

## ANSWERS

August 2007

1. Given this balanced equation representing a reaction:



What occurs during this change?

- A. energy is absorbed and a bond is broken
- B. energy is absorbed and a bond is formed
- C. energy is released and a bond is broken
- D. energy is released and a bond is formed

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2. Given the balanced equation:



Which statement describes the process represented by this equation?

- A. A bond is formed as energy is absorbed
- B. A bond is formed as energy is released**
- C. A bond is broken as energy is absorbed
- D. A bond is broken as energy is released

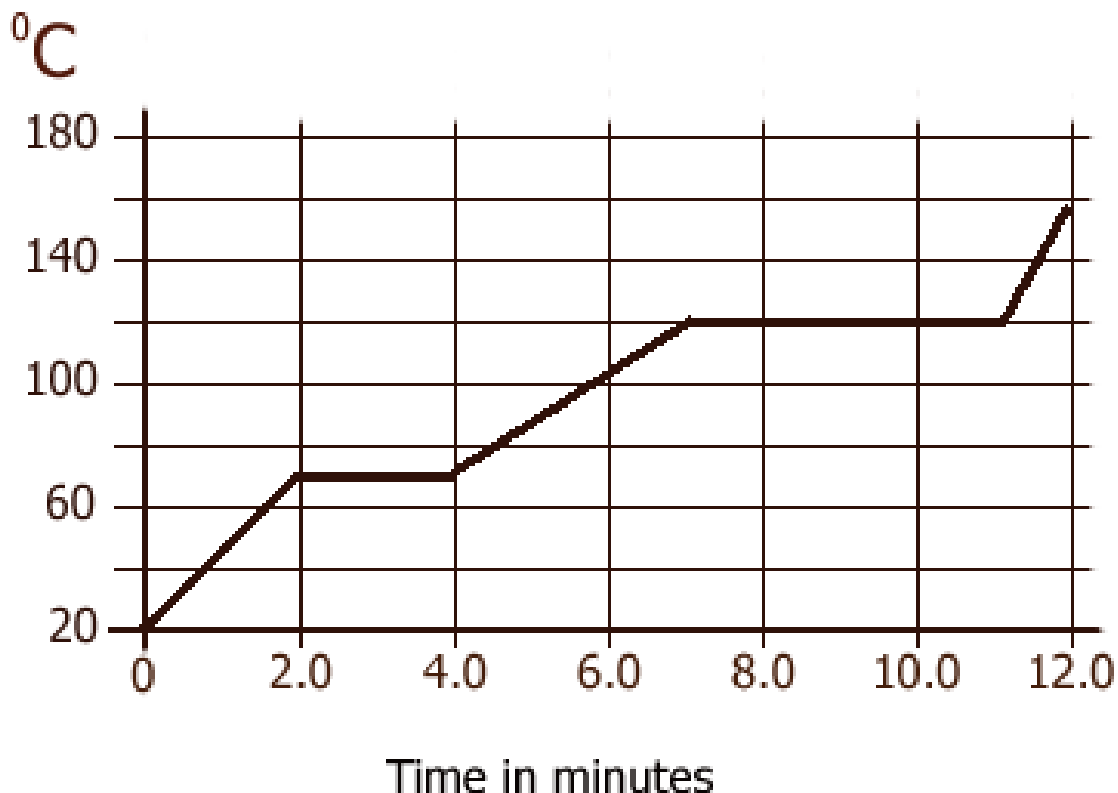
## ANSWERS

The temperature of a sample is increased from 20.°C to 160.° centigrade as the sample absorbs heat at a constant rate of 15 kilojoules per minute at standard pressure.

The graph below represents the relationship between temperature and time as the sample is heated.

3. What is the boiling point of the sample? **120°C**
4. What is the total time the sample is in the liquid phase?  
**From 4.0 to 6.5 minutes, so 2.5 minutes total.**
5. Determine the total amount of energy in Joules needed to melt the sample at its melting point.  
**2 minutes @ 15 kJ per minute, so 30 kilojoules.**

Temperature vs. Time



This page all from the January 2007 Regents exam **ANSWERS**

**6. The balanced equation below represents a molecule of bromine separating into two bromine atoms.**



**What occurs during this change?**

- A. energy is absorbed and a bond is formed
- B. energy is absorbed and a bond is broken**
- C. energy is released and a bond is formed
- D. energy is released and a bond is broken

**7. At STP, which list of elements contains a solid, liquid, and a gas?**

**A. Hf, Hg, He**

B. Cr, Cl<sub>2</sub>, C

C. Ba, Br<sub>2</sub>, B

D. Se, Sn, Sr

**8. At which temperature would atoms of He<sub>(g)</sub> have the highest kinetic energy?**

A. 25°C

**B. 37°C**

C. 273K

D. 298K

**9. Given the balanced reaction as**



**Which statement is true about that reaction?**

**A. It is exothermic and the  $\Delta H = -91.8 \text{ kJ}$**

B. It is exothermic and the  $\Delta H = +91.8 \text{ kJ}$

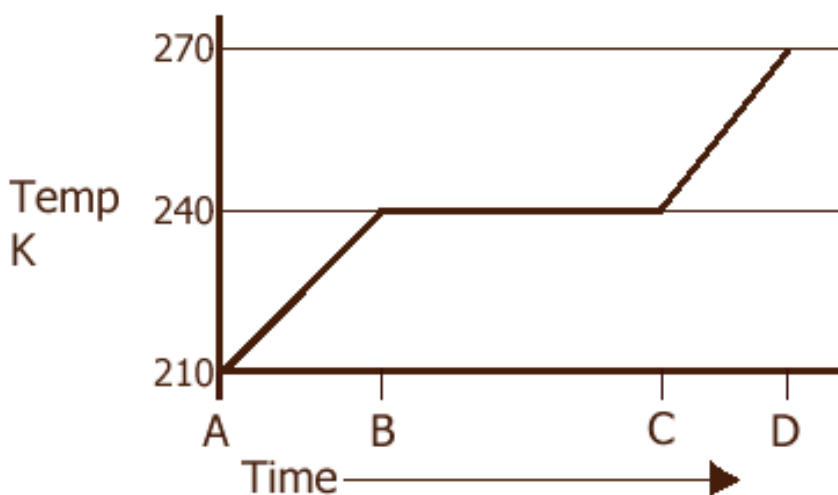
C. It is endothermic and the  $\Delta H = -91.8 \text{ kJ}$

D. It is endothermic and the  $\Delta H = +91.8 \text{ kJ}$

<b>some physical constants for NH<sub>3(L)</sub></b>	
<b>heat of fusion</b>	<b>332 J/g</b>
<b>heat of vaporization</b>	<b>1370 J/g</b>
<b>specific heat capacity</b>	<b>4.71 J/g·K</b>

**A 5.00 gram sample of liquid ammonia is originally at 210 K. The diagram of the partial heating curve below represents the vaporization of the sample at standard pressure due to the addition of heat. The heat is *not* added at a constant rate.**

Partial Heating Curve for Ammonia



## ANSWERS

10. Calculate the total heat absorbed by the 5.00 gram sample during time interval *AB*. Your response must show a numerical set up & a calculated result.

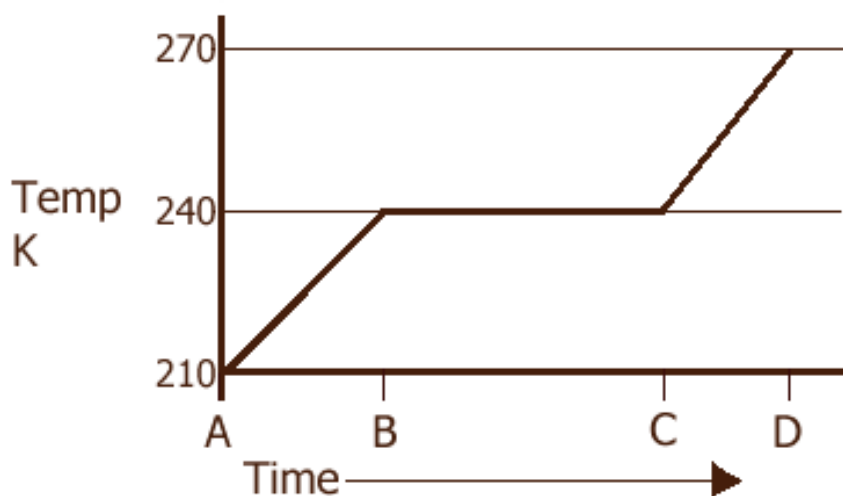
$$q = mC\Delta T$$

$$q = (5.00 \text{ g})(4.71 \text{ J/g}\cdot\text{K})(30.0 \text{ K})$$

$$q = 707 \text{ Joules}$$

**Even though this is in Kelvin, the K all cancel out.**

Partial Heating Curve for Ammonia



**11. Describe what is happening to both the potential energy and the average kinetic energy of the molecules during *BC*. Your response must include both potential and average kinetic energy. Also state phases present during *BC* interval. ANSWERS**

*BC* represents a phase change. The temperature does not change, so kinetic energy stays constant as well. Since it is a heating curve, and heat is being added, without an increase in KE, the potential energy must rise.

The phases are solid melting into liquid.

some physical constants for NH <sub>3(L)</sub>	
heat of fusion	332 J/g
heat of vaporization	1370 J/g
specific heat capacity	4.71 J/g·K

**12. Determine the total amount of heat needed to vaporize this 5.00 gram sample at its boiling point. Answers**

(do not use 2260 J/g, this is NOT water!)

$$q = mH_v$$

$$q = (5.00 \text{ g})(1370 \text{ J/g})$$

$$q = 6850 \text{ Joules}$$

**Do Not do the math, tell how many SF the answer should have, and/or what formulas to use.**

14. If 23.45 grams of ice at  $0^{\circ}\text{C}$  is melted into water at the same temperature. How many joules were used to do this?

4 SF, use heat of fusion formula

15.  $\text{H}_2\text{O}$  at  $35.6^{\circ}\text{C}$  is vaporized to  $100.0^{\circ}\text{C}$ . How many joules did that take?

3 SF, use heat of vaporization formula

16. Water at  $5.00^{\circ}\text{C}$  is frozen at  $0^{\circ}\text{C}$ . How many joules of energy were required to do this? Is this an exothermic or endothermic process?

3SF, use heat of fusion formula.

17. Steam of  $100.^{\circ}\text{C}$  condenses to liquid water at  $22.6^{\circ}\text{C}$ . Is energy released or absorbed? How many joules are exchanged in this process?

3 SF, first heat of vaporization for the condensation, then  $q = mC\Delta T$  for cooling.

17. You add 12,500 joules to 25.00 g of copper. The copper was at 20.0°C. What temperature is it now? (C of Cu = 0.39 J/g·°C)

3 SF,  $q = mC\Delta T$  because of the temp change.

19. To convert 123,500,000 Joules to calories, what conversion factor would you use? (write your conversion factor)

4 SF, 4.18 Joules / 1 cal

21. To convert 20,000 calories into Calories, what conversion factor would you use?

2 SF, 1 Calorie / 1000 cal

22. To convert 56.6 kJ to joules, what is the conversion factor? 3 SF, 1000 Joules / 1 kJ