

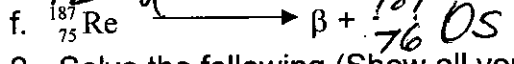
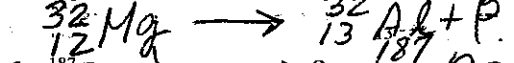
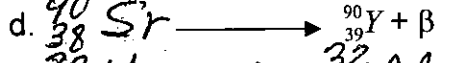
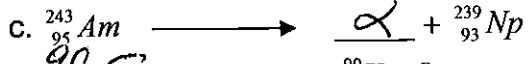
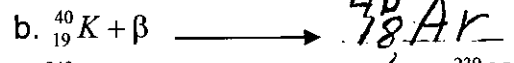
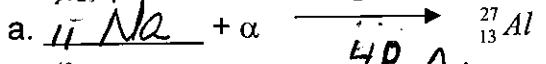
1. What is the minimum protection needed for each of the following radiations?

a. α Paper b. β Clothing, Metal c. γ Lead Sheet

2. Identify the symbol that corresponds to:

a. ${}^4_2\text{He}$ α b. ${}^0_{-1}\text{e}$ β

3. Complete the following nuclear reactions:



2. Solve the following (Show all your work):

a. Tritium dating is used to verify the age of a vintage wine. Tritium has a half life of 12.5 years. If the wine contains one quarter of the tritium level of a sample of ordinary water, then how old is it?

| | | | | |
|--------|---|------|-----|---------|
| t | 0 | 12.5 | 25 | |
| amount | 1 | 1/2 | 1/4 | 25 yrs. |

b. What fraction of tritium should remain in a 50 year old bottle of wine?

| | | | | | |
|--------|---|------|-----|-----|-----|
| t | 0 | 12.5 | 25 | 50 | |
| amount | 1 | 1/2 | 1/4 | 1/8 | 1/8 |

c. The mass of Fe-59 in a sample decreases from 20.0 g to 5.00 g in 6 months. What is the half life of Fe-59?

| | | | | |
|--------|-------|----------|----------|----------|
| t | 0 | 3 months | 6 months | |
| amount | 20.0g | 10.0g | 5.00g | 3 months |

d. K-38 decays by positron emission to Ar-38. K-38 has a half life of 7 minutes. How long will it take a 200 mg sample of K-38 to be reduced to 25 mg?

| | | | | | |
|--------|-------|-------|-------|-------|-------|
| t | 0 | 7min | 14min | 21min | 28min |
| amount | 200mg | 100mg | 50mg | 25mg | |

e. Th-230 has a half life of 22 minutes. How much Th-230 will be left after 132 minutes if initially the sample weighed 480 grams?

| | | | | | |
|--------|------|-------|-------|-------|-------|
| t | 0 | 22min | 44min | 66min | 88min |
| amount | 480g | 240g | 120g | 60g | 30g |

3. Convert: (Show all units and conversion factors for and b)

a. 7.89 atm to mm of Hg

$$7.89 \text{ atm} \times \frac{760 \text{ mmHg}}{1 \text{ atm}} = 5996 \text{ mmHg}$$

b. 345 torr to atm

$$345 \text{ torr} \times \frac{1 \text{ atm}}{760 \text{ torr}} = .454 \text{ atm}$$

c. -45°C to K

$$-45^\circ\text{C} + 273 = 228\text{K}$$

d. 25K to $^\circ\text{C}$

$$25\text{K} - 273 =$$

| | |
|--------|---------|
| 100min | 132min |
| 15g | 7 1/2 g |

7 1/2 g

4. If the volume of 1 mole of a gas at 273K and 1 atm in a balloon is 22.4 L, what will the volume be if:

a. The temperature is reduced to one third of the initial temperature. 7.47 L

b. The pressure is quadrupled. 5.6 L

b. 4 additional moles of gas are introduced into the balloon. 112 L

5. Indicate what kind of relationship (directly proportional, **DP**, or inversely proportional, **IP**) exists between each of the following variables:

a. pressure and volume IP b. pressure and temperature DP
c. volume and moles DP d. temperature and moles IP

6. What is the partial pressure of gas B in a mixture of gases A, B, C, and D if the total pressure is 699 torr and 150 torr of each of the other gases, A, C, and D present?

$$150 \text{ torr} + P_B + 150 \text{ torr} + 150 \text{ torr} = 699 \text{ torr}$$

$$P_B = 699 \text{ torr} - 150 \text{ torr} - 150 \text{ torr} - 150 \text{ torr}$$

$$P_B = 249 \text{ torr}$$