

Work Done

Q1.(2018)

D ✓

Q2.(2018)

C ✓

Q3.a(2018)

Any two from

- Electronic balance/ measuring cylinder ✓
- Thermometer ✓
- Stopwatch /timer ✓
- Joulemeter / Wattmeter ✓
- Voltmeter ✓
- Ammeter ✓

2

Q3.b(2018)

By insulating beaker / adding a lid ✓

1

3.3b

ALLOW a named insulation
ALLOW Wrap in foil

Q3.c(2018)

heater only heats water / all water heated / hot water rises
/less energy transferred/lost (to surroundings) ✓

1

3.3b

ALLOW to obtain accurate results
DO NOT ALLOW heats water from top down to bottom

Q3.d(2018)

Any **two** from

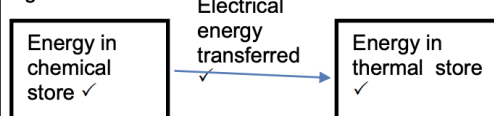
- Chemical energy (in battery store) ✓
- Transferred by Electrical energy (in wires) ✓
- Transferred to Thermal/heat energy store / in (warm) water/heater/beaker ✓
- Idea of conservation of energy ✓

2

2 × 2.1

ALLOW marks to be obtained on diagram

Eg.



ALLOW for 2 marks

Amount of energy gained by thermal store =
amount of energy lost by chemical store ✓✓

Q3.e(2018)

FIRST CHECK THE ANSWER ON ANSWER LINE**If answer = 34.2 (W) award 2 marks****2**

$$P = 3.8 \times 9.0 \checkmark$$

$$P = 34.2 \text{ (W)} \checkmark$$

Q3.f(2018)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 6300 (J) award 3 marks or 6 300 000 (J) award 2 marks**3**

Convert 150 g to 0.15 kg ✓

$$E = 0.15 \times 4200 \times 10 \checkmark$$

$$E = 6300 \text{ (J)} \checkmark$$

ALLOW ecf in conversion

e.g. 150g to 1.5kg X

$$1.5 \times 4200 \times 10 \checkmark \text{ ecf}$$

1.2
2.1
2.1 $E = 63000 \checkmark$ two marks awarded **when working shown**

(63000 on its own scores 0)

ALLOW No conversion

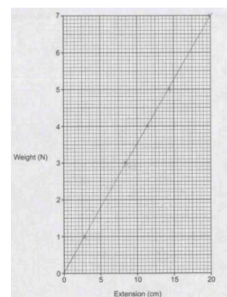
$$E = 150 \times 4200 \times 10 \checkmark$$

$$E = 6\,300\,000 \text{ (J)} \checkmark \checkmark$$
 two marks awarded

Q4.a(2018)

All 5 points correctly plotted to within $\pm \frac{1}{2}$ a square ✓**1****2.2**

Ignore line but if line covering plotting assumes plots are under the line



plots are:

Weight of cube (N)	Extension of spring (cm)
1.0	2.9
3.0	8.4
4.0	11.4
5.0	14.4
7.0	20.0

IGNORE extra marks and dots on the grid as they may be from answering the next question

Q4.b(2018)

	3	Question asks candidates to show that the spring constant is 35 N/m so DO NOT credit an answer of 35 with no workings												
$F = k \times e$ OR $k = F \div e$ OR k is the slope or gradient ✓	1.2	ALLOW evidence of gradient on graph												
Correct numbers from table or graph to calculate k ✓	2.1	Examples of correct numbers: $3.5 \div 10$ ✓✓ $7 \div 20$ ✓✓ any pair of numbers from the table <table><tr><th>Weight of cube (N)</th><th>Extension of spring (cm)</th></tr><tr><td>1.0</td><td>2.9</td></tr><tr><td>3.0</td><td>8.4</td></tr><tr><td>4.0</td><td>11.4</td></tr><tr><td>5.0</td><td>14.4</td></tr><tr><td>7.0</td><td>20.0</td></tr></table>	Weight of cube (N)	Extension of spring (cm)	1.0	2.9	3.0	8.4	4.0	11.4	5.0	14.4	7.0	20.0
Weight of cube (N)	Extension of spring (cm)													
1.0	2.9													
3.0	8.4													
4.0	11.4													
5.0	14.4													
7.0	20.0													
Correct conversion from cm to m (to give k) ✓	2.1	Examples of correct conversion: $3.5 \div 0.1$ ✓✓✓ $7 \div 0.2$ ✓✓✓ ALLOW correct calculation using proportion Correct numbers from table and calculates extension per N e.g. $20 \div 7 = 2.857$ (cm/N) ✓ Understanding of k = force to give one metre extension ✓ Calculate force needed for extension of 100cm $100 \div 2.857 = 35$ ✓✓✓ or $2.857 \times 35 = 100$ ✓✓✓												

Q4.c(2018)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 0.7 (J) award 2 marks

$$E = 0.5 \times 35 \times 0.2^2 \quad \checkmark$$

$$E = 0.7 \text{ (J)} \quad \checkmark$$

2

2 × 2.1

ALLOW 7000 (J) ✓

Q5.(2019)

A ✓

Q6.(2020)

D

Q7.a(2020)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 2 (°C / min) award 3 marks

$$10 \quad \checkmark$$

$$10 / 5 \quad \checkmark$$

$$= 2 \text{ (°C / min)} \quad \checkmark$$

3

2.2
2.2
2.2

ALLOW 60/5 for 1 mark

Q7.b(2020)

(As time increases), temperature decreases / ORA ✓	2	3.1a	ALLOW examples e.g. (in the first minute) it goes down (from 70°C to 67°C) ALLOW inverse relationship IGNORE negative correlation
Decrease in temperature rapid at start / temperature decreases at a decreasing rate / ORA ✓		3.1a	ALLOW value for temperature getting smaller as time increases ALLOW not linear / not proportional / change is less gradual / (change) slower at end / ORA ALLOW comparison of two data points

Q7.c(2020)

FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 8000 (J) award 3 marks	3		
0.2 × 4200 × 10 ✓ 8400 (J) ✓ = 8000 (J) (1sf) ✓		2.1 2.1 1.2	ECF from 11(a) for temperature change ALLOW answer of = 1680 (J) for 1 mark ALLOW answer of = 2000 (J) for 2 marks ALLOW correct sf from candidate's calculation

Q7.d(2020)

Thermal/energy/heat <u>store</u> (in water) decreases / AW ✓	2	1.1	
Thermal/energy/heat <u>store</u> in surrounding/air increases / AW ✓		1.1	ALLOW energy is transferred from the thermal/energy/heat <u>store</u> (of the water) to the surroundings for 2 marks

Q7.e(2020)

Any line with a smaller gradient than the line on the graph ending at a temperature between 61 °C and 69 °C ✓	1	3.2a	DO NOT ALLOW horizontal line at 70 °C
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Q7.f(2020)

Increase thickness of the beaker or insulation / decrease thermal conductivity of the beaker or insulation / put the insulation on the top of the beaker / use a lid / put insulation under the beaker / AW ✓	1	1.1	ALLOW increase the temperature of the room / keep the room temperature the same as the water IGNORE reduce the temperature of the water / put in the sun / use a (hot) water bath
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Q8.(2021)

D

Q9.(2021)

C

Q10.(2021)

C

Q11.(2021)

Gravitational/Thermal
Kinetic/Thermal
Thermal

3	3 × 2.1	All 3 correct ✓✓✓ Any 2 correct ✓✓ Any 1 correct ✓
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Q12.a(2021)

Thermometer ✓

Q12.b(2021)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 5000 (J) award 2 marks

$$E = 0.5 \times 500 \times 20 \checkmark$$

$$E = 5000 \text{ (J)} \checkmark$$

Q13.(2022)

D ✓

Q14.a(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 0.75 (J) award 3 marks

Potential energy = mass x gravitational field strength x height ✓

$$(\text{Potential energy} =) 0.05 \times 10 \times 1.5 \checkmark$$

$$(\text{Potential energy} =) 0.75 \text{ (J)} \checkmark$$

3		ALLOW 0.8 J for 3 marks
	1 x 1.2	
	2 x 2.1	
		ALLOW for 1 mark 0.5 x 1.5 x 10 (=7.5) 0.05 x 15 x 10 (= 7.5)

Q14.b(2022)

Kinetic ✓

Q14.c(2022)

Thermal ✓

2

2 × 2.1

In floor / surroundings ✓

ALLOW air/atmosphere

Q14.d(2022)

0.63 (s) ✓

Q14.e(2022)

Egg breaks /AW ✓

2

2 × 2.2

ALLOW Hits the floor**And any one from:**

(large) force from floor on egg ✓

Deceleration/negative acceleration of egg (when hits floor) ✓

Large change in speed ✓

ALLOW completely losing speed
IGNORE just losing speed

Egg takes a small time to stop ✓

ALLOW stops quickly

Q14.f(2022)

FIRST CHECK THE ANSWER ON ANSWER LINE**If answer = 0.4 (J) award 2 marks**(Kinetic energy =) $0.5 \times 0.05 \times 4^2$ ✓

(Kinetic energy =) 0.4 (J) ✓

Q15.a(2022)

(Mistake – measure volume / use a balance)

Correction – measure mass / find mass / calculate mass ✓

3

3 × 1.2

ALLOW mistakes in any order**ALLOW** corrections written on the mistake lines

Note this mark is for the correction (no mark for the mistake)

IGNORE use a measuring cylinder

Mistake – (only) measure starting temperature / (only) measure one temperature ✓

Correction – measure final temperature / measure temperature change / calculate temperature change ✓

IGNORE add a lid

Q15.b(2022)

Any one from:

Take repeat readings (and average) ✓

Add a lid / cover the top ✓

Stir the water ✓

Include the specific heat capacity of the saucepan in the calculation ✓

Use a digital thermometer ✓

1

3.3b

IGNORE in a closed system / same size saucepan

Q15.c(2022)

Any three from:

Correct symbol for resistor (heater) ✓

Voltmeter to measure pd or voltmeter in parallel with heater ✓

Ammeter to measure current or ammeter in series with heater ✓

(Stopwatch) to measure time / use a set amount of time e.g. 10 minutes ✓

Any one from:

Power = potential difference x current ✓

Energy = power x time ✓

Charge = current x time ✓

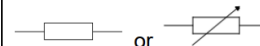
Energy = charge x potential difference ✓

Power = (current)² x resistance ✓

4

3 × 3.3a
1.2

ALLOW variable resistor symbol, so symbols



ALLOW voltmeter to measure voltage
IGNORE voltmeter to measure volts

IGNORE ammeter to measure amps

ALLOW (stopwatch) to measure a unit of time e.g., minutes or seconds

ALLOW voltage or pd for potential difference

ALLOW voltage or pd for potential difference

ALLOW energy = potential difference x current x time

ALLOW symbol equation

Q16.(2023)

C

Q17.(2023)

First check the answer on answer line
If answer = 55 000 (J) award 2 marks

(Kinetic energy =) $0.5 \times 1100 \times 10^2$ ✓

(Kinetic energy =) 55 000 (J) ✓

Q18.(2024)

A

Q19.(2024)

A

Q20.(2024)

D

Q21.(2024)

D