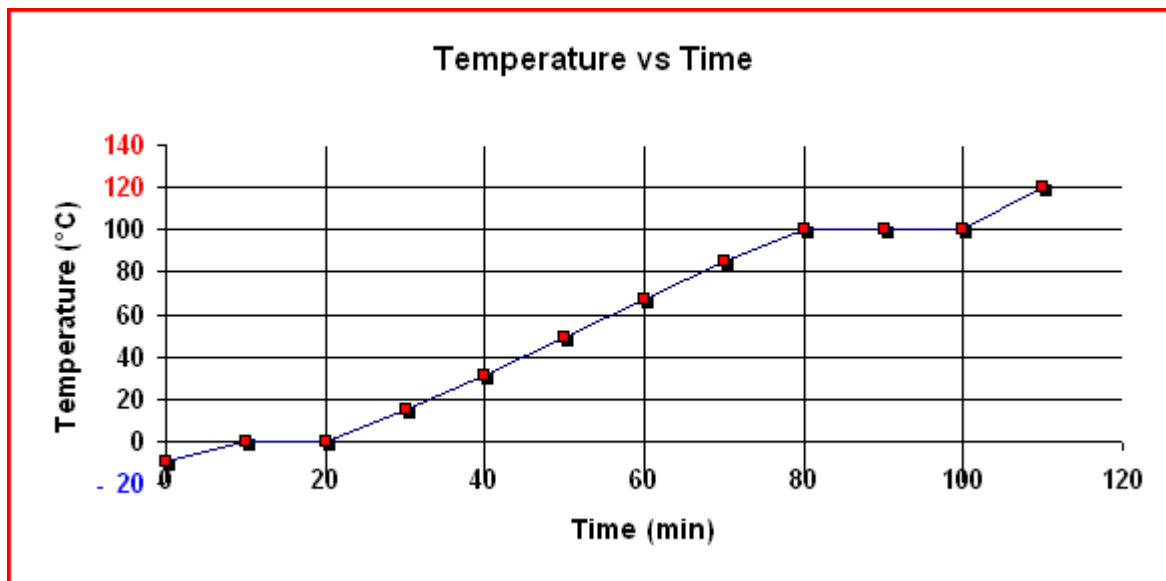


General Chemistry Final Exam Study Guide Semester 2

Thermochemistry

Use the heating curve below to answer question numbers 1-6:



- 1) What is the melting point of the unknown substance?
- 2) What is the boiling point of the unknown substance?
- 3) Highlight/circle the section of the heating curve that represents the liquid phase.
- 4) Place arrows at the regions of the line where the temperature is constant.
- 5) When the unknown substance is all liquid what is changing (i.e. kinetic energy, potential energy, mechanical energy)?
- 6) Going from a solid to a liquid is which type of process? (endothermic or exothermic)
- 7) How much heat is needed to change the temperature of a 42.5 gram sample of copper from 30°C to 90°C? The specific heat of copper is 0.4 J/g°C.
- 8) How many joules of heat are needed to raise the temperature of 10.0 g of aluminum from 22°C to 55°C, if the specific heat of aluminum is 0.90 J/g°C?
- 9) 25.0 g of mercury is heated from 25°C to 155°C, and absorbs 455 joules of heat in the process. Calculate the specific heat capacity of mercury.

- 10) Look at the table below. If the same quantity of heat is supplied to 15 g of each of the substances in the table, which substance will increase the most in temperature and why?

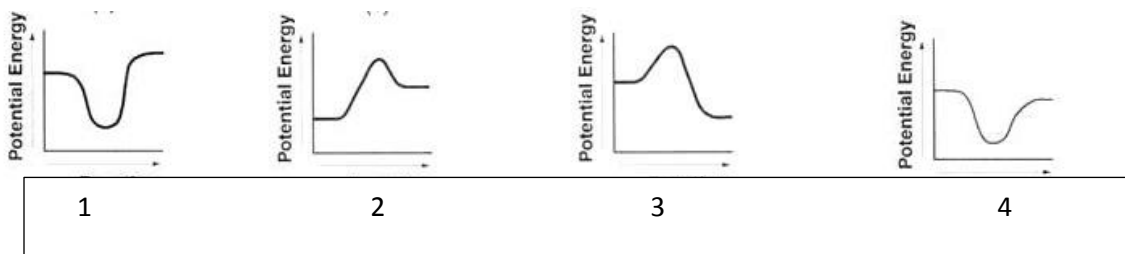
Specific Heats of Common Materials

MATERIAL	SPECIFIC HEAT (Joules/gram • °C)
Liquid water	4.18
Solid water (ice)	2.11
Water vapor	2.00
Dry air	1.01
Basalt	0.84
Granite	0.79
Iron	0.45
Copper	0.38
Lead	0.13

- 11) List the differences between endothermic and exothermic processes.

- 12) What type of materials would make up a good insulated beverage container?

- 13) Which energy diagram below shows an exothermic reaction?

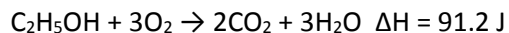


- 14) What is the function of a catalyst?

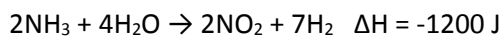
- 15) State the law of conservation of energy.

- 16) In an exothermic reaction, where is “energy” written in the balanced equation?

17) Considering the following equation, how much energy would be released if 10.0g of ethanol, C₂H₅OH, were burned?



18) Considering the following equation, how much heat would be released if 50.0 g of water were reacted?



19) What is a calorimeter?

Nuclear Chemistry

20) Explain the relationship between temperature and nuclear, physical, and chemical change.

21) Write nuclear equations that describe the following processes:

- Uranium-235 undergoes alpha decay to produce Thorium-231
- Lanthanum-144 becomes Cerium-144 when it undergoes beta decay
- Radium-226 undergoes beta decay
- Polonium-209 undergoes alpha decay

22) Fill in the missing information for the equations below:

- ${}_{53}^{129}\text{I} \rightarrow {}_{-1}^0\text{e} + \underline{\quad ? \quad}$
- ${}_{86}^{216}\text{Rn} \rightarrow {}_2^4\alpha + \underline{\quad ? \quad}$
- $\underline{\quad ? \quad} \rightarrow {}_2^4\alpha + {}_{97}^{239}\text{Bk}$
- $\underline{\quad ? \quad} \rightarrow {}_{-1}^0\text{e} + {}_{23}^{52}\text{V}$

23) Compare and contrast fission and fusion. Give an example of each.

- 24) Rank radioactive decay by **increasing** size. Rank radioactive decay by **decreasing** size.
- 25) Give some examples of elements on the periodic table that are always radioactive.
- 26) The half-life of Zn-71 is 2.4 minutes. If one had 100.0 g at the beginning, how many grams would be left after 7.2 minutes has elapsed?
- 27) The half-life of Zn-71 is 2.4 minutes. If you had 100 g at the beginning, how many grams would be left after 7.2 minutes have elapsed?
- 28) 100.0 grams of an isotope with a half-life of 36.0 hours is present at time zero. How much time will have elapsed when 5.00 grams remains?
- 29) Compare and contrast fission and fusion.
- 30) List the effects of solar radiation.
- 31) How does energy move?
- 32) What type of radiation is the electromagnetic spectrum?
- 33) Is visible light a part of the electromagnetic spectrum?
- 34) List all the ways that the light spectrum is used in astronomy.
- 35) Which stage in its life cycle is the Sun?
- 36) The origin of the universe is referred to as what?

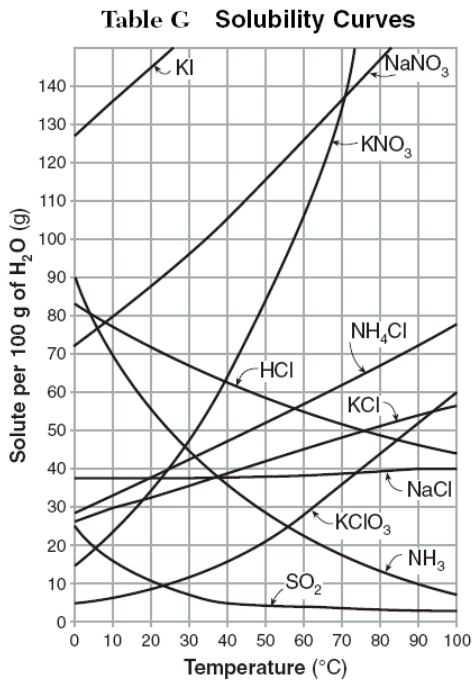
37) Finish this statement: the smaller a star is the _____.

38) What is the largest factor in determining the path a star takes through its life cycle?

39) Why is Hydrogen important to a stars development?

Solubility & Solutions

Use the Solubility Curve below to answer questions 40-45:



40) At what temperature does 85 grams of KNO₃ dissolve?

41) Which compound(s) show that solubility is inversely related to temperature?

42) What compound dissolves the most solute at 70 °C?

43) How many grams of SO₂ can dissolve in 100 g of H₂O at 50 °C?

44) At 30 °C, 90 g of NaNO₃ is dissolved in 100 g of water. Is this solution saturated, unsaturated, supersaturated?

- 45) At 60 °C, 72 g of NH_4Cl is dissolved in 100 g of water. Is this solution saturated, unsaturated, supersaturated?
- 46) When the concentration of reactant molecules is increased, the rate of reaction increases. Explain why.
- 47) When a system is at equilibrium, what can be said about the rates of reaction of the forward and reverse reactions?
- 48) State the relationship between activation energy and endothermic/exothermic reactions.
- 49) Define reaction rate, and state how they can be changed.
- 50) What is the molarity of a solution that contains 4.53 moles of $\text{Li}(\text{NO}_3)$ in 2.85 liters of solution?
- 51) An NaOH solution contains 1.90 grams of NaOH , and its concentration is 0.555 M. How many Liters is it?
- 52) What is the molality of the solution in which 3 moles of NaCl is dissolved in 1.5 kg of water?
- 53) How many grams of $\text{C}_2\text{H}_6\text{O}$ are needed to prepare a 0.10 molal solution using 1 kg of H_2O ?
- 54) You are working with a water-based solution made from a nonelectrolyte solvent (water) that has a freezing point depression of -3.72°C . What is the molal concentration (molality) of this solution? $K_f = -1.86^\circ\text{C}/\text{m}$
- 55) Determine the boiling point of 1.40 moles of SO_2 dissolved in 1750 g of H_2O solution. $K_b = 0.51^\circ\text{C}/\text{m}$
- 56) Calculate the freezing point of a solution made from 32.7 g of C_3H_8 , dissolved in 137.0 g of benzene. The freezing point of benzene is 5.50°C and its $K_f = 5.12^\circ\text{C}/\text{m}$.

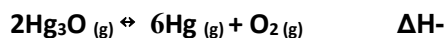
57) Determine the boiling point of a solution of 30.20 g of HOCH₂CH₂OH in 88.40 g of phenol. K_b = 3.60 °C/m, phenol's normal boiling point is 181.8 °C.

58) What would happen to the position of equilibrium (which direction will it shift) when the following changes are made to the reaction below?



- (a) Sulfur dioxide is added to the system _____
(b) Sulfur trioxide is removed from the system _____
(c) Oxygen is added to the system _____

59) What would happen to the position of equilibrium when the following changes are made to the reaction below?



- (a) Hg₃O is added to the system _____
(b) The volume of the system decreases _____
(c) Temperature is increased _____

60) Predict the effect of decreasing the temperature on the position of equilibrium for each of the following...

- (a) H₂(g) + Cl₂(g) ↔ 2HCl(g) + heat _____
(b) 2NH₃(g) + heat ↔ N₂(g) + 3H₂(g) _____
(c) CO(g) + H₂O(g) ↔ CO₂(g) + H₂(g) + heat _____