**Mark schemes**

Q1.

(a) (i) tidal / tides

do not accept water / waves

1

(ii) any three from:

• shorter journey time

accept easier to go from town to town

accept less petrol / fuel used

• less pollution from traffic

accept CO2 / carbon emissions reduced

• energy source is free

• energy source / tides are predictable

• produces less / no pollutant gases (than fuel burning power stations)

accept no CO2 / greenhouse gases produced

accept air pollution for pollutant gases

• conserves supplies of fossil fuels

• uses renewable energy (to generate electricity)

• provides employment

• no visual / noise pollution

less harm to the environment is insufficient

the electricity is cheaper is insufficient

do not accept produces no radioactive waste

the pollution mark scores twice only if it is clear one reference is to traffic and the other is to electricity generation

3

(b) (i) (sometimes) electricity demand may be greater

than supply (of electricity from the system)

accept in case turbines / generators fail

or

can sell (excess) electricity (to the National Grid)

1

(ii) decreases the current

accept increases the voltage

1

reducing energy loss (along cables)

accept less heat / thermal energy lost / produced

1

[7]

Q2.

(a) (i) 0.2 or 1/5

accept 20% for both marks

allow 1 mark for correct substitution answer of 0.2%

or 20 gains 1 mark

ignore units

2

(ii) wasted

accept transformed to heat / other forms

accept transferred to the air / surroundings sound = neutral

1

(b) (i) any one from:

• can fly at night

accept can fly when it is cloudy

accept as a back-up

• can stay in the air for longer

• can fly in the winter

• can fly faster

increases power is neutral

1

(ii) any one from:

• produces no (pollutant) gases

or no greenhouse gases

accept named gas

accept no air pollution

do not accept no pollution

accept less global warming

accept harmful for pollutant

accept produces no carbon

do not accept environmentally friendly

• produces no / less noise

• less demand for fuels

accept any other sensible environmental advantage

1

(iii) accept any sensible suggestion eg, map the Earth’s surface / weather forecasting / spying / monitoring changes to the Earth’s atmosphere, etc

do not accept ideas in terms of transporting

accept use as a satellite

1

[6]

Q3.

(a) (i) any one from:

• waves

do not accept water

• tides

• falling water

accept hydroelectric

• biofuel / biomass

• solar

accept sun / sunlight

do not accept light

accept solar cells / panels

• geothermal

do not accept heat

1

(ii) decrease

1

(b) (i) increases from 4am (to 8am) remains constant from 8am (to 10am)

accept increases from 30 000

accept stays constant from 40 000

allow 1 mark for goes up then stays the same

for full credit must be some indication of time or power

2

(ii) natural gas

1

[5]

Q4.

(a) 1/25 or 1:25 or 0.04

accept 4 % or or 1 in 25 for both marks

allow 1 mark for total of 375

allow 1 mark for a clearly correct method using a clearly incorrect total

do not accept 1:26

2

(b) (i) B

do not credit reason if B is not chosen

1

(only) burning fossil fuels produces carbon

dioxide / carbon (emissions)

or nuclear fuels don’t produce carbon dioxide

insufficient – smallest amount of fossil fuels

accept less carbon dioxide

1

(ii) accept anything reasonable eg

increased level of insulation

use energy efficient light bulbs

do not leave appliances on standby

switch thermostats down (1°C)

generate own electricity

install solar panels

accept insulate

accept specific examples eg loft

1

(c) (i) any three from:

• no power output until wind speed exceeds 4m/s

• output rises rapidly after 4m/s

• output begins to level out / rises less rapidly at /

after 13m/s

• output peaks at 21 / 22m/s

• output constant between 21 / 22 and 25 / 26 m/s

• output falls (rapidly) after 25 / 26m/s

accept for 1 mark goes up then comes down

3

(ii) any one from:

• unreliable energy source

• dilute energy source

• take up too much land

accept wind does not always blow

accept need thousands / lots of turbines

ignore reference to visual / noise pollution

ignore reference to kill birds

1

[9]

Q5.

(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]

Q6.

(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]

Q7.

(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]

Q8.

(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 and 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) water heated to produce (high pressure) steam

1

steam 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 CO2

1

(increased) CO2 increases / contributes to / causes global warming /

greenhouse effect

mention of ozone layer negates this mark

do not accept CO2 warms atmosphere

1

[9]

Q9.

(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]

Q10.

(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 judge 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]

Q11.

(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 CO2 SO2 NOx

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]

Q12.

(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 only 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]

Q13.

(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 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

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]

Q14.

(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]

Q15.

(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:

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]

Q16.

(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]

Q17.

(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 CO2, SO2,

acid rain and greenhouse gases can be accepted

ozone negates credit

1

[4]

Q18.

(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]

Q19.

(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 CO2 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]

Q20.

(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]

Q21.

(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]

Q22.

(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]

Q23.

(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]

Q24.

any one from:

basic idea of reduced use of fuels to heat homes or offices or shops for 1st 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 2nd 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]

Q25.

(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]

Q26.

(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]

Q27.

To gain marks the candidate must

1. Select one option Advantages ) Max 4

2. State 8 valid advantages/disadvantages/relevant Disadvantages) Min 1

comparisons with either of the alternatives 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]

Q28.

(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]

Q29.

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]

Q30.

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]

Q31.

(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

CO2\* (\*sequential (i))

for 1 mark each

2

(b) (i) E = 5 × 108 × 3600 × 24 J/day

× 4 (for 4 generators) (sequential on P × t) = 1.73 × 1014 (J/day)

for 1 mark each

3

(ii) 2.66 × 1010 × 18 829 = 4.86 × 1014

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]

Q32.

(a) must 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

anti-nuclear 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

anti-coal examples

unsightly

pollution

supplies of fuel limited

acid rain

non-renewable

pro-nuclear examples

fuel cheap

no foreseeable fuel shortage

pro-coal 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]

Q33.

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 SO2 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]

Q34.

(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]

Q35.

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]

Q36.

(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]

Q37.

(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]

Q38.

(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]

Q39.

(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]

Q40.

(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]

Q41.

(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]

Q42.

(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]

Q43.

3

20 0.3

each for 1 mark

[3]

Q44.

(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]

Q45.

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 in winter

• 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 minm. 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 allowed, though not required)

any ten for 1 mark each

[10]