KWAZULU-NATAL

DEPARTMENT OF EDUCATION

PHYSICAL SCIENCES

GRADE 10

TERM 1: HEATING AND COOLING CURVE

YEAR 2024

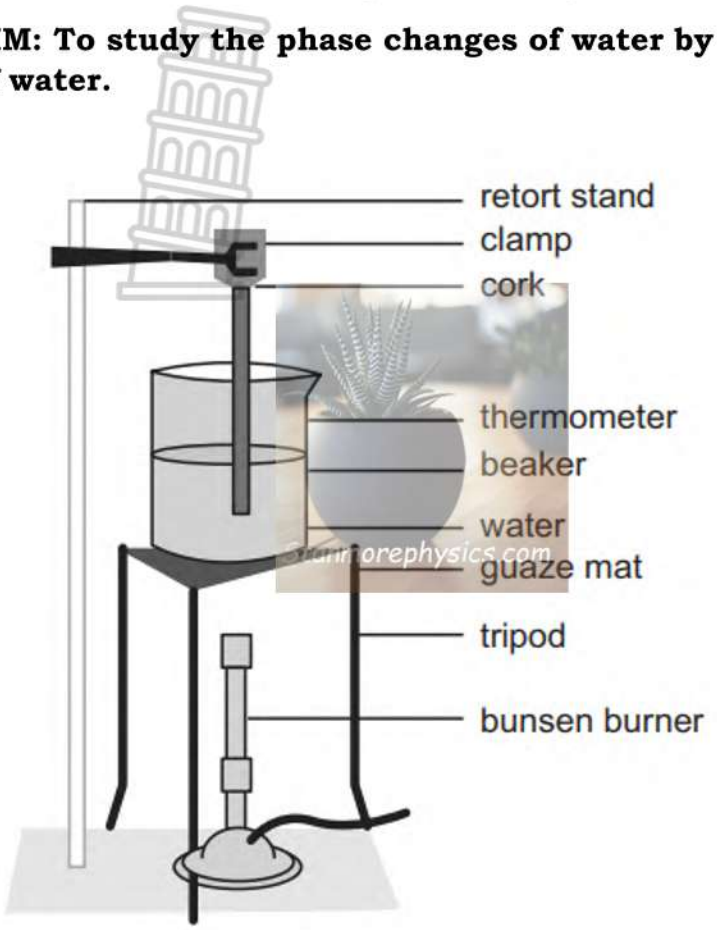
Mark Distribution		Date(s) Completed
PART A Practical Part	____/5	
PART B Experimental Write Up	____/25	
PART C Practical test	____/20	
Total Marks	____/50	

NAME OF LEARNER: _____

NAME OF SCHOOL: _____

EXPERIMENT 1: Heating and cooling curve of water.

AIM: To study the phase changes of water by plotting the heating and cooling curve of water.



BEAKER	CRUSHED ICE CUBES	THERMOMETER	BURNSON BURNER	TRIPPLE STAND	STOP WATCH

METHOD

1. Set up the apparatus as shown in the diagram
2. **Place** some ice in a beaker.
3. **Measure** the temperature of the ice and **record** it.
4. Use the Bunsen burner to **heat** the ice in a beaker until it boils.
5. **Measure** the temperature of the contents in the beaker on the 5 minutes interval. Use the table provided to **record** the temperature.
6. **Remove** water from the heat and **measure** the temperature on the 5 minutes interval, until the beaker is cool to touch. **Record** results on the table provided.

PART A: HANDLING OF THE APPARATUS MARKING TOOL:

Skills	1	2	3
	No Mark	1 Mark	2 Marks
Connecting the apparatus	The apparatus is set up incorrectly.	The setup of apparatus has been attempted, and is mostly correct- but there are mistakes which may cause errors in the readings taken.	The apparatus is set up correctly in all respects and reliable readings can be taken.
Data collection, recording and presentation	Data collected is inaccurate and there is no attempt to record data in appropriate format. Presentation is untidy.	Data is recorded in appropriate format but is insufficient / incorrect /inaccurate in some instances. Fairly neat presentation.	Data recorded **logical, sufficient and** recorded in **an appropriate format** (In table with correct headings, units). Well presented.
Observation of precautions	The learner works carelessly without any consideration of precautions/instructions.	The learner works with care and records readings carefully and as accurately as possible.	
Total			**[05]**

PART B

EXPERIMENTAL WRITE UP (TO BE DONE MOSTLY BY LEARNERS)

RESULTS:

1. **Record** your results in the following table:

TABLE 1: ICE BEING HEATED UNTIL WATER BOILS (5)

Time (minutes)	Temperature (°)	Phase water
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
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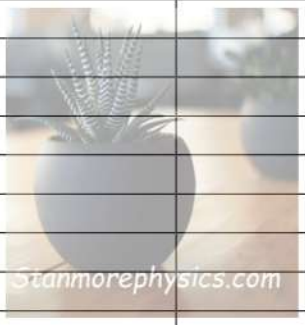


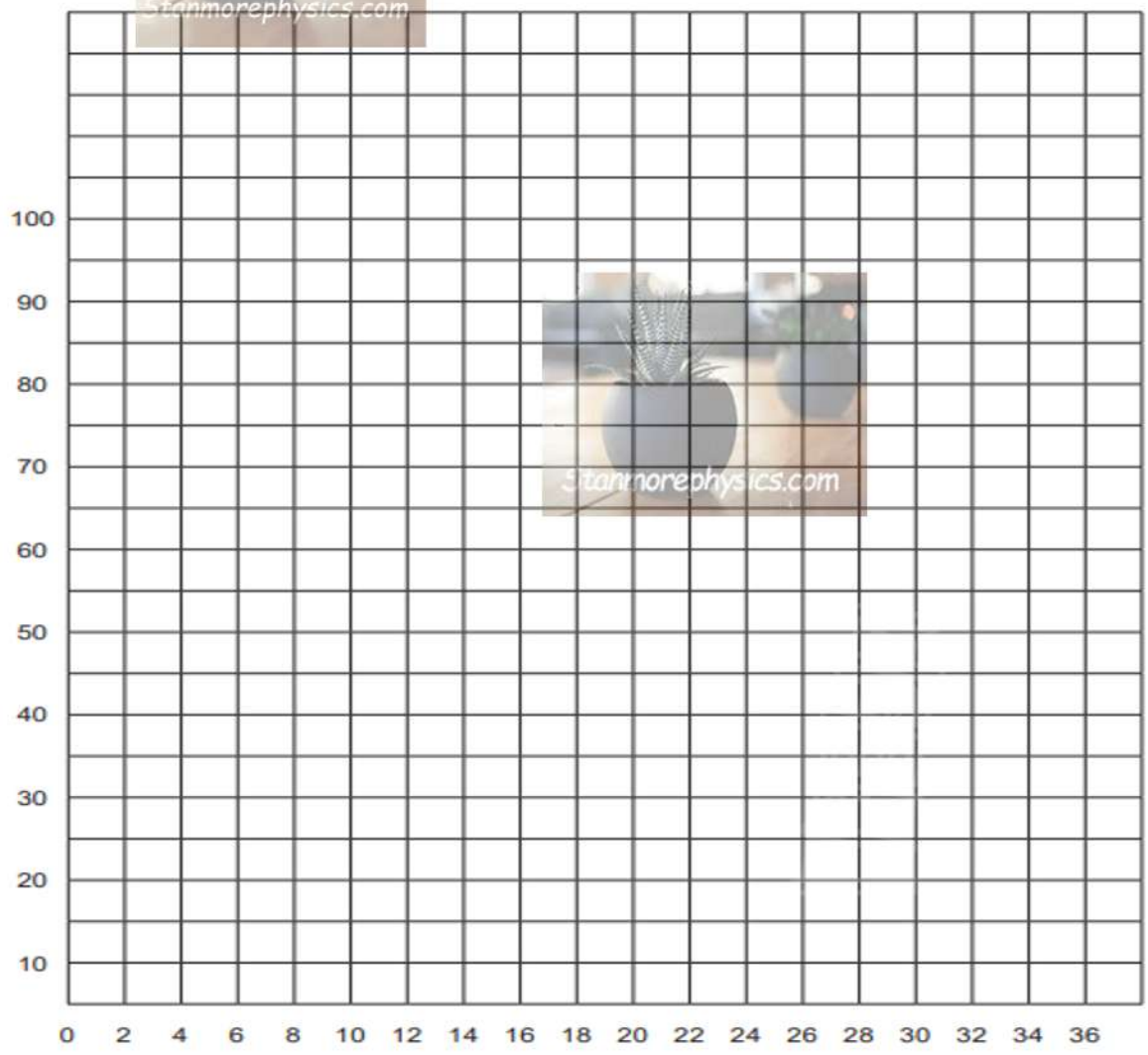
2. Predict the temperature of water if it continued to boil for another 3 minutes (1)

_____

3. TABLE 2: TIME AND TEMPERATURE FOR HOT WATER COOLING (3)

TIME (MINUTES)	TEMPERATURE (°C)
1	
2	
3	
4	
5	
6	
7	
8	

4. On the same piece of graph paper, plot two graphs of temperature against time as
   4.1 ice is heated to boiling point, and (7)
   4.2 hot water is cooled. (3)
   4.3 label each graph appropriately as " Heating curve" and "Cooling curve" (2)
   4.4 also write the phases of water on the heating curve. (1)

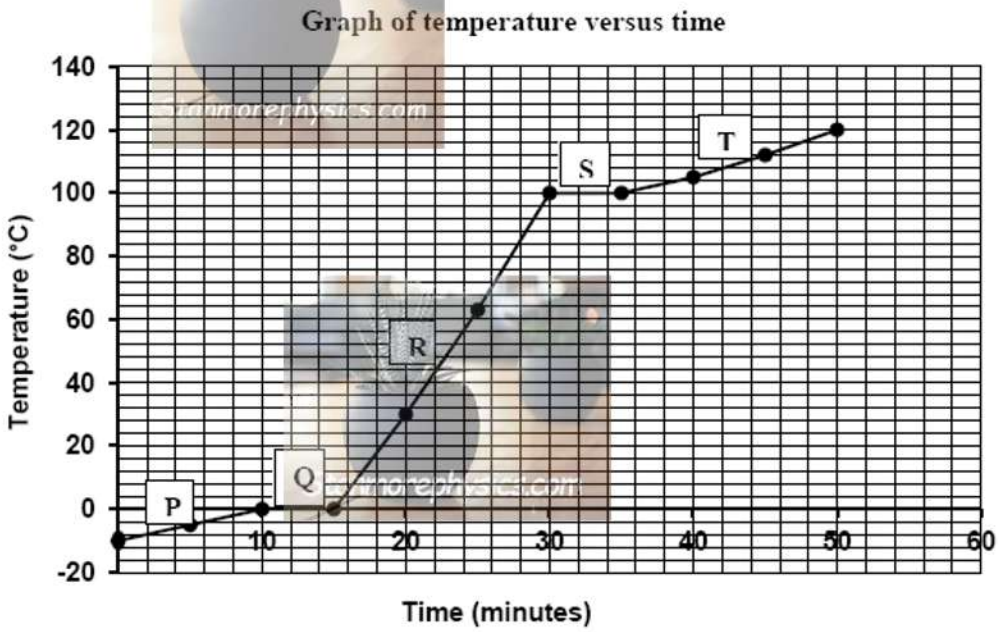


5. During which time intervals is the following happening?
   5.1 the ice is melting _____ (2)
   5.2 the water is boiling _____ (1)

PART C: KNOWLEDGE TEST

For the heating and cooling curve of water experiment:

1. What was the initial temperature of the ice before heating? (1)
2. Describe the phase changes at different temperatures observed during the experiment. (3)
3. Write down the chemical formula of:
   3.1 ice (1)
   3.2 liquid water (1)
   3.3 water vapour (1)
4. The learners obtained the following temperature versus time graph from their results.



Which segment in the graph represents each of the following? Write down **ONLY** the letter that represents the correct segment.

4.1 Where melting takes place ____ (1)

4.2 Where mainly the liquid phase is present ____ (1)

4.3 Where mainly the gas phase is present ____ (1)

4.4 Where boiling takes place ____ (1)

4.5 When a given quantity of water is heated at a constant rate, the phase change from liquid to gas takes longer than the phase change from solid to liquid. Provide a reason for this statement. (2)

4.6 Refer to the energy involved to give a reason why the temperature remains constant during the time of segment **S**. (2)

4.7 One of the apparatuses used during the experiment was the one on the right.

4.7.1 Give the reading as displayed on the apparatus. _____ (1)

4.7.2 A table below must be completed by giving either the function / the name of the apparatus.

	Apparatus/Equipment	Function / Use
4.7.2.1	_____	To take readings of temperature of water at different times
4.7.2.2	Glass Beaker	_____
4.7.2.3	_____	To provide heat to change the temperature of water
4.7.2.4	Stop watch	_____

(4)

[20]

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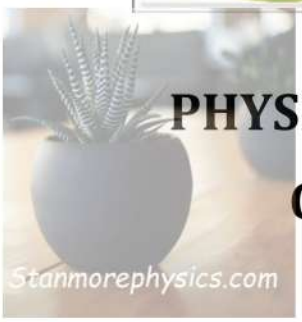

PHYSICAL SCIENCES

GRADE 10

TERM 1: HEATING & COOLING CURVE OF WATER

YEAR 2024

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Total Marks	**___/50**	

MARKING GUIDELINE

PART A: PLANNING OF THE APPARATUS GIVEN TO USE

Skills	**1**	**2**	**3**
	No Mark	1 Mark	2 Marks
Connecting the apparatus	The apparatus is set up incorrectly.	The setup of apparatus has been attempted, and is mostly correct- but there are mistakes which may cause errors in the readings taken.	The apparatus is set up correctly in all respects and reliable readings can be taken.
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Total			**[05]**

PART B

1. **Table 1B:** The temperature and phase of ice (water) (OR similar description of the contents of the table).✓

Time (minutes)	Temperature (°C)	Phase of water
0	0,0	solid
2	0,0	✓solid/liquid
4	2,5	liquid
6	8,0	liquid
8	10,0	liquid
10	18,0	liquid
12	31,0	liquid
14	42,0	liquid
16	52,0	liquid
18	63,5	liquid
20	74,0	liquid
22	83,5	liquid
24	89,0	liquid
26	93,5	liquid
28	94,5	liquid
30	96,0	✓ boiling water or steam
32	96,0	boiling water or steam
34	96,0	boiling water or steam

✓accurate (according to the video)
✓all results have same number of decimals (5)

2. Predict the temperature of the water if it continued to boil for another 3 minutes.
96 °C✓ (1)

3. Table 2 Time and temperature for hot water cooling.

(OR similar descriptive title for the table.) ✓

Time (minutes)	Temperature (°C)
0	45,5
1	35,0
2	29,0
3	25,0
4	22,0
5	19,0
6	17,0
7	15,5
8	14,5

✓accurate (according to the video)

✓all results have same number of decimals (3)

4. On the same piece of graph paper, plot two graphs of temperature against time as

4.1 ice is heated to boiling point, and (7)

4.2 hot water is cooled. (3)

4.3 Label each graph as "heating curve" and "cooling curve". (2)

4.4 Also write in the phases of water on the heating curve. (1)

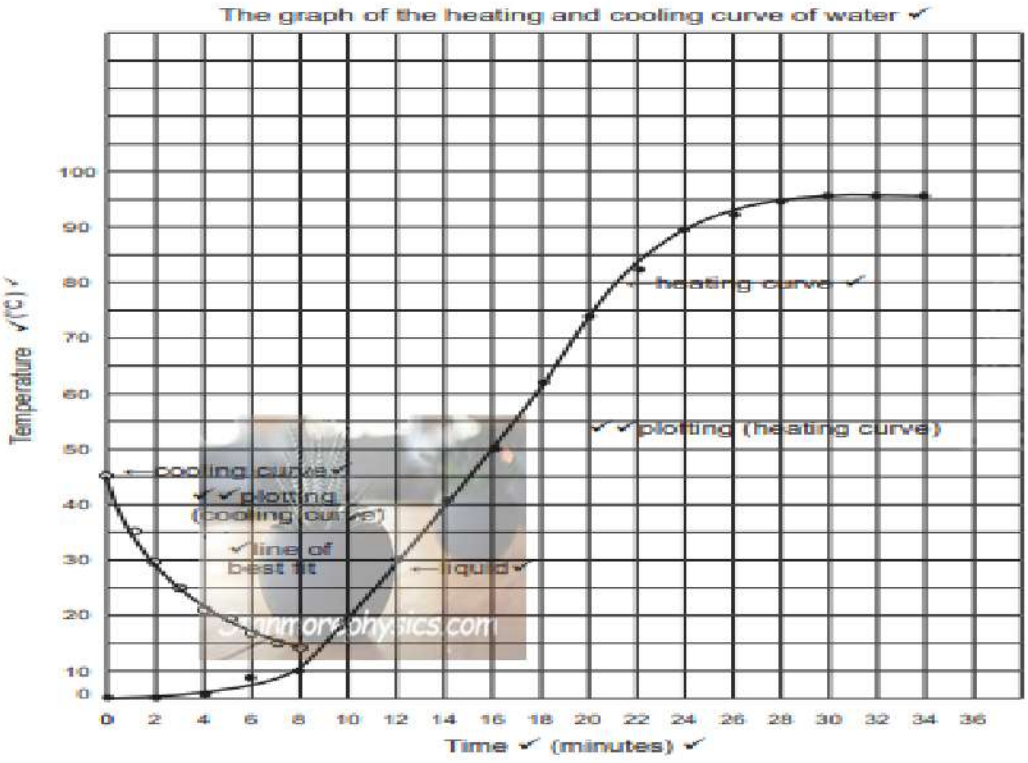
5. During which time interval is the following happening?

5.1 the ice is melting.

0 °C ✓ to 2 (or 3) °C ✓ (2)

5.2 the water is boiling.

30°C ✓ to 34°C ✓ (2)



PART C

1. 0^0C√ (1)

2. The phase changes:

Solid phase – ice, √ liquid phase water in liquid form, √ and gas phase steam and gas√

3.1 H_2O √

3.2 H_2O √

3. 3 H_2O √

4.1 BC √ (1)

4.2 CD√ (1)

4.3 EF√ (1)

4.4 DE√ (1)

4.5 Segment AB is smaller than segment DE√. This means that <u>more energy</u>√ is needed in DE to loosen bonds in a liquid to allow them to be further apart(to form a gas than needed in a solid to form a liquid. (2)

4.6 <u>Molecules escape from liquid phase</u>. √

<u>Molecules take energy from liquid</u> as they escape, preventing temperature from rising. √

Or All energy absorbed is used to break the bonds within a liquid to change it to a gas.

4.7	Model Response	Marks
4.7.1	74°C ▯ [accept anything within range 73°C to 75°C]	1
4.7.2.1	Thermometer ▯	1
4.7.2.2	Keep water for which temperature will be measured *Accept* 'keep the water' ▯	1
4.7.2.3	Bunsen burner ▯	
4.7.2.3	To measure time interval ▯	1

Z