**Mark schemes**

Q1.

(a)

battery in series with bulb and ammeter

1

voltmeter in parallel with bulb

1

variable resistor

or

variable power pack

or

potentiometer

1

(b) A is brighter because it has a higher current (than lamp B at any p.d.)

1

(therefore A has a) higher power output (than bulb B)

accept higher energy output per second

1

(c) lower current (than lamp A) for the same potential difference

accept answer in terms of R = V / I

1

lower gradient (than lamp A)

1

(d) 0 – 2 Volts

allow a range from 0 V up to any value between 1 and 2 V.

1

(for an ohmic conductor) current is directly proportional to potential difference

allow lines (of best fit) are straight and pass through the origin

1

(so) resistance is constant

1

[10]

Q2.

(a) (i) high levels of infrared radiation (from the Sun)

allow lots of (solar) energy (available)

do not accept ‘heat’ for infrared

‘it is hot’ is insufficient

‘lots of sunlight’ is insufficient

1

(ii) reflected

1

(iii) boiler

correct order only

1

turbine

1

transformer

1

(b) 2 100 000 (kWh)

allow 1 mark for correct substitution i.e. 140 000 × 15 provided no subsequent step

2

(c) (i) only 1 wind turbine was considered

accept only one location is considered

1

or

other wind turbines may have generated more electricity

accept insufficient sample size

only 1 week’s weather was reported on

or

wind speed varies from one week to another

‘wind speed varies’ is insufficient

1

(ii) any one from:

• wind speed is too high / low

allow no wind

allow too windy

• wind is unreliable.

allow wind is variable

1

(iii) any one from:

• wind is a renewable energy source

• do not use fuel

• energy source is free

• do not release carbon dioxide

• do not release greenhouse gases

• do not release sulfur dioxide

• do not cause acid rain

• do not cause climate change

• do not cause global warming

• do not cause global dimming.

answer must be an advantage of wind, converse answers in terms of fossil fuels are insufficient

accept do not release pollutant gases

‘no pollution’ is insufficient

1

[11]

Q3.

(a) (i) infrared (radiation)

accept IR (radiation)

1

(ii) (heated) water turns to steam

ignore reference to fossil fuels

do not accept water evaporates to steam

1

steam turns a turbine

1

turbine turns a generator

accept turbine connected to a generator

1

(b) (i) (so the molten salts) can store large amounts of energy

accept there is a small temperature change for a large energy transfer

accept heat for energy

1

(ii) 16 (hours)

an answer that rounds to 16 gains 2 marks eg 15.71

allow 1 mark for a correct substitution ie 2 200 000 = 140 000 × t

3

(iii) the number of daylight hours varies

less sunlight is insufficient

1

the (mean) power (received from the Sun per square metre) varies

accept an answer in terms of maximum possible electrical output only possible during Summer for 1 mark

1

(c) (i) non-renewable power stations have higher Capacity Factors than renewable power stations

1

fuel (for non-renewable power stations) is always available

reference to non-renewable power stations operating all the time is insufficient

non-renewable energy sources are reliable is insufficient

1

(most) renewable energy sources are unpredictable / unreliable

accept (most) renewable energy sources depend on the weather

1

(ii) the (proportion of) time that solar storage power stations can generate electricity is greater (than for other renewable energy sources)

1

[14]

Q4.

(a) (i) 150

1

(ii) transferred to the surroundings by heating

reference to sound negates mark

1

(iii) 0.75

450 / 600 gains 1 mark

accept 75% for 2 marks

maximum of 1 mark awarded if a unit is given

2

(iv) 20 (s)

correct answer with or without working gains 2 marks

correct substitution of 600 / 30 gains 1 mark

2

(b) (i) to avoid bias

1

(ii) use less power and last longer

1

1 LED costs £16, 40 filament bulbs cost £80

or

filament costs (5 times) more in energy consumption

1

(iii) any one from:

• availability of bulbs

• colour output

• temperature of bulb surface

1

[10]

Q5.

(a) potential

1

(b) (i) 13 200

allow 1 mark for correct substitution, ie 660 × 20 provided no subsequent step shown

2

(ii) 16.5

allow 1 mark for correct

or

correctly calculated

substitution, ie or

provided no subsequent step shown

2

[5]

Q6.

(a) (i) 24

allow 1 mark for converting time to 600 seconds

or showing method ie 14400/10

or

provided no further steps shown

2

(ii) 24

ignore any unit

or

their (a)(i)

1

(b) (i) 20 45

both required – either order

1

(ii) the block transfers energy to the surroundings

1

[5]

Q7.

(a) (i) 720

allow 1 mark for correct substitution,

ie 72 × 10 provided no subsequent step shown

2

(ii) 720

or

their (a)(i)

1

(b) (i) gravitational potential

allow gravitational

allow potential

1

(ii) 432

allow 1 mark for correct substitution, ie provided no subsequent step shown

2

watt / W

1

[7]

Q8.

(a) 1 080 000

allow 1 mark for correct substitution

ie ½ × 15 000 × 12 × 12

2

(b) any one from:

• KE (of wind) more than doubles

• mass of air (hitting blades) more than doubles

• area swept out by blades more than doubles

do not accept blades are larger / have a bigger area

• area swept out by blades increases × 4

1

[3]