Unit 11 · Quantity of Heat

WORKSHEET

Full marks 32

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 32

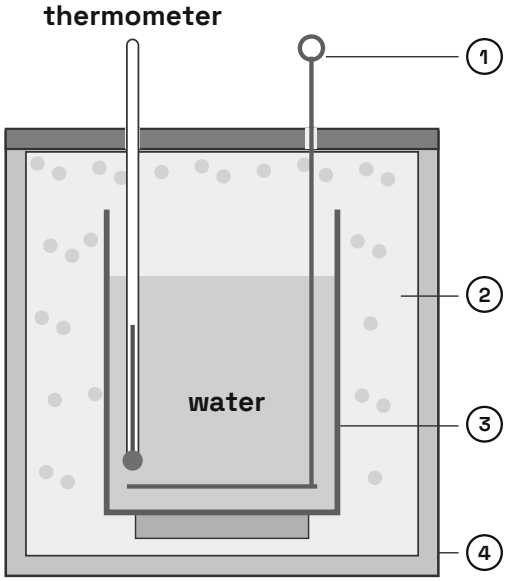
1 Key words [4]

Match each term in Column A with its meaning in Column B. One meaning in Column B is not needed. Each carries 0.5 mark.

Column A		Column B
1. heat capacity	☐	**a.** the heat needed to raise 1 kg of a substance by 1 K
2. specific heat capacity	☐	**b.** melting under pressure and freezing again when the pressure is removed
3. calorimetry	☐	**c.** heat that changes the phase without changing the temperature
4. latent heat	☐	**d.** the steady temperature at which a solid turns into a liquid
5. evaporation	☐	**e.** the heat needed to raise a whole body's temperature by 1 K
6. regelation	☐	**f.** the one temperature and pressure at which ice, water and vapour exist together
7. triple point	☐	**g.** the measurement of quantities of heat
8. melting point	☐	**h.** the heat flowing through a unit area each second
		i. the change from liquid to vapour at the surface, at any temperature

2 Label the diagram [2]

The diagram shows a calorimeter set up for the method of mixtures. Write the part that belongs in place of 1 to 4. Each carries 0.5 mark.



1. _____ **2.** _____

3. _____ **4.** _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. The SI unit of specific heat capacity is: [1]

a. J/K **b.** J/(kg K)

c. J/kg **d.** W/(m K)

ii. The heat capacity of a 2.0 kg iron pot (s = 470 J/(kg K)) is: [1]

a. 235 J/K **b.** 470 J/K

c. 940 J/K **d.** 2350 J/K

iii. While ice is melting, the heat it takes in: [1]

a. raises its temperature

b. increases the potential energy of its molecules, not their kinetic energy

c. is lost to the surroundings

d. increases the kinetic energy of its molecules

iv. Food cooks faster in a pressure cooker because: [1]

a. the pressure itself cooks the food

b. the higher pressure raises the boiling point of water

c. steam has a higher specific heat capacity than water

d. the water boils at a lower temperature

v. Which is true of evaporation, but not of boiling? **[1]**

a. it happens throughout the liquid

b. it happens only at one fixed temperature for a given pressure

c. it happens at any temperature, from the surface only

d. it needs no latent heat

4 Short answers [7]

Write short answers to the following questions.

a. Why is water used as the coolant in car engines and in hot-water bags? **[2]**

b. Water kept in a clay pot (a gagri or matka) stays cooler than water in a steel pot on a hot day. Why? **[2]**

c. An aluminium kettle of mass 0.50 kg holds 2.0 kg of water at 20 °C. How much heat is needed to bring the kettle and the water to 100 °C? (s of water = 4200 J/(kg K), of aluminium = 910 J/(kg K)) **[3]**

5 Long answer [4]

Write a long answer to the following question.

Describe how the specific heat capacity of a metal is found by the method of mixtures. Write the equation used.

6 Numerical problems [7]

Solve the following problems. Show your working. Specific heat capacity of water 4200 J/(kg K); latent heat of fusion of ice 3.36×10^5 J/kg; latent heat of vaporization of water 2.26×10^6 J/kg.

a. Sunita drops 50 g of ice at 0 °C into 250 g of water at 30 °C in an insulated jug. Show that all the ice melts, and find the final temperature. (Ignore the jug.) **[4]**

Answer: _____

b. Steam at 100 °C is bubbled into 1.0 kg of water at 20 °C until the water reaches 80 °C. What mass of steam condenses? **[3]**

Answer: _____

7 Think [3]

High in the Himalaya water boils well below 100 °C, and rice takes far longer to cook. A trekker turns the stove up as high as it goes. Does that help? Explain.

_____

_____

_____

_____

_____

8 Activity: A cooling curve

(not marked)

Pour hot water (about 80 °C) into a cup and put a thermometer in it. Read the temperature every minute for 15 minutes, stirring gently. Note the room temperature.

Time (min)	0	1	2	3	5	7	10	15
Temperature (°C)								
Excess over the room (°C)								

When does the water cool fastest? How does that fit Newton's law of cooling?