**Mark schemes**

Q1.

(a) current that is always in the same direction

1

(b) total resistance = 30 (Ω)

1

V = 0.4 × 30

1

12 (V)

1

allow 12 (V) with no working shown for 3 marks

an answer of 8 (V) or 4 (V) gains 2 marks only

(c) P = 0.4 × 12 = 4.8

1

5 (W)

1

allow 5 (W) with no working shown for 2 marks

allow 4.8 (W) with no working shown for 1 mark

[6]

Q2.

(a) he may receive an electric shock

or

he may be electrocuted

1

if he touches the live wire

1

(b) 10 690 = I × 230

1

I = 10 690 / 230

1

46.478(260) (A)

1

46

1

allow 46 (A) with no working shown for 4 marks

(c) cost is higher

1

more energy is used (per second)

1

[8]

Q3.

(a) (because the) potential of the live wire is 230 V

1

(and the) potential of the electrician is 0 V

1

(so there is a) large potential difference between live wire and electrician

1

charge / current passes through his body

allow voltage for potential difference

1

(b) diameter between 3.50 and 3.55 (mm)

allow correct use of value of cross-sectional area of 9.5 to 9.9 (mm2) with no final answer given for 1 mark

2

(c) 18000 = I × 300

1

I = 18000 / 300 = 60

1

13 800 = (602) × R

1

R = 13 800 / 602

1

3.83 (Ω)

1

allow 3.83(Ω) with no working shown for 5 marks

answer may also be correctly calculated using P = IV and V = IR if 230 V is used.

[11]

Q4.

(a) any one from:

• high cost of installing overhead power lines or underground cables or pylons

• high cost as (very) long cables needed

• amount of electricity required is too low

allow not enough (surplus) electricity would be generated

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a 'best-fit' approach to the marking.

Level 3 (5 – 6 marks):

clear comparison of advantages and disadvantages of each method

Level 2 (3 – 4 marks):

at least one advantage and one disadvantage is stated for one method and a different advantage or disadvantage is stated for the other method

Level 1 (1 – 2 marks):

at least one advantage or one disadvantage of either method

Level 0 (0 marks):

No relevant information

examples of physics points made in the response

Advantages of both methods:

• both renewable sources of energy

• both have no fuel (cost)

• both have very small (allow 'no') running costs

• no carbon dioxide produced

accept carbon neutral

accept no greenhouse gases

accept doesn't contribute to global warming

Advantages of wind:

• higher average power output

produces more energy is insufficient

Advantages of hydroelectric:

• constant / reliable power (output)

• lower (installation) cost

Disadvantages of wind:

• higher (installation) cost

• variable / unreliable power output

• (may) kill birds / bats

Disadvantages of hydroelectric:

• lower power output

• (may) kill fish or (may) damage habitats

• more difficult to set up (within river)

Disadvantages of both methods:

• (may be) noisy

• visual pollution

ignore payback time unless no other relevant points made

ignore time to build for both

6

[7]

Q5.

(a) 4

1

(b) (i) 2

allow 1 mark for correct substitution ie

provided no subsequent step

2

(ii) 5

allow 1 mark for correct substitution ie

provided no subsequent step

2

[5]

Q6.

(a) field

correct order only

1

current

1

force

accept motion

accept thrust

1

(b) (i) arrow pointing vertically downwards

1

(ii) increase current / p.d.

accept voltage for p.d.

1

increase strength of magnetic field

accept move poles closer together

1

(iii) reverse (poles of) magnets

1

reverse battery / current

1

(c) (i) 1.5 or 150%

efficiency = 120 / 80 (× 100)

gains 1 mark

an answer of 1.5 % or 150

gains 1 mark

2

(ii) efficiency greater than 100%

or

output is greater than input

or

output should be 40 (W)

1

(iii) recorded time much shorter than actual time

accept timer started too late

accept timer stopped too soon

1

[12]

Q7.

(a) increases

accept reaches highest value

do not accept increases and decreases

1

(b) (i) increases

1

(ii) increases

1

(c) 18

allow 1 mark for correct substitution i.e. 12 × 1.5 provided no subsequent step

2

watt

accept W

answer may be indicated in the list

1

[6]

Q8.

(a) (i) 1.7

1

(ii) 51

or

30 × their (i) correctly calculated

allow 1 mark for correct substitution i.e. 1.7

or their (i)

2

coulomb / C

do not accept c

1

(iii) 612

or

their (ii) × 12 correctly calculated

or

their (i) × 360 correctly calculated

allow 1 mark for correct substitution i.e. E = 12 × 51

or 12 × their (ii)

or their (i) × 360

2

(b) ions vibrate faster

or

ions vibrate with a bigger amplitude

accept atoms for ions throughout

accept ions gain energy

accept ions vibrate more

ions start to vibrate is insufficient

1

electrons collide more (frequently) with the ions

or

(drift) velocity of electrons decreases

electrons start to collide is insufficient

there are more collisions is insufficient, unless both electrons and ions are implied

1

[8]

Q9.

(a) decreased

correct order only

1

decreased

1

increased

1

(b) (i) A

reason only scores if A chosen

1

uses least / less energy (in 1 year)

a comparison is required

accept uses least power

accept uses least kWh

1

(ii) greater the volume the greater the energy it uses (in 1 year)

1

(iii) a very small number sampled

accept only tested 3

accept insufficient evidence / data

allow not all fridges have the same efficiency or a correct description implying different efficiencies

only tested each fridge once is insufficient

there are lots of different makes is insufficient

1

[7]

Q10.

(a) advantage

any one from:

• produce no / little greenhouse gases / carbon dioxide

allow produces no / little polluting gases

allow doesn’t contribute to global warming / climate change

allow produce no acid rain / sulphur dioxide

reference to atmospheric pollution is insufficient

produce no harmful gases is insufficient

• high(er) energy density in fuel

accept one nuclear power station produces as much power as several gas power stations

nuclear power stations can supply a lot of or more energy is insufficient

• long(er) operating life

allow saves using reserves of fossil fuels or gas

1

disadvantage

any one from:

• produce (long term) radioactive waste

accept waste is toxic

accept nuclear for radioactive

• accidents at nuclear power stations may have far reaching or long term consequences

• high(er) decommissioning costs

accept high(er) building costs

• long(er) start up time

1

(b) (i) 12 000 (kWh)

allow 1 mark for correct substitution eg

2000 × 6

or

2 000 000 × 6

or

an answer of 12 000 000 scores 1 mark

2

(ii) any idea of unreliability, eg

• wind is unreliable

reference to weather alone is insufficient

• shut down if wind too strong / weak

• wind is variable

1

(c) any one from:

• cannot be seen

• no hazard to (low flying) aircraft / helicopters

• unlikely to be or not damaged / affected by (severe) weather

unlikely to be damaged is insufficient

• (normally) no / reduced shock hazard

safer is insufficient

less maintenance is insufficient

installed in urban areas is insufficient

1

[6]

Q11.

(a) water moves (from a higher level to a lower level)

1

transferring GPE to KE

1

rotating a turbine to turn a generator

accept driving or turning or spinning for rotating

moving is insufficient

1

transferring KE to electrical energy

transferring GPE to electrical energy gains 1 mark of the 2 marks available for energy transfers

1

(b) (TVs in stand-by) use electricity

accept power / energy

1

generating electricity (from fossil fuels) produces CO2

accept greenhouse gas

accept sulfur dioxide

1

(CO2) contributes to global warming

accept climate change for global warming

accept greenhouse effect if CO2 given

accept acid rain if linked to sulfur dioxide

1

(c) a factor other than scientific is given, eg economic, political or legal

personal choice is insufficient

1

[8]

Q12.

(a) air near freezer compartment is cooled or loses energy

accept air at the top is cold

1

cool air is (more) dense or particles close(r) together (than warmer air)

do not allow the particles get smaller / condense

1

so (cooler) air falls

1

air (at bottom) is displaced / moves upwards / rises

do not allow heat rises

accept warm air (at the bottom) rises

1

(b) if volume is doubled, energy use is not doubled

or

volume ÷ energy not a constant ratio

1

correct reference to data, eg 500 is 2×250 but 630 not 2×300

1

(c) accept suitable examples, eg

advantage:

• reduces emissions into atmosphere

• lower input power or uses less energy or wastes less energy

• costs less to run

cost of buying or installing new fridge is insufficient

ignore reference to size of fridge

1

disadvantage:

• land fill

• energy waste in production

• cost or difficulty of disposal

• transport costs

1

[8]

Q13.

(a) (i) 5.88 (watts)

an answer of 5.9 scores 2 marks

allow 1 mark for correct substitution ie

0.42 =

allow 1 mark for an answer of 0.0588 or 0.059

2

(ii) 8.12

allow 14 – their (a)(i) correctly calculated

1

(b) (i) input power / energy would be (much) less (reducing cost of running)

accept the converse

electricity is insufficient

1

(also) produce less waste energy / power

accept ‘heat’ for waste energy

1

(as the waste energy / power) increases temperature of the cabinet

1

so cooler on for less time

1

(ii) line graph

need to get both parts correct

accept scattergram or scatter graph

both variables are continuous

allow the data is continuous

1

(c) number of bulbs used-halogen=24 (LED=1)

1

total cost of LED = £30 + £67.20 = £97.20

accept a comparison of buying costs of halogen £36 and LED £30

1

total cost of halogen= 24 x £1.50 + 24 x £16.00 = £420

or

buying cost of halogen is £36 and operating cost is £384

accept a comparison of operating costs of halogen £384 and LED £67.20

allow for 3 marks the difference in total cost is £322.80 if the number 24 has not been credited

1

statement based on correct calculations that overall LED is cheaper

must be both buying and operating costs

an alternative way of answering is in terms of cost per hour:

buying cost per hour for LED = 0.0625p/£0.000625

buying cost per hour for halogen = = 0.075p/£0.00075

a calculation of both buying costs scores 1 mark

operating cost per hour for LED = = 0.14p/£0.0014

operating cost per hour for halogen= = 0.8p/£0.008

a calculation of both operating costs scores 1 mark

all calculations show a correct unit

all units correct scores 1 mark

statement based on correct calculations of both buying and operating costs, that overall LED is cheaper

correct statement scores 1 mark

1

[12]

Q14.

(a) water heated by radiation (from the Sun)

accept IR / energy for radiation

1

water used to heat buildings / provide hot water

allow for 1 mark heat from the Sun heats water if no other marks given

references to photovoltaic cells / electricity scores 0 marks

1

(b) 2 (minutes)

1.4 × 103 =

gains 1 mark

calculation of time of 120 (seconds) scores 2 marks

3

(c) (i) 150 (kWh)

1

(ii) £60(.00) or 6000 (p)

an answer of £6000 gains 1 mark

allow 1 mark for 150 × 0.4(0) 150 × 40

allow ecf from (c)(i)

2

(iii) 25 (years)

an answer of 6000 / 240

or

6000 / their (c)(ii) × 4

gains 2 marks

an answer of 6000 / 60

or

6000 / their (c)(ii) gains 1 mark, ignore any other multiplier of (c)(ii)

3

(iv) any one from:

• will get £240 per year

accept value consistent with calculated value in (c)(iii)

• amount of light is constant throughout the year

• price per unit stays the same

• condition of cells does not deteriorate

1

(d) any one from:

• angle of tilt of cells

• cloud cover

• season / shade by trees

• amount of dirt

1

[13]

Q15.

(a) (i) temperature (increase) and time switched on are directly proportional

accept the idea of equal increases in time giving equal increases in temperature

answers such as:

• as time increases, temperature increases

• positive correlation

• linear relationship

• temperature and time are proportional

score 1 mark

2

(ii) any one from:

“it” refers to the metal block

• energy transfer (from the block) to the surroundings

accept lost for transfer

accept air for surroundings

• (some) energy used to warm the heater / thermometer (itself)

accept takes time for heater to warm up

• (metal) block is not insulated

1

(iii) 15 000

allow 1 mark for correct substitution, ie 50 × 300 provided no subsequent step shown

2

(b) lead

reason only scores if lead is chosen

1

needs least energy to raise temperature by 1°C

accept needs less energy to heat it (by the same amount)

lowest specific heat capacity is insufficient

1

[7]

Q16.

(a) (i) to obtain a range of p.d. values

accept increase / decrease current / p.d. / voltage / resistance

accept to change / control the current / p.d. / voltage / resistance

to provide resistance is insufficient

a variable resistor is insufficient

do not accept electricity for current

1

(ii) temperature of the bulb increases

accept bulb gets hot(ter)

accept answers correctly

expressed in terms of collisions between (free) electrons and ions / atoms

bulb gets brighter is insufficient

1

(iii) 36

allow 1 mark for correct substitution, ie 12 × 3 provided no subsequent step shown

2

watt(s) / W

accept joules per second / J/s

do not accept w

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a ‘best-fit’ approach to the marking.

0 marks

No relevant content.

Level 1 (1-2 marks)

There is a basic comparison of either a cost aspect or an energy efficiency aspect.

Level 2 (3-4 marks)

There is a clear comparison of either the cost aspect or energy efficiency aspect

OR

a basic comparison of both cost and energy efficiency aspects.

Level 3 (5-6 marks)

There is a detailed comparison of both the cost aspect and the energy efficiency aspect.

For full marks the comparisons made should support a conclusion as to which type of bulb is preferable.

Examples of the points made in the response:

cost

• halogen are cheaper to buy

simply giving cost figures is insufficient

• 6 halogen lamps cost the same as one LED

• LEDs last longer

• need to buy 18 / more halogen lamps to last the same time as one LED

• 18 halogens cost £35.10

• costs more to run a halogen than LED

• LED has lower maintenance cost (where many used, eg large departmental store lighting)

energy efficiency

• LED works using a smaller current

• LED wastes less energy

• LEDs are more efficient

• LED is 22% more energy efficient

• LED produces less heat

• LED requires smaller input (power) for same output (power)

6

[11]

Q17.

(a) iron

1

hairdryer

1

kettle

1

answers can be in any order

(b) (i) Y

1

(ii) bar drawn with any height greater than Y

ignore width of bar

1

(c) (bigger volume) takes more time (to boil)

accept explanation using data from graph

1

(so) more energy transferred

do not accept electricity for energy

1

(and) this costs more money

ignore reference to cost of water

wasting more money because heating more water than needed is insufficient

1

[8]

Q18.

(a) £16.50

allow 1 mark for correct substitution ie 110 × 15

an answer of 1650 gains both marks

an answer of 43.80 gains both marks

allow 1 mark for 292 × 15

2

(b) 292

allow 1 mark for correctly using the reading 53490

ie 53782 – 53490

accept £43.80 for both marks

2

[4]

Q19.

(a) (i) kinetic

do not accept movement

1

(ii) thermal sound

accept heat for thermal

do not accept noise for sound

both answers required in either order

1

(b) transferred to surroundings / surrounding molecules / atmosphere

‘it escapes’ is insufficient

or

becomes dissipated / spread out

accept warms the surroundings

accept degraded / diluted

accept a correct description for surroundings eg to the washing machine

do not accept transformed into heat on its own

1

(c) (i) 3 (.0 p)

allow 1 mark for correct substitution of correct values ie 0.2 x 15

allow 1 mark for calculating cost at 40°C (16.5p)

or

cost at 30°C (13.5p)

2

(ii) any two from:

• less electricity needed

ignore answers in terms of the washing machine releasing less energy

an answer in terms of the washing machine releasing CO2 negates mark

do not accept less energy is produced

• fewer power stations needed

• less fuel is burned

accept a correctly named fuel

do not accept less fuel is needed

2

[7]

Q20.

(a) (i) conduction

1

convection

1

correct order only

(ii) to keep the ceramic bricks hot for a longer time

1

(b) (i) E = P × t

18.2

allow 1 mark for correct substitution ie 2.6 × 7 provided that no subsequent step is shown

2

(ii) 91 (p)

or their (b)(i) × 5 correctly calculated

accept £0.91

do not accept 0.91 without £ sign

1

(c) E = m × c × θ

2 250 000

allow 1 mark for correct substitution ie 120 × 750 × 25 provided that no subsequent step is shown

answers 2250 kJ or 2.25 MJ gain both marks

2

[8]

Q21.

(a) E = P × t

91 (p)

an answer £0.91 gains 3 marks

an answer 0.91 gains 2 marks

allow 2 marks for energy transferred = 18.2 (kWh)

or

substitution into 2 equations combined, ie 2.6 × 7 × 5

allow 1 mark for correct substitution into E = P × t, ie E = 2.6 × 7

or

allow 1 mark for multiplying and correctly calculating an incorrect energy transfer value by 5

3

(b) answers should be in terms of supply exceeding demand

accept there is a surplus / excess of electricity (at night)

1

(c) reduce (rate of) energy transfer (from ceramic bricks)

accept heat for energy

do not accept no energy / heat escapes

do not accept answers in terms of lost / losing heat if this implies heat is wasted energy

1

so keeping the (ceramic) bricks hot for longer

accept increase time that energy is transferred to the room

accept keep room warm for longer

or

to stop the casing getting too hot

accept so you do not get burnt (on the casing)

1

(d) E = m × c × θ

120

allow 1 mark for correct substitution

ie 9 000 000 = m × 750 × 100

2

[8]

Q22.

(a) (i)

1.6 (W)

allow 1 mark for correct substitution ie

2

(ii)

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]

Q23.

(a) (i) TV

1

(ii) hairdryer and sandwich toaster

both required either order but no others

1

(b) (i) 1.2

allow 1 mark for correct substitution

ie 0.4 × 3 provided that no subsequent step is shown

2

(ii) 18

accept £0.18 for both marks

or

their (b)(i) × 15 correctly calculated

an answer 0.18 scores 1 mark

allow 1 mark for correct substitution

ie 1.2 or their (b)(i) × 15 provided that no subsequent step is shown

2

[6]

Q24.

(a) (i) food processor

hairdryer

both required and no other

either order

1

(ii) TV

Table lamp

Food processor

all required and no other

any order

1

(b) any two from:

• transfers / requires / uses more energy / power

accept more electricity used

accept higher power

• more electricity needs to be generated

• more (fossil) fuels (likely) to be burnt

accept a named fossil fuel

2

(c) (i) precise

this answer only

1

(ii) any three from:

• can look for trends / patterns

• help reduce energy use / consumption

• reduce bills

accept save money

• identify appliances which use a lot of energy

• replace appliances with more efficient ones

• see effect of leaving appliances on (standby)

to monitor usage is insufficient

answers in terms of environment are insufficient

3

[8]

Q25.

(a) fan

1

drill

1

washing machine

four circled including correct three scores 1 mark

five circled scores zero

1

(b) Appliances only transfer part of the energy usefully

1

The energy transferred by appliances makes the surroundings warmer

1

[5]

Q26.

(a) (i) A

1

(ii) bar drawn with correct height

ignore width of bar

1

(b) (i) E = P × t

2.4

allow 1 mark for correct substitution

ie 1.2 × 2

provided no subsequent step shown

2

(ii) 36 or their (b)(i) × 15 correctly calculated

or

their (b)(i) × 0.15 correctly calculated with an answer given in £

allow 1 mark for correct substitution

ie 2.4 × 15

or

their (b)(i) × 15

allow 1 mark for correct substitution

provided no subsequent step shown

an answer £0.36 gains both marks

2

[6]

Q27.

(a) electric current

(rate of) flow of (electric) charge / electrons

accept

with Q and t correctly named

1

potential difference

work done / energy transferred per coulomb of charge

(that passes between two points in a circuit)

accept

with W and Q correctly named

1

(b) metals contain free electrons (and ions)

accept mobile for free

1

as temperature of filament increases ions vibrate faster /

with a bigger amplitude

accept atoms for ions

accept ions/atoms gain energy

accept vibrate more for vibrate faster

do not accept start to vibrate

1

electrons collide more (frequently) with the ions

or

(drift) velocity of electrons decreases

do not accept start to collide

accept increasing the p.d. increases the temperature (1 mark)

and

(and) resistance increases with temperature (1 mark) if no other marks scored

1

(c) 7.8

allow 1 mark for obtaining value 1.3 from graph

or allow 1 mark for a correct calculation using an incorrect current in the range 1.2-1.6 inclusive

2

[7]

Q28.

Fan C

1

Kettle B

1

Lamp D

1

Radio E

1

[4]

Q29.

(a) (i) 7.6

allow 1 mark for correct substitution and / or transformation

ie

95 × 8.0

2

(ii) 25 (hours)

allow 1 mark for obtaining number of kWh = 200

an answer of 26(.3) gains both marks

2

(b) any two from

• transferred to the surroundings / air / atmosphere

• becomes spread out

• shared between (many) molecules

• (wasted as) heat / sound

2

[6]

Q30.

(a) radio

radio must be chosen for reason to score

1

gives out sound

inclusion of other forms of energy negates mark

or

others give out heat / thermal energy

1

(b) Kettle

accept 2.5 (kW)

1

(c) 60 (p)

accept £0.6(0)

allow 1 mark for correct substitution ie 4 × 15

substitution only scores if no subsequent step shown

£60 scores 1 mark

2

(d) (bigger volume) takes more time (to boil)

accept explanation using data from graph

1

(so) more energy transferred

do not accept electricity for energy

1

(and) this costs more money

ignore references to cost of water

1

[8]

Q31.

(a) transferred to surroundings / surrounding molecules / atmosphere

‘it escapes’ is insufficient

or

becomes dissipated / spread out

accept warms the surroundings

accept degraded / diluted

accept a correct description for

surroundings eg to the washing machine

do not accept transformed into heat on its own

1

(b) a smaller proportion / percentage of the energy supplied is wasted

owtte

accept a statement such as ‘less energy is wasted’ for 1 mark

do not accept costs less to run

ignore references to uses less energy

2

(c) (i) 2.4 (p)

accept 2 p if it is clear from the working out this is rounded from 2.4 p

allow 1 mark for correct substitution of correct values

ie 0.2 × 12

allow 1 mark for calculating cost at 40 °C (13.2 p)

or

cost at 30 °C (10.8 p)

2

(ii) any one from:

• less electricity needed

ignore answers in terms of the washing machine releasing less energy

an answer in terms of the washing machine releasing CO2 negates the mark

do not accept less energy is produced

• fewer power stations needed

• less fuel is burned

accept a correctly named fuel

do not accept less fuel is needed

1

[6]

Q32.

(a) each hair gains the same (type of) charge

or

(each) hair is negatively charged

do not accept hair becomes positively charged

or

(each) hair gains electrons

1

similar charges repel

accept positive charges repel

providing first marking point is in terms of positive charge

or

negative charges repel

or

electrons repel

1

(b) 0.000002

accept correct substitution and transformation for 1 mark

or

2 × 10-6

ie 30 / 15 or .03 / 15000 or 30 / 15000 or .03 / 15

or

2 μ C

answers 2 and 0.002 gain 1 mark

2

(c) current

do not accept amp / amperes

1

[5]

Q33.

(a) (i) 2(.0)

accept 2000 W or 2000 watt(s)

accept answer given in table

do not accept 2000

1

(ii) 4.5

allow 1 mark for correct substitution

ie 1.5 × 3

allow 1 mark for the answers 1.5 or 6(.0)

2

(iii) 54

or

their (a)(ii) × 12 correctly calculated

allow 1 mark for correct substitution

ie 4.5 × 12

or

their (a)(ii) × 12

allow 1 mark if correct answer is given in pounds eg £54

2

(b) (i) 6 pm

1

temperature starts to rise faster

only scores if 6 pm given

or

graph (line) is steeper / steepest

it refers to graph gradient or temperature

accept answers in terms of relative temperature rise

eg 5 to 6 pm 2 °C rise, 6 to 7 pm 6 °C rise

accept temperature rises sharply / rapidly / quickly

do not accept temperature starts to rise

1

(ii) middle box ticked

1

[8]

Q34.

(a) 32,400,00 J

allow 1 mark for correct substitution

3.24 × 10^7 J

2

(b) (3kW) fan heater

accept 3kW

accept the middle one

1

(c)

features common to more than one heater, treat as neutral

oil-filled

low level heat

cannot be knocked over / space saving / no trailing wires

do not accept just wall-mounted

or more control over heat output

do not accept just 3 heat settings

1

fan

warms (office) rapidly or can be used to cool air (in summer)

accept can be used as a fan

accept cool air fan (setting)

accept ‘it has a cool air setting in case it gets too hot’

do not accept a specific reference to cooling the heater

1

ceramic

can be switched on for set periods of time

do not accept just has a timer

or can be switched on before office is used / switched off automatically at night

1

[6]

Q35.

(a) electrical

1

sound

correct order only

1

(b) the energy transformed by the TV will be destroyed

1

(c) a higher efficiency than

1

[4]

Q36.

(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]

Q37.

(a) (i) 0.6

accept 60 %

allow 1 mark for useful energy = 480

answer 0.6 with any unit or 60 gains 1 mark only

2

(ii) transferred to surroundings

accept goes into the air

accept heats the surroundings up

accept gets spread out

accept transferred into heat (only)

do not accept wasted / lost unless qualified

destroyed negates mark

transferred into light / sound negates mark

1

(b) (i) 1.75

allow 1 mark for converting to kW

answers of 0.7, 0.525, 0.35, 0.875, 1.05, 5.25 gains 1 mark

answers of 1750 or 17.5 gains 1 mark

2

(ii) 21p or £0.21 or their (b)(i) × 12

1

(c) any two from:

• (more) electricity needs to be generated

(more) electricity is being used

• (more) power stations needed

• (more) fossil fuels burnt

accept named fossil fuel

• (more) pollutant gases emitted

accept named gas

accept harmful for pollutant

accept greenhouse gases

accept atmospheric pollution

accept answer in terms of any form of electricity generation and an associated environmental problem

2

[8]

Q38.

(a) electric drill C

1

MP3 player E

1

toaster B

1

(b) (i) 2100

no unit required / ignore units

accept 2.1 kW must have units for this

1

(ii) Y

1

(iii) bar drawn with any height greater than Y

ignore width of bar

1

(c) (i) any one from:

answers must be a comparison

• holds more water

do not accept 1 litre of water on its own

• works in other countries

accept a named country

accept works at 2 voltages

• boils faster

• has a more powerful element

do not accept 1 kW element on its own

• can filter water

1

ignore can wash filter

(ii) any one from:

• it weighs less

• smaller to pack

• cheaper to use

answers must be a comparison

or state why the chosen feature is an advantage

accept boils enough for one drink

1

[8]

Q39.

(a) £15

allow 1 mark for use of 125 (kWh)

allow 1 mark for an answer 1500

allow both marks for 1500 pence / p

allow 1 mark for correct calculation of annual cost for either freezer (£27 and £42)

2

(b) £45

or their (a) × 3

allow 1 mark for correct use of 3

allow 1 mark for 12 – 9 = 3

2

(c) any two from:

the marks are for the explanation

yes plus explanation

• less electricity / energy needed / used

accept less energy wasted

• less (fossil) fuels burned

accept a named fossil fuel

do not accept conserving (fossil) fuels

• less polluting gases emitted

accept a named polluting gas / greenhouse gases / carbon emissions / reduce global warming

accept an answer in terms of nuclear fuel

eg less nuclear fuel required (1)

less nuclear waste (1)

2

or no plus explanation

• old freezer must be disposed of

• hazardous chemicals inside freezer

accept CFC gases

• (lot of) energy used in producing new freezer

[6]

Q40.

(a) iron

1

hairdryer

1

kettle

answers can be in any order

1

(b) sound

1

(c) is more efficient than

1

[5]

Q41.

(a) £19.20

allow 1 mark for correct substitution

ie 160 × 12

allow 1 mark for an answer (£)1920

an answer of 1920p gains both marks

an answer of £40.80 gains both marks

allow 1 mark for 340 × 12

2

(b) 340

allow 1 mark for correctly using the reading 62580

ie 62920 − 62580

accept £40.80 for both marks

2

[4]

Q42.

(a) kinetic

accept movement

1

(b) (i) 3 (kWh)

allow 1 mark for selecting the correct information

1

(ii) transfers more energy

accept transform or use for transfer

accept electricity for energy

allow higher (average) power and switched on for more time

2

(iii) any one from:

• use the internet

• brochures

• reading adverts

• visiting shops

• recommendation from friends / plumbers

1

[5]

Q43.

(a) (i) heat

1

(ii) temperature increases or (cause) convection (currents)

accept gets warmer

accept gets hotter

1

(iii) 60% or 0.6

60 without % scores 1 mark

0.6 with a unit scores 1 mark

60 with incorrect unit scores

1 mark

or correct substitution

for 1 mark

2

(b) street

1

more (energy transferred as) light or less (energy transferred as) heat or useful

energy output the highest

can only score this mark if first mark scored

all efficiencies calculated correctly score 2nd mark point

1

[6]

Q44.

(a) each correct line scores 1 mark

if more than 3 lines are drawn mark incorrect ones first, to a maximum of 3 lines

3

(b) toaster

accept 1.2 kW

1

(c) (i) 400

1

(ii) £24 or 2400p

full credit for their (c)(i) × 6p for full credit the correct numerical answer must have the correct unit

an answer of 24 or 2400 with no unit or the incorrect unit scores 1 mark

(c)(i) × 6 incorrectly evaluated scores 1 mark

2

(d) 6

allow 6000 for 1 mark

allow 3 × 2 for 1 mark

2

[9]

Q45.

(a) (i) electrons

1

(ii) ammeter

do not accept ampmeter

1

must be capital A

horizontal lines not required no e.c.f.

1

(b) light bulb

answers in either order

1

hairdryer

1

[5]

Q46.

(a) (i) any one from:

water to the mug

water to the air

mug to the air

mug to the table

both required

direction of transfer must be correct

1

(ii) when temperatures are the same

accept a specific example eg when the temperature of the water and mug are the same

accept radiant heat transfer will never stop

1

(b) wood

1

(c) (i) conduction

accept convection if not given as 3rd answer

1

insulator

1

(ii) any one from:

do not accept any rebuilding of house

double glazing

loft insulation

accept roof for loft

1

carpets

(cavity) wall insulation

do not accept closing doors and windows

draft excluders

foil behind radiators

accept blocking chimney

paint inside walls white

[6]

Q47.

(a) Sun

Any valid

for 1 mark each

2

(b) From electric/pe or chemical in battery

for 1 mark

to ke, light, sound, heat

3 for 1 mark each

4

(c) Gravitational pe OR just pe

For any gravity feed

OR Elastic pe

any valid

OR Food

For maintaining body/life etc.

OR Any descriptive answer

e.g. water in a high lake used to produce hydroelectric power

2 for 1 mark each

2

[8]

Q48.

(a) (i) …….. light …… electrical

2

for 1 mark each

(ii) …….. electrical……chemical

for 1 mark each

2

(iii) …….. electrical ….. kinetic

for 1 mark each

2

(b) (i) 1500 / 10

gains 1 mark

1

but

150

gains 2 marks

1

(ii) heat (thermal) or sound

for 1 mark

1

[9]

Q49.

(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]

Q50.

(a) changes the sound wave(s)

to a varying or changing (electric) potential difference or p.d. or voltage

or current or to an irregular alternating current or a.c. or transfers

sound energy to electrical energy (1) mark is vibrations or pulses or of

sound or in air become electrical waves

do not credit just ‘to electricity’ or ‘to a.c’

2

(b) (i) decrease or reduce the amplitude

accept less amplitude nothing else added

1

(ii) increase the frequency or decrease

wavelength

accept higher frequency nothing else added

1

[4]