# Mark schemes

**1**

(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]**

**2**

(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]**

**3**

(a) insulation

*allow example e.g fibreglass*

**1**

double glazing

*allow curtains*

**1**

draught excluder

*allow double glazing / close fitting door*

*allow turning down thermostat once only / turn down the heating*

**1**

(b) transfers more useful energy

*allow converts more energy into light / less into heat / less energy wasted*

**1**

**[4]**

**4**

(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]**

**5** (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]**

**6** (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]**

**7** (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]**

**8** (a) 60% sector correct
other two sectors closer to 13:7 than 12:8 or 14:6
sectors correctly labelled (w.r.t rank order of size)

*each for 1 mark*

**3**

(b) (i) *ideas that wasted energy*
is transferred to surrounding air
pan
stove
is converted to another/correctly named energy form

*any 2 for 1 mark each*

**2**

(ii) 40

*for 1 mark*

**1**

**[6]**

**9**

| | |
|---|---|
| 20 | 3 |
| | 0.3 |

*each for 1 mark*

**[3]**

**10** (a) *any evidence of:* momentum = mass × velocity (words, symbols or numbers) appropriate re-arrangement mass as 0.05kg

*each gains 1 mark*

**but** 800

*gains 4 marks*

**4**

(b) (i) *any reference to* friction with air/air resistance

*gains 1 mark*

**but** *idea that* friction with air/air resistance is high (at high speed)

*gains 2 marks*

**2**

(ii) *any evidence of:* k.e. $\propto v^2$ **or** k.e. = ½ $mv^2$

$\frac{\text{final k.e.}}{\text{initial k.e.}}$

either initial or final k.e. correctly calculated (i.e. 16000; 10240)

*each gains 1 mark*

**but** $(0.8)^2$

*gains 3 marks*

**but** 64%(credit 0.64)

*gains 4 marks (also credit e.c.f)*

**4**

**[10]**

**11** (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

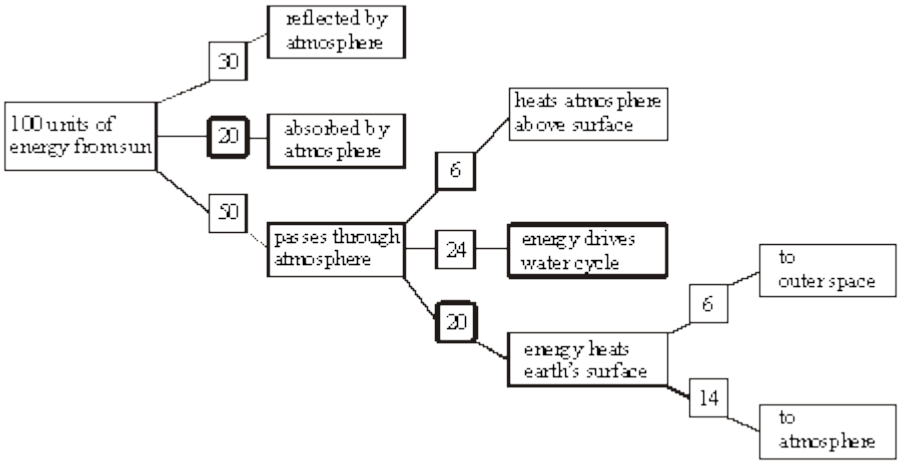
(do not credit reference to cost unless : cheaper so can spend more on environment)

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

**3**

**[9]**

**12**




*each for 1 mark*
*allow 'error carried forward' to the last box'*

**[3]**

**13**

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 allowed, though not required)

*any ten for 1 mark each*

**[10]**