / nuclear – high cost of building both

<u>anti-nuclear</u> examples
nuclear fuel transported on roads/rail in region
possible effects on public health in surrounding area
high cost of de-commissioning
long life very active waste materials produced
how waste materials stored safely for a long time

<u>anti-coal</u> examples
unsightly
pollution
supplies of fuel limited
acid rain
non-renewable

<u>pro-nuclear</u> examples
fuel cheap
no foreseeable fuel shortage

<u>pro-coal</u> examples
safe
reliable
large coal reserves
disposal of solid waste is easier

to max 6

6

(b) choice 0 marks

any three valid reasons each with explanation, which may or may not be comparisons with other fuel

But

at least two of which must be relevant to this site

3

[9]

29 Read all the answer first. See below.

Mark the first two advantages and disadvantages (√ or *X*) ignoring

neutral answers. Only allow a third advantage if there is only one disadvantage given. Only allow a third disadvantage if only one advantage is given.

max. 3 advantages (e.g. cheap fuel, good availability, saving fossil fuels, low running costs, reliable, more energy / kg, less fuel needed, no greenhouse gases emitted, no SO_2 causing acid rain)

max. 3 disadvantages (e.g. danger to health of local community, non renewable, high cost of decommissioning, long half life of waste materials, need for safe storage of waste, high cost of commissioning, danger involved in transporting fuel / waste)

max. 4 marks

[4]

30 (a) **Using wind (advantage)**

any **one** from

can be used in remote locations

renewable

clean

accept does not cause pollution to the air / land

1

Using wind (disadvantage)

any **one** from

does not generate much (electrical) energy
many hundreds wind turbines would be needed

*accept many hundreds wind turbines would be needed **or** too much land would be needed for wind farms **or** wind energy is 'dilute'*

the wind is unreliable

*accept the wind does not blow all of the time **or** the wind is not always strong enough*

noise / visual pollution

*do **not** accept just the word pollution*

1

Using coal (advantage)

any **one** from

can generate electricity all of the time

accept reliable electrical / energy supply

generates a lot of (electrical) energy

1

Using coal (disadvantage)

any **one** from

pollution by carbon dioxide / greenhouse gas

*accept slow start-up time **or** production of ash **or** difficult to transport (coal) **or** there's not much coal left*

non renewable

pollution by sulphur dioxide acid rain

1

(b) all link lines correct

accept one link line correct for one mark

2

[6]

31 *do **not** give any credit for renewable **or** non-renewable **or** installation **or** decommissioning costs*

fossil fuel advantage

1

a reliable source of energy

fossil fuel disadvantage

pollution by carbon dioxide /

accept causes acid rain
accept highest costs / more expensive than nuclear / more expensive than renewable

1

nuclear advantage

do not produce gases that increase the greenhouse effect **or** cause acid rain

accept nuclear is cheaper than fossil

1

nuclear disadvantage

accidents / waste can release very dangerous radioactive material radiation

*accept it produces waste that stays dangerously radioactive for thousands of years **or** radioactive waste has to be stored safely for thousands of years*

1

renewable advantage

there are no fuel costs

almost pollution free (apart from noise and visual)
accept cheaper than fossil

1

renewable disadvantage

not a reliable source of energy except for hydroelectric

accept (most) require large areas of land
accept visual / noise pollution

1

[6]

32 (a) **(oil / natural gas / coal)**

no marks are given for choosing the correct non-renewable energy source

burning releases carbon dioxide (1) greenhouse effect (1)

OR

allow 2 effects for 2 marks

burning (releases sulphur dioxide (1) acid rain (1)

OR

(nuclear power)

no marks given for choosing the correct non-renewable energy source

accidents can release very dangerous radioactive material (1)

produces waste that stays dangerously radioactive for thousands of years **or** radioactive waste has to be stored safely for thousands of years (1)

accept the cost of installation and decommissioning is high

2

(b) any four from:

(wind power)

no marks are given for choosing the correct non-renewable energy source

- considered unsightly / visual pollution (1) very large areas of land (1)
- noisy for people living nearby / noise pollution (1)

(tidal power)

no marks are given for choosing the correct non-renewable energy source

- barrages / visual pollution (1)
- destroys the habitat of many living organisms (1)

(hydroelectricity)

no marks are given for choosing the correct non-renewable energy source

- damming / visual pollution (1)
- very large areas of land (1) flooding (1)

4

[6]

33 (a) 20

accept twenty

1

(b) correct division 35/15

1

larger area labelled coal

accept smaller area labelled oil

1

(c) can be started up very quickly

1

(d) (i) carbon dioxide

1

(ii) sulphur dioxide

accept nitrogen oxidestotal

1

[6]

34 (a) any **two** from

reliable

accept it is not always windy

can be used as storage for surplus electricity

generates more electricity

accept would need hundreds of wind turbines to generate this electricity

takes less space is neutral

no noise pollution

*do **not** accept can be started up quickly*

2

(b) advantage :

does not produce greenhouse gases / carbon dioxide / water
or acid rain / sulphur dioxide

1

disadvantage :
danger from radioactive materials if accidents **or** waste radioactive materials

accept slower start-up time

1

(c) any **one** situation with a suitable explanation

satellite
weigh less **or** work for many years **or** remote

remote places on Earth pump water **or** operate phones **or** road signs / lights **or** weather stations **or** too expensive / impractical

calculators / watches small amount of electricity needed

2

[6]

35 (a) mark independently

(from) gravitational

accept potential
do not credit stored

1

(to) kinetic

accept movement

1

(b) **advantage**

* the current can be low (for the same power)
* less energy **or** heat loss **or** power loss

accept the cables do not have to be (so) thick

accept less cost to support higher (rather than heavier) cables

accept aluminium can be used and aluminium is cheaper than copper

*do not credit efficient **or** cheaper*

do not credit no loss of energy

do not credit electricity loss

2

disadvantage

* it is difficult to insulate high voltage
* pylons have to be taller and so more expensive

...to give a good separation between them and the ground /people/high vehicles

***or** ... to prevent/reduce the danger of electric shock **or** lethal*

do not credit dangerous

do not credit get a shock

*do not credit reference to step down transformers **or** electromagnetic field*

2

[6]

36 (i) gravitational **or** potential

do not accept stored

1

light

credit solar

1

kinetic **or** movement

credit moving

1

chemical

1

(ii) any **one** from

gas

coal

1

(iii) any **one** from

oil

*do not accept petrol **or** paraffin*

peat **or** turf

nuclear

*credit coal **or** gas if not given as answer to part (ii)*
*do not accept wood **or** fossil fuel **or** chemical*

1

[6]

37 (a) sectors nearer to correct value than to 1% either side

coal	35%
nuclear	5%
gas	24%
moving water	1%

each for 1 mark -
to a maximum of 3 marks
deduct 1 mark if sector left blank

three sectors labelled correctly w.r.t. rank order of size

for 1 mark

4

(b) (fossil) fuels (*allow* combustible/flammable/non renewable)

1

(c) moving water/hydro
wind/waves/tides/solar (*allow* geothermal/
wood/biomass)

each for 1 mark

2

(d) any indication that we get more (energy from nuclear sources)

gains 1 mark

but
5 times as much/more

gains 2 marks

2

[9]

38 (a) *sectors closer to correct value than ± 1%* nuclear (5%)
gas 24% moving water 1%

each for 1 mark

maximum of 2 marks

3

sectors labelled correctly w.r.t. rank order of size

for 1 mark

But deduct 1 mark if not all sectors used

(b) 5 × as much (do **not** credit simply more/4% more)
4 × as much

1

(c) wind/waves/solar/tides
(allow geothermal/wood/biomass)

any one for 1 mark

1

(d) *idea that*
electricity is a secondary/man made source/needs another source to produce it

for 1 mark

1

[6]

39

20 3
0.3

each for 1 mark

[3]

40

(a) cooking and heating water 30
heating rooms 50

each for 1 mark

2

(b) coal
idea that amount used fell/declined/line goes down

gains 1 mark

but *idea that* fall/decline is steady/gradually/approx halved

gains 2 marks

gas
ideas that
amount used rose/increased
in/from 1980/more used before 1980/ref to 1980
as an important date/*rapid* increase in use
(*credit idea that* gas>coal from c.1990
in either part with 1 mark (to maximum 4)

each for 1 mark

max 4

(c)
- *less* carbon dioxide produced
- less change to weather/food production/gained warming/water levels (no mark for "greenhouse gas" alone)
- no/less sulphur dioxide produced/coal produces sulphur dioxide
- less acid rain/damage to fish/buildings/trees/crops/animals/tumours etc (do not credit reference to cost unless : cheaper so can spend more on environment)

("It" used in an answer will refer to "gas") any 3 for 1 mark each

3

[9]

41 ideas that

- direct solar radiation will provide enough energy to heat the (specially designed) buildings during the period Oct-Mar / summer
- solar cells will produce plenty of electricity in Oct-Mar / summer (when wind generators produce little)
- a couple of wind generators will produce all electricity needed (for all but heating) Apr-Oct / winter
- number required makes wind generators unsuitable for heating / buildings
- no solar energy in June and July / little in winter
- solar / wind have little effect on environment
- **or** cause no air pollution
- solar and wind complement each other
- **or** together provide energy all year
- fuel / gas / diesel can provide energy all the time / at any time
- fuel / gas / diesel needed for transport
- fuel / gas / diesel needed for heating <u>in winter</u>
- diesel has to be imported
- diesel likely to freeze
- gas wouldn't have to be imported
- drilling for gas difficult / harms environment
- but atmospheric pollution a global rather than local matter so any produced in Antarctic doesn't matter much

(deduct 1 mark (to min^{m}. zero) for incorrect claims about destroying ozone layer)

- gas produces less carbon dioxide (for the same energy released) than diesel*
- gas produces less sulphur dioxide (for the same energy released than diesel*

(* these ideas met by candidates in Q.16 so must be <u>allowed</u>, though not <u>required</u>)

any ten for 1 mark each

[10]