

# Radioactivity – Worksheet

**1)** Fill in the blanks (radioactive decay, gamma, alpha, random, unstable, beta)

Radioactivity is a spontaneous and \_\_\_\_\_ phenomenon whereby \_\_\_\_\_ nuclei of certain elements radiate \_\_\_\_\_ rays, beta particles, and \_\_\_\_\_ particles in order to become stable. \_\_\_\_\_ are high energy electromagnetic waves. \_\_\_\_\_ particles are electrons, and alpha particles are helium nuclei. When these particles are emitted, the nucleus converts into a stable nucleus. This is called \_\_\_\_\_.

**2)** The three types of radioactive emissions are called alpha ( $\alpha$ ), beta ( $\beta$ ) and gamma ( $\gamma$ ) radiation. Complete the table below with the correct information about each type.

	Charge	Atomic Symbol	Can Be Stopped By
Alpha			
Beta			
Gamma			

**3)** Which of the three radioactive emissions ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) best fit the following statements? Write the correct symbol/s on the lines.

- These emissions are charged. \_\_\_\_\_
- This emission is the most massive (heaviest). \_\_\_\_\_
- This emission is the most charged. \_\_\_\_\_
- This emission is most dangerous outside of the body. \_\_\_\_\_
- This emission is stopped by thin paper or a few centimeters of air. \_\_\_\_\_
- This emission can travel through paper, but is stopped by aluminum. \_\_\_\_\_
- This emission can travel through fairly thick lead. \_\_\_\_\_

**4)** What is an alpha particle?

- a) A fast moving proton b) A helium nucleus c) A fast moving electron

**5)** What is a beta particle?

- a) A fast moving neutron b) A helium nucleus c) A fast moving electron

**6)** Alpha, beta and gamma radiation come from:

- The nucleus of an unstable atom
- The electron shells of an atom
- The nucleus of a stable atom

**7)** What changes when a radioactive substance decays?

- a) It goes mouldy b) It gives off heat c) It gives out nuclear radiation

**8)** How does the activity of a radioactive source change over time?

- a) It decreases with time b) It stays constant c) It increases with time

**9)** A Geiger counter records 5000 counts in 25 s. What is its activity?

- a) 12000 Bq b) 200 Bq c) 5000 Bq

**10)** A radioactive source has a half-life of 30 minutes. How much remains after one hour?

- a) 50% b) 25% c) 12.5%

- 11) Which of the following radiation is an electromagnetic wave?  
 a) Alpha b) Beta c) UV
- 12) Which of the following radiation is not an electromagnetic wave?  
 a) Infrared b) Visible Light c) microwave d) gamma e) Alpha
- 13) Which of the measurement unit is not relevant to radioactivity?  
 a) Gray b) Sievert c) Rad d) Rem e) Curie d) Tesla

14)

A radioactive source emits  $\alpha$ ,  $\beta$  and  $\gamma$  radiations in a beam as shown.

Radioactive source      Sheet of paper      5 mm aluminium

The main radiation(s) in the beam at **X** and **Y** are

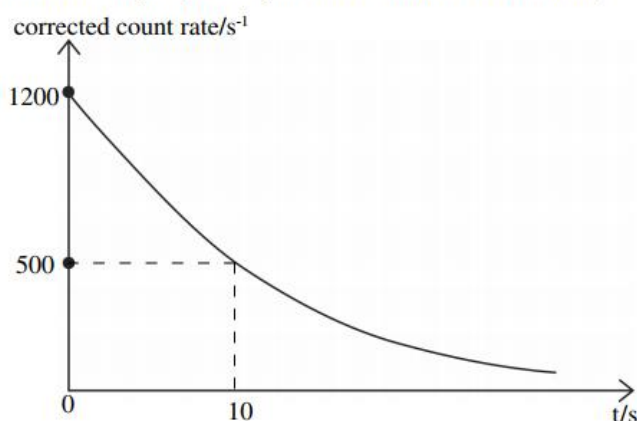
	Position X	Position Y
A	$\alpha$ and $\beta$	$\beta$
B	$\beta$ and $\gamma$	$\beta$
C	$\alpha$ and $\gamma$	$\gamma$
D	$\alpha$ and $\beta$	$\alpha$
E	$\beta$ and $\gamma$	$\gamma$

A graph of activity against time for a sample of one of the fission products is shown below.

(i) From the graph, determine the half life of the fission product.

(ii) A scientist states that the sample will be safe only when the activity falls to 120 kBq. How long will it take for the activity to fall to this level?

The sketch graph shows the corrected count rate measured for the decay of a radioactive sample (the sample-detector distance is constant):



- (a) At time  $t=0s$ , what factors will affect the count-rate measured? (3)
- (b) If the count-rate is  $1200s^{-1}$  at  $t=0s$ , and is  $500s^{-1}$  after 10s, find the decay constant for the radioactive isotope. (2)
- 15) (c) What is the half-life of this isotope? (1)