PERIOD: _____ DATE: _____

Study guide Kinetics and nuclear chemistry

USE THE GRAPHS FOR THE FOLLOWING QUESTIONS

1. This is a(n) (**endothermic/endothermic**) graph. exothermic

2. The surroundings are getting (**hotter/colder**).

3. The reaction is (**releasing/absorbing**) energy.

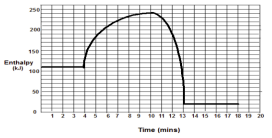
4. The enthalpy (H) of the reactants is 110 kJ.

5. The enthalpy (H) of the products is 20 kJ.

6. The change in enthalpy (ΔH) of the reaction is −90 kJ.

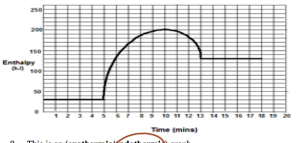
7. The activation energy of the reaction is 130 kJ.

Thermodynamics Graph



8. The (**products/reactants**) have more potential energy.

Thermodynamics Graph

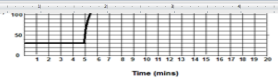


9. This is an (**exothermic/endothermic**) graph.

10. The enthalpy (H) of the reactants is 30 kJ.

11. The enthalpy (H) of the products is 130 kJ.

12. The change in enthalpy (ΔH) of the reaction is +100 kJ.



9. This is an (**exothermic/endothermic**) graph.

10. The enthalpy (H) of the reactants is _____ kJ.

11. The enthalpy (H) of the products is _____ kJ.

12. The change in enthalpy (ΔH) of the reaction is _____ kJ.

13. The activation energy of the reaction is 170 kJ.

14. The surroundings are getting (**hotter/colder**).

15. The (**products/reactants**) have more potential energy.

16. Define reaction rate. The rate at which reactants are used up or products are made.

17. How is the reaction rate monitored? $-\frac{\Delta[\text{Reactants}]}{\Delta t} = \frac{\Delta[\text{Products}]}{\Delta t}$

catalyst

18. What does a catalyst do?

19. How does a catalyst work?

20. Name three ways to slow a reaction down.

21. How does one of the methods used in question 20 work?

22. What two things need to happen in order for a reaction to be effective?

these are in your notes.

NUCLEAR CHEMISTRY STUDY GUIDE

23. Define the following:

a. Nucleon e. Band of stability i. Critical mass

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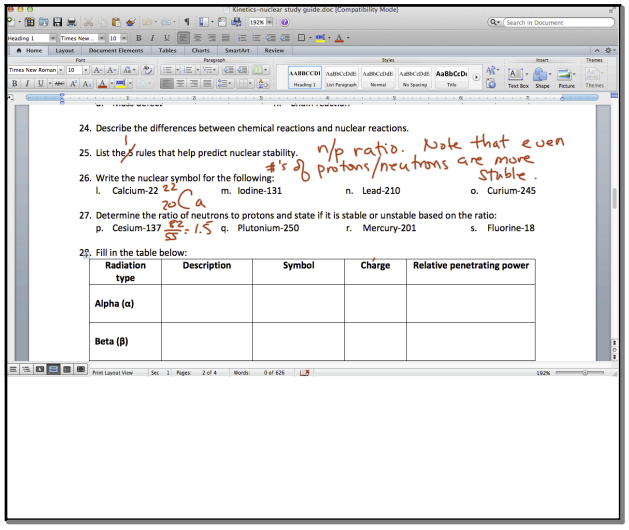


24. Describe the differences between chemical reactions and nuclear reactions.

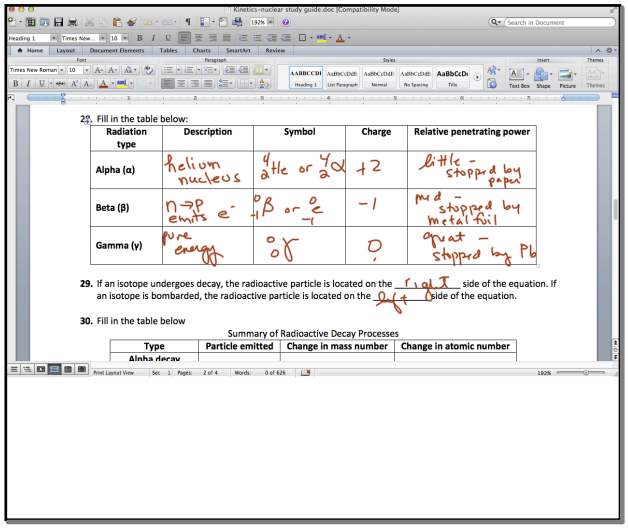
25. List the rules that help predict nuclear stability. n/p ratio. Note that even #'s of protons/neutrons are more stable.

26. Write the nuclear symbol for the following:
    l. Calcium-22 $^{22}_{20}Ca$ m. Iodine-131 n. Lead-210 o. Curium-245

27. Determine the ratio of neutrons to protons and state if it is stable or unstable based on the ratio:
    p. Cesium-137 $\frac{82}{55} = 1.5$ q. Plutonium-250 r. Mercury-201 s. Fluorine-18

28. Fill in the table below:

Radiation type	Description	Symbol	Charge	Relative penetrating power
Alpha (α)				
Beta (β)				



28. Fill in the table below:

Radiation type	Description	Symbol	Charge	Relative penetrating power
Alpha (α)	helium nucleus	^4_2He or $^4_2\alpha$	+2	little – stopped by paper
Beta (β)	$n \rightarrow p$ emits e^-	$^0_{-1}\beta$ or $^0_{-1}e$	−1	med – stopped by metal foil
Gamma (γ)	pure energy	$^0_0\gamma$	0	great – stopped by Pb

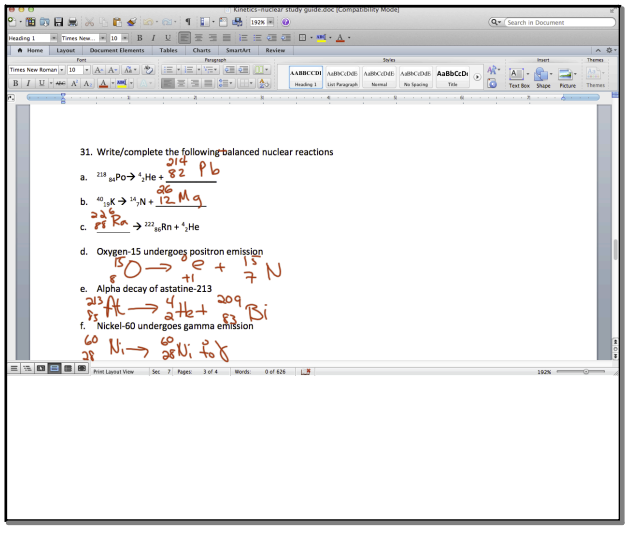
29. If an isotope undergoes decay, the radioactive particle is located on the right side of the equation. If an isotope is bombarded, the radioactive particle is located on the left side of the equation.

30. Fill in the table below

Summary of Radioactive Decay Processes

Type	Particle emitted	Change in mass number	Change in atomic number
Alpha decay			

Beta decay			
Positron emission			
Gamma emission			



Summary of Radioactive Decay Processes

Type	Particle emitted	Change in mass number	Change in atomic number
Alpha decay	^4_2He	−4	−2

Beta decay	e^-	0	+1
Positron emission	e^+	0	−1
Gamma emission	$^0_0\gamma$	0	0

31. Write/complete the following balanced nuclear reactions

a. $^{218}_{84}Po \rightarrow {}^4_2He + {}^{214}_{82}Pb$

b. $^{40}_{19}K \rightarrow {}^{14}_{7}N + {}^{26}_{12}Mg$

c. $^{226}_{88}Ra \rightarrow {}^{222}_{86}Rn + {}^4_2He$

d. Oxygen-15 undergoes positron emission
$^{15}_{8}O \rightarrow {}^0_{+1}e + {}^{15}_{7}N$

e. Alpha decay of astatine-213
$^{213}_{85}At \rightarrow {}^4_2He + {}^{209}_{83}Bi$

f. Nickel-60 undergoes gamma emission
$^{60}_{28}Ni \rightarrow {}^{60}_{28}Ni + {}^0_0\gamma$

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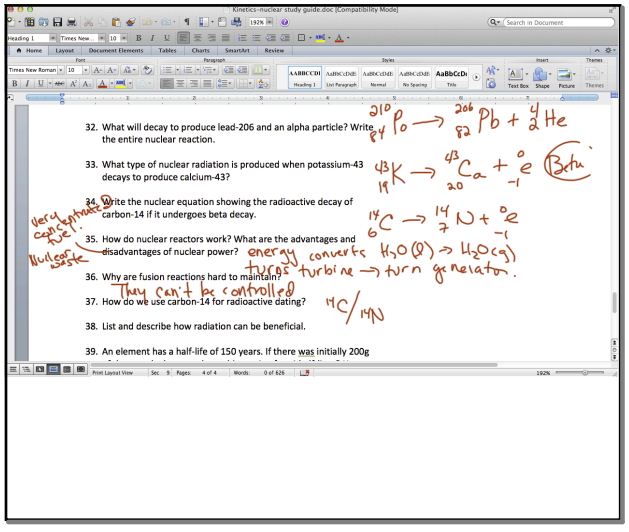


32. What will decay to produce lead-206 and an alpha particle? Write the entire nuclear reaction.

33. What type of nuclear radiation is produced when potassium-43 decays to produce calcium-43?

34. Write the nuclear equation showing the radioactive decay of carbon-14 if it undergoes beta decay.

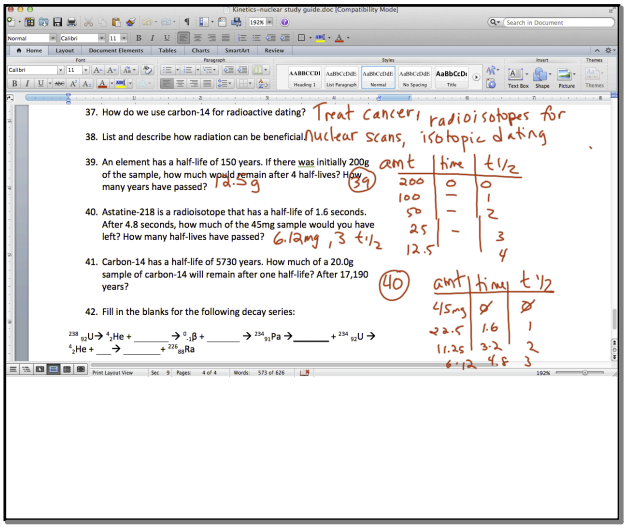
35. How do nuclear reactors work? What are the advantages and disadvantages of nuclear power?

36. Why are fusion reactions hard to maintain?

37. How do we use carbon-14 for radioactive dating?

38. List and describe how radiation can be beneficial.

39. An element has a half-life of 150 years. If there was initially 200g



37. How do we use carbon-14 for radioactive dating?

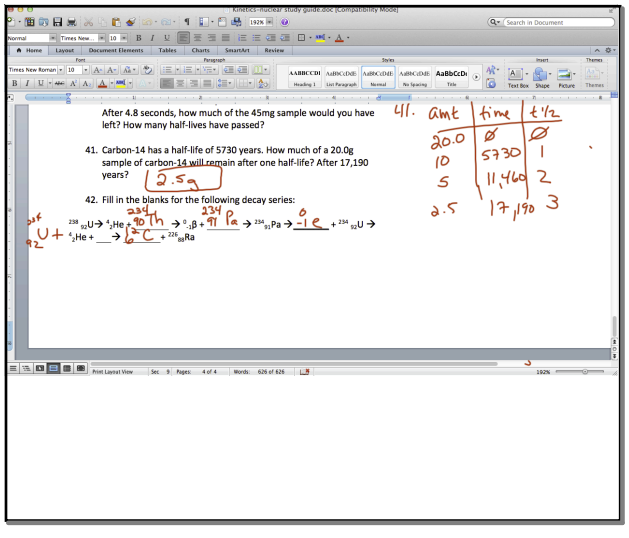
38. List and describe how radiation can be beneficial.

39. An element has a half-life of 150 years. If there was initially 200g of the sample, how much would remain after 4 half-lives? How many years have passed?

40. Astatine-218 is a radioisotope that has a half-life of 1.6 seconds. After 4.8 seconds, how much of the 45mg sample would you have left? How many half-lives have passed?

41. Carbon-14 has a half-life of 5730 years. How much of a 20.0g sample of carbon-14 will remain after one half-life? After 17,190 years?

42. Fill in the blanks for the following decay series:



After 4.8 seconds, how much of the 45mg sample would you have left? How many half-lives have passed?

41. Carbon-14 has a half-life of 5730 years. How much of a 20.0g sample of carbon-14 will remain after one half-life? After 17,190 years?

42. Fill in the blanks for the following decay series: