Mark schemes

Q1.

(a) elastic potential (energy)

allow E_e / EPE

1

(b) $E_e = 0.5 \times 735 \times 8.0^2$

allow a correct substitution using
k = 1470 (N/m) and e = 8 (m)
or
k = 1470 (N/m) and e = 16 (m)
or
k = 735 (N/m) and e = 16 (m)

1

E_e = 23 520 (J)

this answer only

1

total E_e = 47 040 (J)

this answer only

1

47 040 = 240 × 9.8 × *h*

allow a correct substitution of their calculated value of E_e (using $E_e = 0.5ke^2$)

1

$$h = \frac{47\,040}{(240 \times 9.8)}$$

allow a correct rearrangement using their calculated value of E_e (using $E_e = 0.5ke^2$)

1

h = 20 (m)

allow an answer consistent with their value of E_e (using $E_e = 0.5ke^2$)

1

(c) air resistance (opposes the motion of the pod upwards)

1

(so) not all of the elastic potential energy will be transferred to gravitational potential energy

allow the energy transfer is not 100% efficient
allow some energy is transferred to the surroundings
allow some energy is dissipated
ignore energy is wasted
ignore reference to mass of person in pod

1

[9]

Q2.

(a) in the summer the power output from the hydroelectric generator is lower but the solar power output would be greater

*allow power output of hydroelectric generator depends on rainfall **and** power output of solar power system depends on light intensity*

1

so less variation in total power output (which improves the reliability of the supply)

allow electricity supply for total power output

1

allow reference to specific months eg April to September

[2]

Q3.

(a) independent variable: (type of) insulation / material

do not accept thickness of material

1

dependent variable: time

1

(b) 0.1 (ºC)

1

(c) viewing angle affects measurement
or
parallax error

allow judgement needed in reading the position (of the liquid in the thermometer)

allow the level of the liquid may be between lines

allow number of lines may be miscounted

ignore harder to read

ignore lines are close together

ignore human error

1

(d) E = 10 500(J)

1

$$m = \frac{10\,500}{4200 \times (85\text{-}65)}$$

*allow a correct substitution **and** rearrangement using an incorrectly / not converted value of E*

1

m = 0.125 (kg)

allow a correct calculation using an incorrectly / not converted value of E

1

(e) (same) temperature decrease in a shorter time
means a higher thermal conductivity

allow converse answer

1

(because) the rate of energy transfer is higher

1

[9]

Q4.

(a) h = 1.75 (m)

1

E_p = 60 × 9.8 × 1.75

allow a correct substitution using an incorrectly / not converted value of h

1

E_p = 1029 (J)

allow a correct calculation using an incorrectly / not converted value of h

1

$$P = \frac{1029}{1.40}$$

allow a correct substitution using their calculated value of E_p

1

P = 735 (W)

allow an answer consistent with their value for E_p

1

(b) girl increases her kinetic energy (as well as increasing her gravitational potential energy)

1

some energy is wasted in her muscles
or
some energy transferred as thermal energy (to surroundings)

allow some energy transferred due to air resistance
ignore unqualified references to friction
ignore references to sound

1

(c) the boy's mass was greater than the girl's mass

1

[8]