Unit 12 · Heat

WORKSHEET

Full marks 50

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 50

1 Key words [4]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

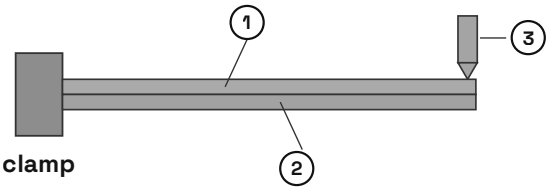
anomalous	bimetallic	boiling	cubical	evaporation	fusion	heat equation	latent	superficial	volatile

The change of a liquid into its vapor from its surface, at any temperature below its boiling point, is called _____. Liquids such as spirit and petrol, which evaporate quickly, are called _____ liquids. The increase in the area of a solid on heating is _____ expansion, and the increase in the volume of a substance is _____ expansion. Two different metals joined along their length make a _____ strip. The heat taken in or given out during a change of state, at a constant temperature, is called _____ heat. The heat needed to melt 1 kg of a solid at its melting point is its specific latent heat of _____. "Heat lost by the hot body = heat gained by the cold body" is the _____.

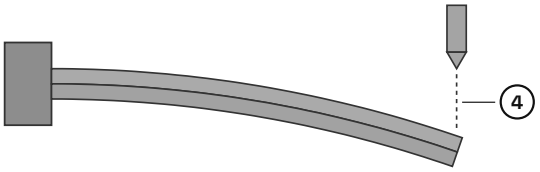
2 Label the diagram [2]

The diagram shows a bimetallic strip used as a switch. Write the word that belongs in place of each number. Each carries 0.5 mark.

Cold: straight, circuit closed



Hot: bends away, circuit broken



Brass expands more, so it ends up on the outside.

1. _____ **2.** _____

3. _____ **4.** _____

3 True or false [3]

Write ✓ for a true statement and ✗ for a false one. Each carries 0.5 mark.

i. Evaporation produces cold, which flows into the surroundings. ☐

ii. Heated at a steady pressure, a gas expands more than a liquid, and a liquid more than a solid. ☐

iii. When a metal plate with a hole in it is heated, the hole gets smaller. ☐

iv. A liquid can have only cubical expansion. ☐

v. The molecules of water at 0 °C have more kinetic energy than those of ice at 0 °C. ☐

vi. While water boils, its temperature stays at the boiling point however strongly it is heated. ☐

4 Multiple choice [5]

Choose the correct option for each of the following questions.

i. Which of these does **not** increase the rate of evaporation of water? [1]

a. warming the water
b. a breeze over its surface
c. humid air above it
d. pouring it into a wide dish

ii. The SI unit of specific latent heat is: [1]

a. J/(kg °C)
b. J/kg
c. J °C
d. kg/J

iii. When a bimetallic strip of brass and iron is heated, it bends because: [1]

a. iron expands more than brass
b. brass expands more than iron
c. both metals contract
d. the rivets expand

iv. How much heat is needed to boil away 0.5 kg of water already at 100 °C? ($L = 2{,}260{,}000$ J/kg) [1]

a. 4,520,000 J
b. 1,130,000 J
c. 210,000 J
d. 226,000 J

v. Why is the latent heat of vaporization of water much larger than its latent heat of fusion? [1]

a. water boils at a higher temperature than ice melts
b. steam is heavier than water
c. in boiling, each molecule must break completely free of its neighbors and push back the air
d. boiling happens more slowly than melting

5 Very short answers [3]

Write very short answers to the following questions.

a. What is the latent heat of fusion of ice used in Nepal's exams? [1]

b. Why is a tight metal lid easier to take off a jar after hot water is run over it? [1]

c. How many joules does a 1,000 W heater give in 168 s, if no heat is lost? **[1]**

6 Short answers **[8]**

Write short answers to the following questions.

a. Give a reason: ice at 0 °C cools a drink better than the same mass of water at 0 °C. **[2]**

b. Give a reason: a burn from steam at 100 °C is more severe than one from boiling water at 100 °C. **[2]**

c. Give a reason: electric wires are hung with some sag between the poles. **[2]**

d. Write any two differences between evaporation and boiling. **[2]**

7 Long answers **[8]**

Write long answers to the following questions.

a. What is evaporation? Explain, using the kinetic theory of matter, why evaporation causes cooling. **[4]**

b. Define latent heat. Explain, using the kinetic molecular theory, why the temperature of melting ice stays at 0 °C while it is heated. **[4]**

8 Numerical problems **[14]**

Solve the following problems. Show your working. Take s of water = 4,200 J/(kg °C), L of fusion of ice = 336,000 J/kg and L of vaporization of water = 2,260,000 J/kg.

a. How much heat does it take to turn 100 g of water at 20 °C into steam at 100 °C? (s of water = 4,200 J/(kg °C); L = 2,260,000 J/kg) **[3]**

Answer:

b. Find the heat needed to change 1 kg of ice at −10 °C into steam at 100 °C. What share of it is used in boiling? **[4]**

Answer:

c. Rizwan adds 40 g of ice at 0 °C to 200 g of water at 25 °C. Find the final temperature, assuming all the ice melts and no heat is lost. **[4]**

Answer:

d. How much steam at 100 °C must be passed into 500 g of water at 20 °C to warm it to 80 °C? **[3]**

Answer: _____

9 Think **[3]**

50 g of ice at 0 °C cools 250 g of juice at 30 °C to about 11.7 °C. Find the final temperature if 50 g of water at 0 °C is used instead, and explain the difference.

10 Activity: Which dries first? (not marked)

Soak five pieces of the same cotton cloth and wring each out the same way. Hang them as below, feel each every 15 minutes, and fill in the table.

Piece	How it is left	Time to dry	Factor it shows
A	spread out, in the sun		
B	folded in four, in the sun		
C	spread out, in still shade		
D	spread out, in shade, in a breeze		
E	crumpled in a bowl		