Unit 2 NAME

Class Work 10/20/13

2.10 Performance Task

SPARK

Compare your homework with the person next to you!

Performance Assessment

- TASK: write an email to Marcus explaining whether or not he should get a refund.

Unit 2 NAME

Class Work 10/20/13

2.11 Heating for Phase Change

SPARK

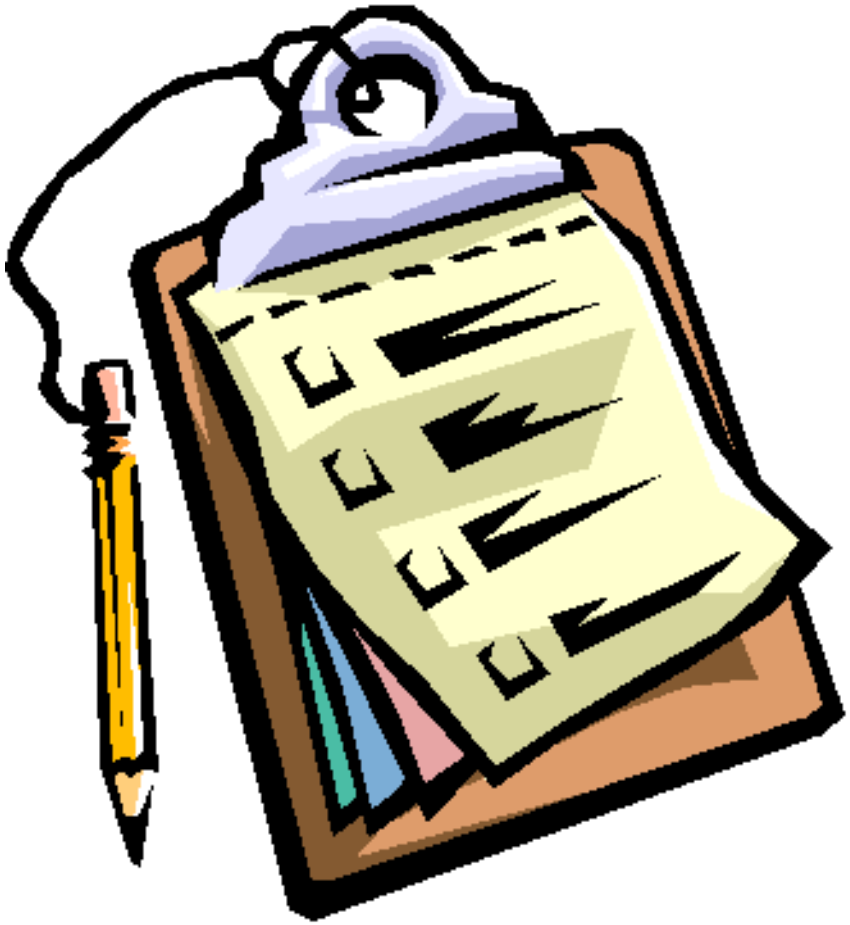
1. What element is a liquid at 305K?
    1. Magnesium
    2. Flourine
    3. Gallium
    4. Iodine

Objective

SWBAT calculate the amount of heat required for a substance to undergo a phase change.

Agenda:

- SPARK
- Objective
- Notes
- Practice
- Homework



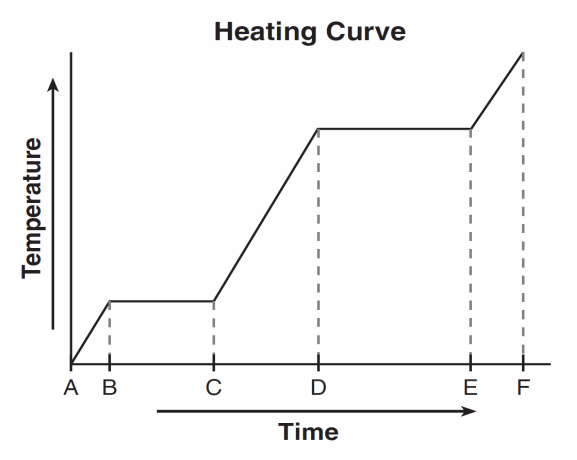
Review HW

Review of questions

10. Given the diagram representing a heating curve for a substance:

During which time interval is the average kinetic energy of the particles of the substance constant while the potential energy of the particles increases?

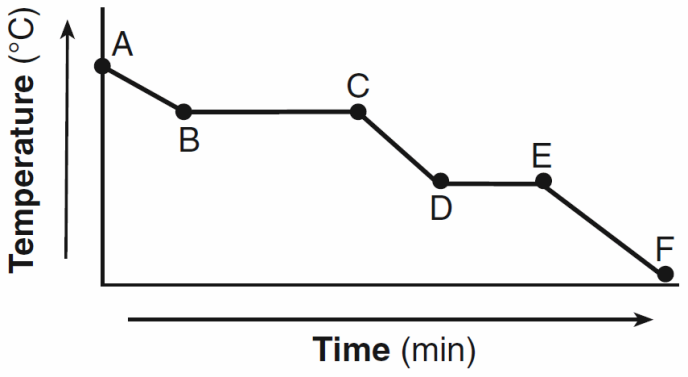
1) AC
2) BC
3) CD
4) DF



11. Given the cooling curve of a substance:

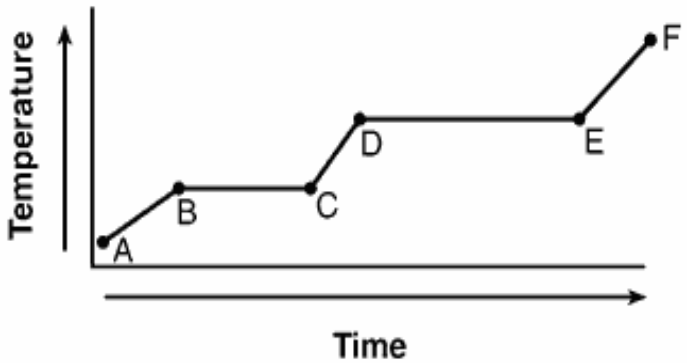
During which intervals is potential energy decreasing and average kinetic energy remaining constant

1) AB and BC
2) AB and CD
3) DE and BC
4) DE and EF

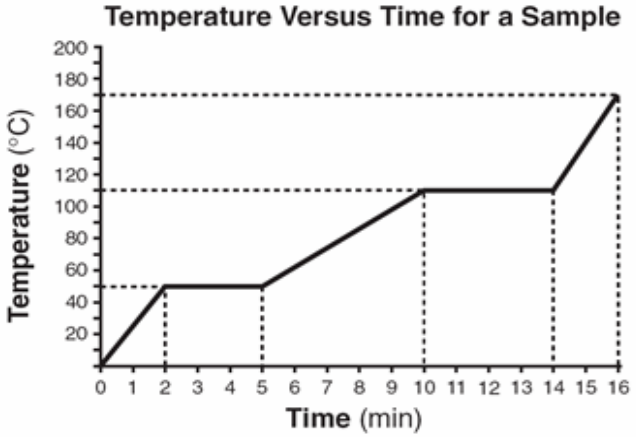


12. The graph below represents the uniform heating of a substance, starting with the substance as a solid below its melting point.

Which line segment represents an increase in potential energy and no change in average kinetic energy?



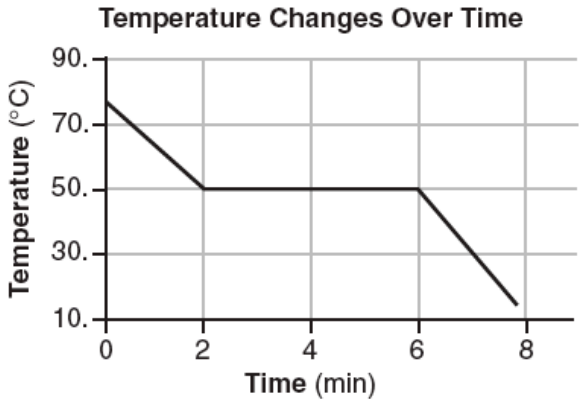
12. Starting as a solid, a sample of a substance is heated at a constant rate. The graph below shows the changes in temperature of this sample.



What is the melting point of the sample and the total time required to completely melt the sample after it has reached its melting point

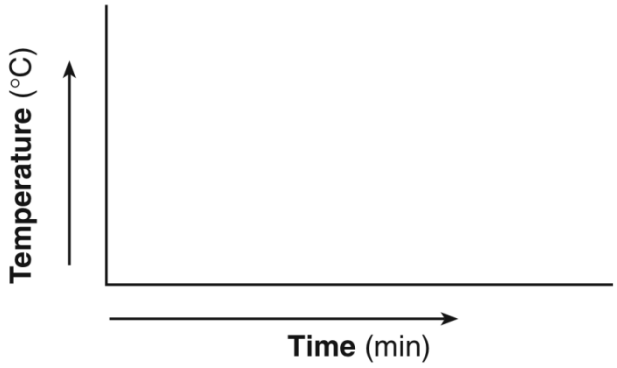
1) 50°C and 3 min
2) 50°C and 5 min
3) 110°C and 4 min
4) 110°C and 14 min

13. The graph below shows a compound being cooled at a constant rate starting in the liquid phase at 75°C and ending at 15°C. What is the freezing point of the compound, in degrees Celsius?



State what is happening to the average kinetic energy of the particles of the sample between minute 2 and minute 6.

A different experiment was conducted with another sample of the same compound starting in the solid phase. The sample was heated at a constant rate from 15°C to 75°C. On the graph below, draw the resulting heating curve.



What Kelvin temperature is equal to 15°C?

Balloon Demo

Important Heat Units

calorie (cal):

amount of heat required to raise the temperature of one gram of pure H_2O by one degree Celsius (°C)

Joule (J):

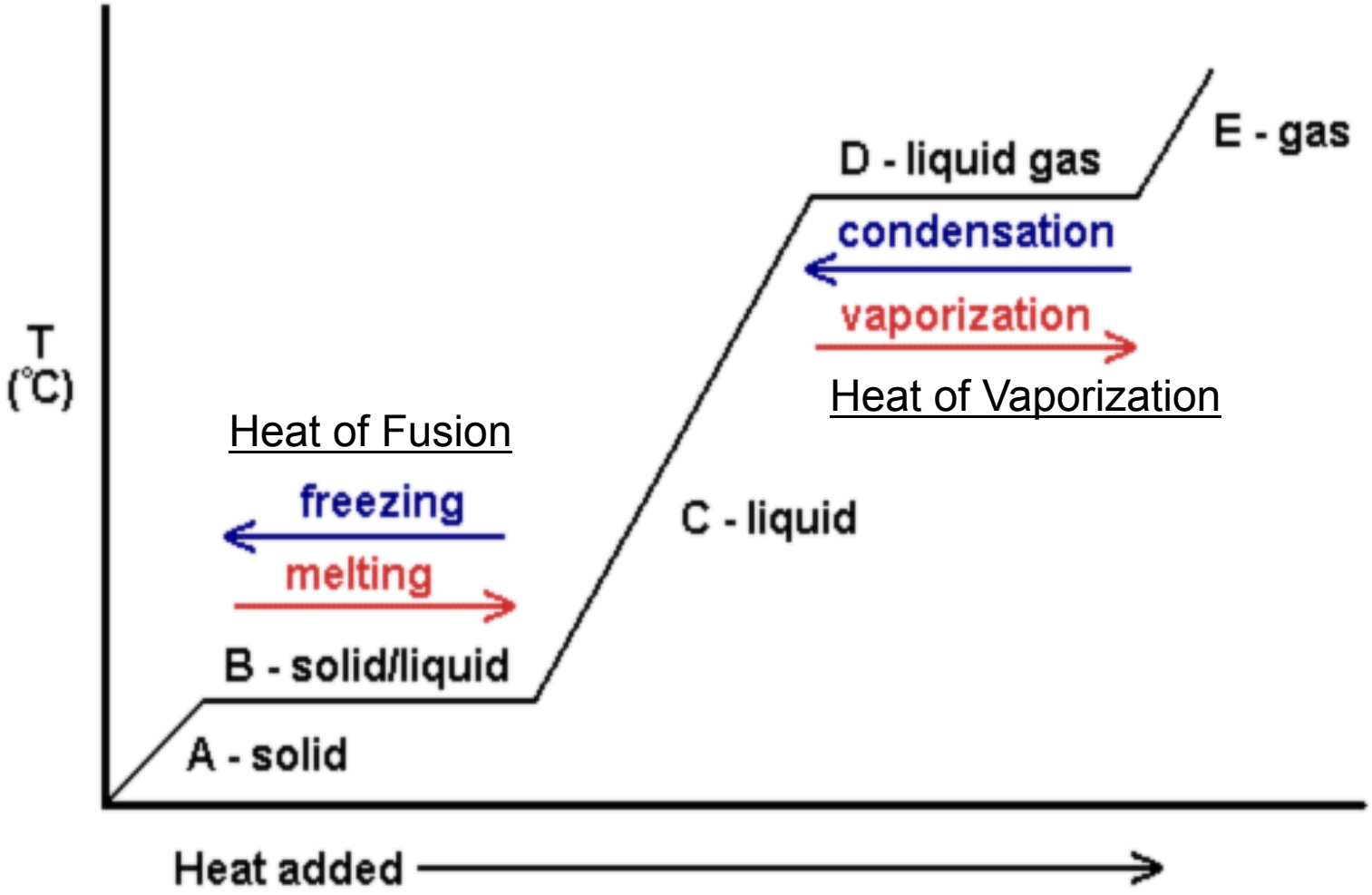
SI unit for heat and energy

nutritional Calorie = 1000 calories

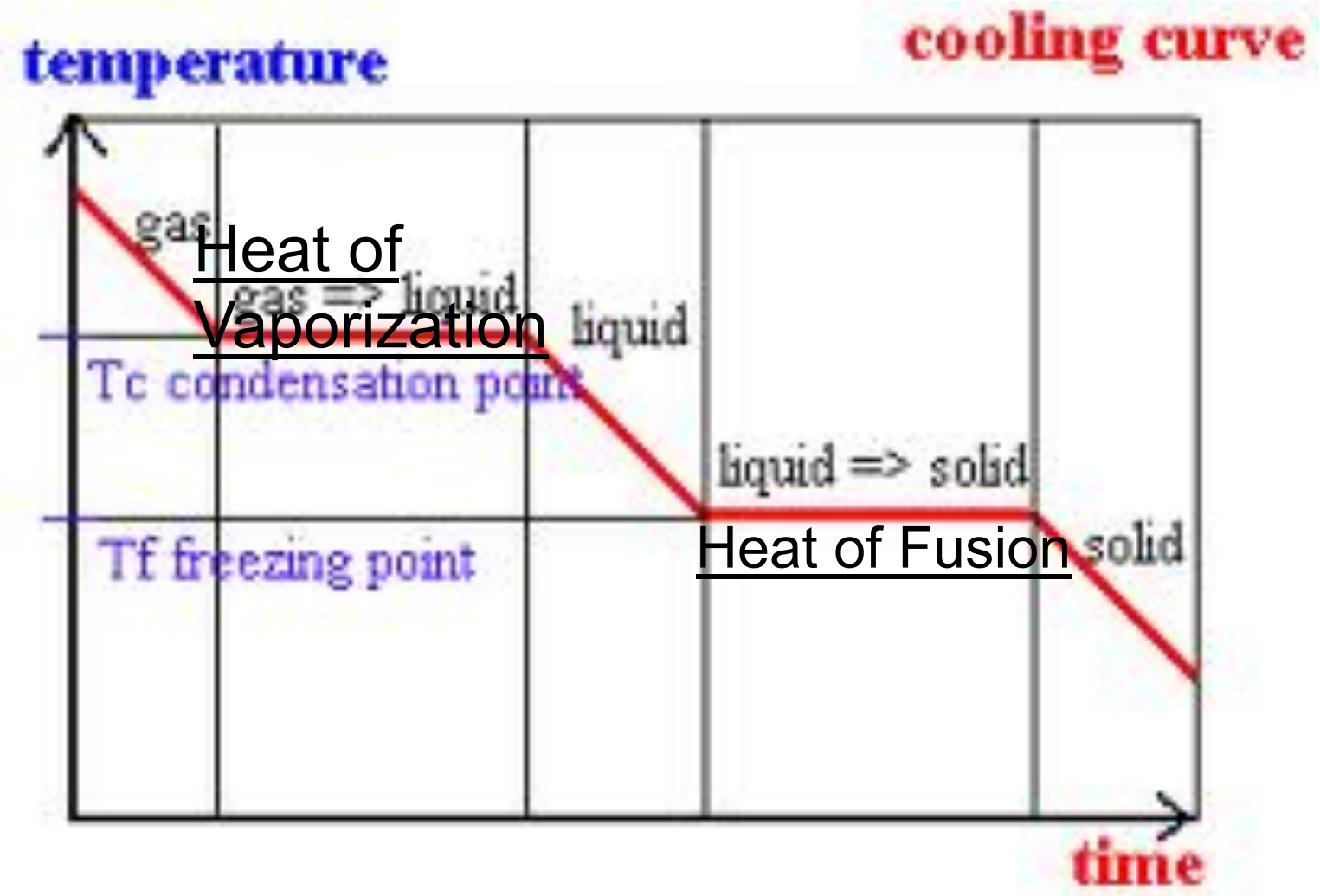
Reminder

- FUSION: solid to liquid
- VAPORIZATION: liquid to gas

Heating Curves



Cooling Curve



STP

- STP = Standard temperature and pressure
- Shown in Table A
- P= 1 atm = 101.3 kPa
- T=273 K= 0 C

Energy Requirements for Phase Changes

Heat of Fusion (H_f):

Amount of heat in Joules (J) required to complete a substances phase change from a solid (s) to a liquid (*l*)

Heat of Vaporization (H_v):

Amount of heat in Joules (J) required to complete a substances phase change from a liquid (*l*) to a gas (g)

Calculating Heat Required for Phase Changes

$q = mH_f$

Look at Table T

heat **mass** **Heat of fusion**

Look at Table B!! $H_{f\ H^2O} = 334\ J/g$

1. How much heat is required to melt 35 grams of water (s)?

Calculating Heat Required for Phase Changes

$q = mH_f$

Look at Table T

heat **mass** **Heat of fusion**

Look at Table B!! $H_{f\ H^2O} = 334$ J/g

2. How much heat is required to melt 50 grams of water (s)?

Calculating Heat Required for Phase Changes

$q = mH_v$

Look at Table T

heat **mass** **Heat of vaporization**

Look at Table B!! $H_{V\ H^2O} = 2260$ J/g

1. How much heat is required to boil 75 grams of water (l)?

Calculating Heat Required for Phase Changes

$q = mH_v$

Look at Table T

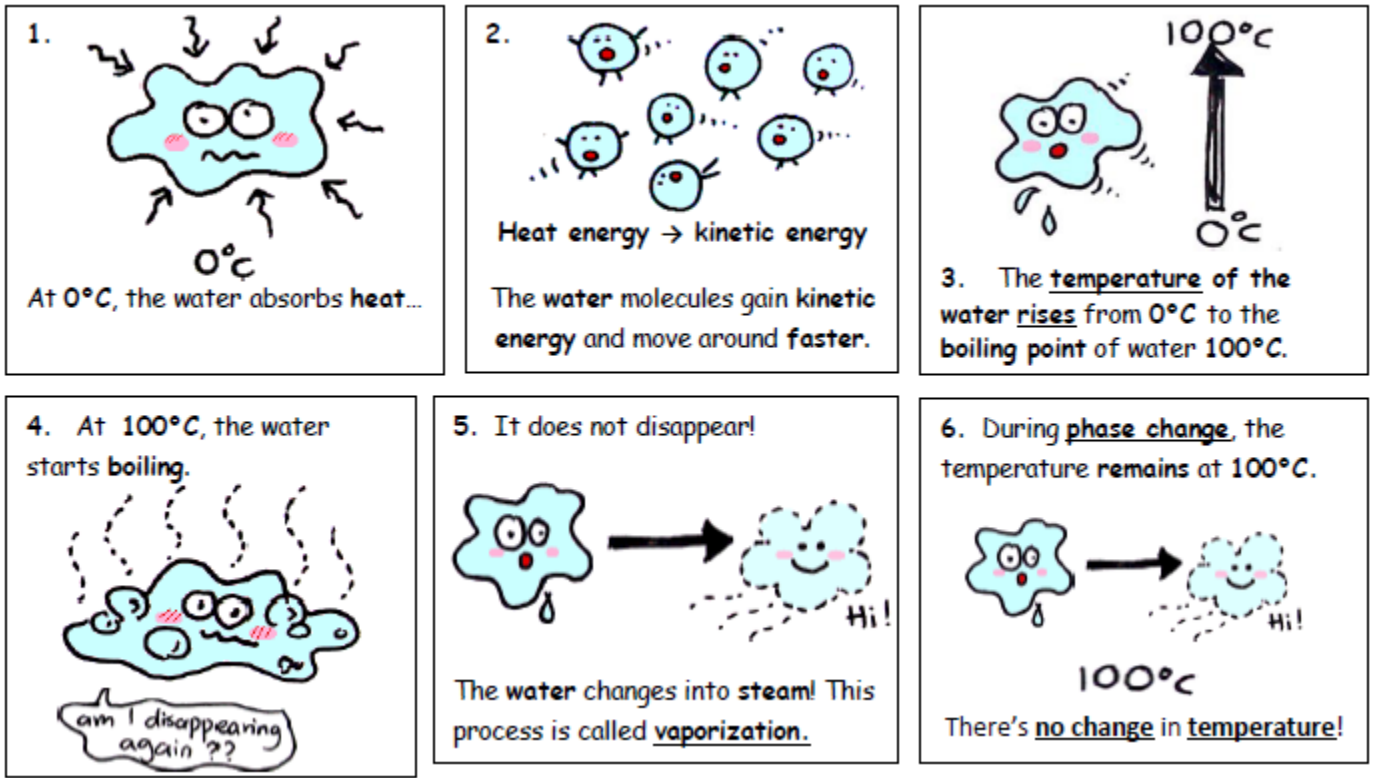
heat **mass** **Heat of vaporization**

Look at Table B!! $H_{V\ H_2O} = 2260$ J/g

2. How much heat is required to boil 30 grams of water (l)?

Why do we care?

- It is important for architects to know what amount of heat a certain mass of steel would start to melt at.



Connect to the balloon

- Stop and Jot:
  - How does the heat required for a phase change relate to our demo with the balloon?

Practice 1: What is the total amount of heat required to vaporize 1.00 gram of $H_2O(l)$ at 100.°C and 1 atmosphere?

- 1) 4.18 J
- 2) 334 J
- 3) 373 J
- 4) 2260 J

Practice 2: What is the minimum amount of heat required to completely melt 20.0 grams of ice at its melting point?

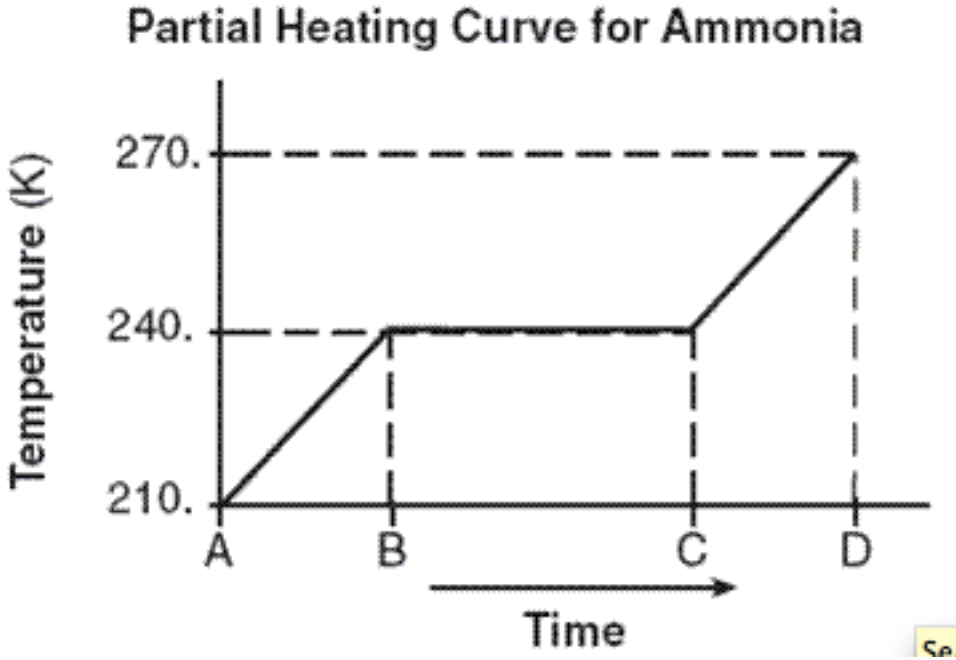
- 1) 20.0 J
- 2) 83.6 J
- 3) 6,680 J
- 4) 45,200 J

Practice 3: What is the total number of joules released when a 5.00-gram sample of water changes from liquid to solid at 0°C?

- 1) 334 J
- 2) 1670 J
- 3) 2260 J
- 4) 11 300 J

Practice 4:

A 5.00-gram sample of liquid ammonium is originally at 210. K. The diagram of the partial heating curve below represents the vaporization of the sample of ammonia at standard pressure due to the addition of heat.



Specific heat of NH3 (l)	**4.71 J/g*K**
Heat of fusion	**332 J/g**
Heat of vaporization	**1370 J/g**

Calculate the total heat absorbed by the 5.00 gram sample during time interval BC

Independent Practice

- Continue working on 2.11 WS

HOMEWORK

Complete Worksheet!