

Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Mark Schemes

Q1.

(a) conduction 1

(b) (i) there is a bigger temperature difference between the water and the surrounding air
accept the water is hottest / hotter 1

so the transfer of energy (from hot water) is faster
accept heat for energy
ignore temperature falls the fastest 1

(ii) 120
allow 1 mark for converting kJ to J correctly, ie 4 032 000
or
correctly calculating temperature fall as 8°C
or
allow 2 marks for correct substitution, ie $4\,032\,000 = m \times 4200 \times 8$
answers of 0.12, 19.2 **or** 16.6 gain 2 marks
answers of 0.019 **or** 0.017 gain 1 mark 3

(iii) water stays hot for longer 1

so heater is on for less time
accept so less energy needed to heat water 1

so cost of the jacket is soon recovered from) lower energy costs / bills
accept short payback time 1

[9]

Q2.

(a) (i) produces carbon dioxide / nitrogen oxides

accept greenhouse gases
ignore pollutant gases

1

that (may) contribute to global warming

accept causes global warming

damages ozone layer negates this mark

accept alternative answers in terms of: sulfur dioxide / nitrogen oxides

causing acid rain

1

(ii) carbon capture / storage

answer must relate to part (a)(i)

collecting carbon dioxide is insufficient

or

plant more trees

or

remove sulfur (before burning fuel)

1

(b) (i) (power station can be used) to meet surges in demand

accept starts generating in a short time

can be switched on quickly is insufficient

1

(ii) can store energy for later use

accept renewable (energy resource)

accept does not produce CO₂ / SO₂ / pollutant gases

1

(c) (i) turbines do not generate at a constant rate

accept wind (speed) fluctuates

accept wind is (an) unreliable (energy source)

1

(ii) any **one** from:

- energy efficient lighting (developed / used)
use less lighting is insufficient
- increased energy cost (so people more likely to turn off)
accept electricity for energy
- more people becoming environmentally aware

1

[7]

Q3.

(a) (i)
$$\text{efficiency} = \frac{\text{useful energy out} (\times 100\%)}{\text{total energy in}}$$

1.6 (W)

allow **1** mark for correct substitution ie $\frac{0.2}{100} = \frac{\text{output}}{8}$

2

(ii)
$$\text{efficiency} = \frac{\text{useful energy out } (\times 100\%)}{\text{total energy in}}$$

32 (%) / 0.32

or

their (a)(i) ÷ 5 correctly calculated

ignore any units

1

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

- comparison over same period of time of relative numbers of bulbs required eg over 50 000 hours 5 CFL's required to 1 LED
accept an LED lasts 5 times longer
- link number of bulbs to cost eg 5 CFL's cheaper than 1 LED
an answer in terms of over a period of 50 000 hours CFLs cost £15.50 (to buy), LED costs £29.85 (to buy) so CFLs are cheaper scores both marks
an answer in terms of the cost per hour (of lifetime) being cheaper for CFL scores 1 mark if then correctly calculated scores both marks
- over the same period of time LEDs cost less to operate (than CFLs)

2

(ii) any **one** from:

- price of LED bulbs will drop
*do **not** accept they become cheaper*
- less electricity needs to be generated
accept we will use less electricity
- less CO₂ produced
- fewer chips needed (for each LED bulb)
- fewer bulbs required (for same brightness / light)
- less energy wasted
*do **not** accept electricity for energy*

1

[6]