Chapter 1·2 Solutions

Answer 1

(3 marks)

When you walk across a bridge you sometimes see expansion joints. These are gaps between the different parts of the bridge. On hot, sunny days these gaps are narrower than on cold winter days. Use your understanding of the kinetic theory to explain why this is so.

Description	Marks
The reason objects expand is as they heat up the atoms having more kinetic energy and therefore vibrate more and take up more space.	1–2
When a solid is heated (particularly a metal) it increases in size	1
Total	**3**

Answer 2

(3 marks)

Answer **TRUE** or **FALSE** to each of the following.

You place a mercury thermometer and an alcohol thermometer into the same beaker of warm liquid at the same time. When the mercury and alcohol bars reach steady points:

the mercury has the same temperature as the warm liquid.

the alcohol has the same temperature as the mercury.

the mercury and alcohol have both absorbed the same amount of heat from the warm liquid.

Description	Marks
True	1
True	1
False	1
	Total 3

Answer 3

(3 marks)

Each day, when Victoria gets home from work, she climbs the stairs to her second-floor apartment. On some days she walks up the stairs and on other days she runs up them.

Victoria's potential energy, kinetic energy and power output may change as she climbs the stairs. Assuming that Victoria's mass remains constant, and that she is halfway up the stairs:

her potential energy is (circle the correct response)

less for walking than for running	the same for walking and running	greater for walking than running

her kinetic energy is (circle the correct response)

less for walking than for running	the same for walking and running	greater for walking than running

her power output is (circle the correct response)

less for walking than for running	the same for walking and running	greater for walking than running

Description	Marks
Potential energy – same	1
Kinetic energy – less	1
Power output – less	1
Total	**3**

Answer 4

(4 marks

Using your understanding of the kinetic theory explain why the mass moved closer to the desk as the wire was heated.

Description	Marks
Kinetic theory states that particles in fixed positions and vibrate	1
Heat from candle caused particles to increase in vibration	1
Increased in vibration means they move further apart so wire expands	1
Wire expands and gets longer so mass closer to ground.	1
Total	**4**

Answer 5

(4 marks)

As a result of your studies of heat and temperature this year, state whether the following statements are True or False.

	Statement	True or False
A	Heat is best described as how hot an object is.	
B	Temperature is a measure of the total kinetic energy that an object contains.	
C	Objects can both gain and lose heat but the net heat transfer is from hotter objects to cooler objects.	
D	When a metal cube is heated without melting the kinetic energy of the particles increases.	

		Marks
A	F	1
B	F	1
C	T	1
D	T	1
Total		**4**

Answer 6

(5 marks)

The following graph shows the temperature change when 1.00 kg of water is heated in an insulated container by a 2.00 kW heater. The temperature change has not been recorded.

Using the information in the graph,

(a) determine the time interval, in seconds, between B and C; and (2 marks)

Description	Marks
Time taken from graph 20 - 1 = 19 minutes (19 ± 1)	1
19 × 60 = 1140 s (1080–1200)	1
Total	**2**

(b) use this time value to calculate the amount of energy supplied by the 2.00 kW heater in the time interval between B and C. Express your answer with appropriate units.
(3 marks)

Description	Marks
$W=P \times t$	1
$= 2000 \times 1140$ $= 2\ 280\ 000$ J or 2 280 kJ or 2.28 MJ (includes 1 mark for the unit)	1–2
Total	**3**

Answer 7

(4 marks)

Complete the following table by using the diagram(s) and your understanding of the concepts of thermal expansion and contraction to choose the best answer. Tick the appropriate column to indicate your answer to each question.

Question	Metal 1	Metal 2	neither
Which metal expands more when heated?	✓		
Which metal has particles with the greater average kinetic energy when in the "off" position?			✓
Which metal's particles have the least change in their average distance apart when cooled?		✓	
Which metal's particles have the least change in their average distance apart when heated?		✓	

Description	Marks
Metal 1	1
Neither	1
Metal 2	1
Metal 2	1
Total	**4**