National 5 Physics
Properties of Matter
Check Test 1: Solutions

1. B
2. D
3. E
4. C
5. C
6. B
7. D
8. A
9. E
10. B

11. (a) $E = Pt$ (1)

$= 400 \times 90$ (1)

$= 3.6 \times 10^4$ J (1)

(b) $E_h = cm\Delta T$ (1)

$(3.6 \times 10^4) = c \times 2.0 \times (58 - 22)$ (1)

$c = 500 \text{ J kg}^{-1} \text{ °C}^{-1}$ (1)

(c) (i) To prevent heat from being lost to the surroundings. (1)

(ii) The value obtained for c will be higher. (1)

In practice, more heat energy will need to be supplied to change the temperature of the metal by the same amount (and c α E_h). (1)

12. Answers may include:

- Water is a liquid; copper is a solid.
- Both substances have different initial temperatures, but will reach a common final temperature (thermal equilibrium).
- The final temperature will depend on the mass of each substance, the specific heat capacity of each substance and the heat energy supplied to both.
- Mass is the amount of matter that makes up an object, measured in kilograms (kg).
- Specific heat capacity is the amount of heat energy required to change the temperature of 1 kg of a substance by 1 ˚C, measured in joules per kilogram per degrees Celsius (J kg^{-1} ˚C^{-1}).
- Heat energy is a specific type of energy measured in joules (J).
- Relevant equation: $\Delta T = \frac{E_h}{cm}$ with quantities and units labelled.
- Any other suitable response. (3)

13. (a) $E = Pt$ (1)

$= 15 \times (10 \times 60)$ (1)

$= 9000\ J$

(b) (i) (The block with the greatest c will have the lowest ΔT)

Block X (1)

(ii) $E_h = cm\Delta T$ (1)

$9000 = c \times 1.0 \times (25 - 15)$ (1)

$c = 900\ J\ kg^{-1}\ °C^{-1}$ (1)

(c) (i) Insulate the metal block.

OR

Switch the heater on for a shorter time.

OR

Any other suitable response. (1)

(ii) Final temperature would increase/be greater (if c(i) mentions insulating).

OR

Final temperature would decrease/be lower (if c(i) mentions shorter time). (1)