Half Life Review Problems

a. Iodine-131 is used to destroy thyroid tissue in the treatment of an overactive thyroid. The half-life of iodine-131 is 8 days. If a hospital receives a shipment of 200 g of iodine-131, how much I-131 would remain after 32 days?

b. Technetium-99 is used for brain scans. If a laboratory receives a shipment of 200 g of this isotope, how much will remain after 24 hours. The half life of Technetium-99 is 6 hours.

c. Mercury -197 is used for kidney scans and has a half-life of 3 days. If the 32 grams of mercury-197 is ordered, but takes 15 days to arrive, how much would arrive in the shipment?

d. The half-life of strontium-90 is 25 years. How much strontium-90 will remain after 100 years if the initial amount is 4.0 g?

e. If the half-life of uranium-232 is 70 years, how many half-lives will it take for 10 g of it to be reduced to 1.25 g?

Half Life Review
Key

(A) starting mass = 200 g
half life = 8 days
total decay time = 32 days

time (days)	mass (g)
0	200
8	100
16	50
24	25
32	12.5 g

(B) starting mass = 200 g
half life = 6 hrs
total decay time = 24 hrs

time (hrs)	mass (g)
0	200 g
6	100
12	50
18	25
24	12.5 g

(C) starting mass = 32 g
half life = 3 days
total decay time = 15 days

time (days)	mass (g)
0	32
3	16
6	8
9	4
12	2
15	1

(d) initial mass = 4 g
half life = 25 yrs
total decay = 100 yrs

time (yrs)	mass (g)
0	4
25	2
50	1
75	0.5
100	0.25 g

(e) initial mass 10 g
half life = 70 years
time to decay ?
final mass = 1.25 g

time (y)	mass (g)
0	10 g
70	5 g
140	2.5
210 years	1.25 g

would take this long

Half-life Practice Worksheet

1. Sodium-24 has a half-life of 15 hours. How much sodium-24 will remain in an 18.0 g sample after 60 hours?

2. After 42 days a 2.0 g sample of phosphorus-32 contains only 0.25 g of the isotope. What is the half-life of phosphorus-32?

3. Polonium-214 has a relatively short half-life of 164 seconds. How many seconds would it take for 8.0 g of this isotope to decay to 0.25 g?

4. How many days does it take for 16 g of palladium-103 to decay to 1.0 g? The half-life of palladium-103 is 17 days.

5. By approximately what factor would the mass of a sample of copper-66 decrease in 51 minutes? The half-life of copper-66 is 5.10 minutes.

6. In 5.49 seconds, 1.20 g of argon-35 decay to leave only 0.15 g. What is the half-life of argon-35?

(1) half life = 15 hrs
starting mass = 18.0 g

time (hr)	mass (g)
0	18
15	9
30	4.5
45	2.25
60	1.125 g

(2) work backwards!

starting mass = 2 g
ending mass = 0.25 g

*figure out how many half lives have passed

time (days)	mass (g)
0	2
14	1
28	0.5
42	0.25

= 3

42 ÷ 3 = 14 days

(3) half life = 164 seconds
starting mass = 8 g

time (sec)	mass (g)
0	8 g
164	4 g
328	2 g
492	1 g
656	0.5 g
820	0.25 g

820 sec

(4) half life = 17 days
starting mass = 16 g

time (day)	mass (g)
0	16 g
17	8
34	4
51	2
68	1

68 days

(5) starting mass → pretend it starts ~~but~~ 100g to see by how much it would decrease

half life = 5.10 min

time (min)	mass (g)
0	100 g
5.10	50
10.2	25
15.3	12.5
20.4	6.25
25.6	3.125
30.7	1.5625
35.8	0.78
40.9	0.39
46	0.195
51.1	0.09

10 half lives would go by

(6) starting mass = 1.20 g
work backwards

time (s)	mass (g)
0	1.20 g
1.83	0.6
3.66	0.3
5.49	0.15

3 half lives went by in 5.49 s
5.49 / 3 = 1.83 sec

Name HW Key Date Class

SECTION 2 Reinforcement

Relative Ages of Rocks

Directions: *In the blank at the left, write the term that completes each statement.*

relative dating 1. Natural laws govern the way geologists determine the age of rock deposits. This technique is called _____.

superposition 2. The principle of _____ states that an older rock layer and things buried in it occur beneath younger layers unless the layers have been disturbed.

unconformities 3. Some rock layers are incomplete. The gaps are called _____.

erosion/weathering 4. A common cause of gaps in rock layers is _____.

Directions: *Look at the cross-sectional view of the rock layers shown in Figure 1. For each question, decide which of the two named materials is older. Assume the layers have not been overturned. Write the name of the older material on the line provided.*

brown sandstone 5. tan sandstone and brown sandstone

brown sandstone 6. brown sandstone and gray limestone

gabbro dike 7. gabbro dike and brown sandstone

gray shale 8. gabbro dike and gray shale

trilobite 9. snail fossil and trilobite fossil

snail fossil 10. snail fossil and dinosaur bone

green shale 11. snail fossil and green shale

~~red sandstone~~ 12. dinosaur bone and red sandstone unclear/ignore

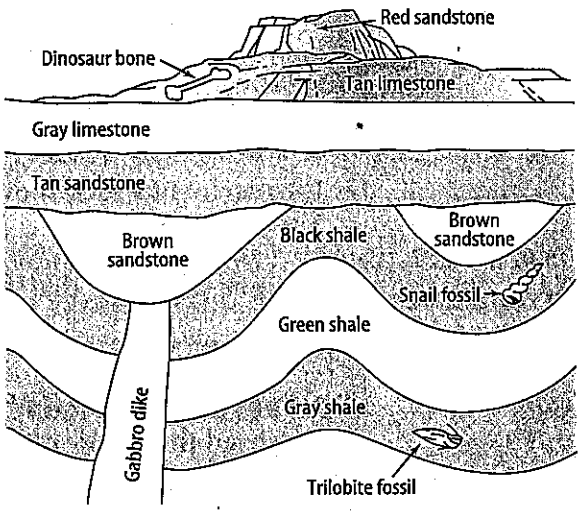
grey limestone 13. red sandstone and gray limestone

~~tan~~ sandstone 14. tan limestone and tan sandstone

gray limestone 15. tan limestone and gray limestone

angular unconformity 16. The type of unconformity shown in Figure 1 is a(n) _____.

Figure 1



Meeting Individual Needs

Name _____ Class _____ Date _____

WORKSHEET 63 TEACHING TRANSPARENCY

Use with Chapter 21
Section 21.2

Determining Relative Age

1. Which rock is the youngest?

4

2. Which rock is the oldest?

A

3. Where in the rock sequence does a disconformity occur?

between I + J

4. Where in the rock sequence does an angular unconformity occur?

G + below

5. What is the relative age of the fault? Explain your answer, naming any principle you applied.

fault is younger than A, B, C, D, E, F
older than the intrusion & layer G
cross cutting → law of superposition

6. What is the relative age of X? Explain your answer, naming any principle you applied.

younger than D & E & F
older than 4
" than G + above

7. List the rock layers in order from oldest to youngest.

A, B, C, D, E, F, X, G, H, I, J, K, L, M

FAULT