

1Q. How do nuclear reactions differ from chemical reactions?

1A. nuclear reactions involve the nucleus breaking apart or recombining (protons or neutrons). chemical rxns involve the exchange or sharing of electrons

2Q. What is
radioactive decay?

2A. When the nucleus of
an atom spontaneously
breaks down.

3Q. What is an alpha particle? (mass, identity, charge)

3A. An alpha particle is the nucleus of a helium atom. It has 2 p^+ , and 2 n^0 , It has a charge of 2^+

4Q. How does a beta particle compare to an alpha particle?

4A. A beta particle is a high speed electron. It has no mass, no protons or neutrons. It has a charge of $1-$

5Q. How does a gamma ray compare to both alpha and beta particles?

5A. A gamma ray is not a particle. It has no mass and no charge. It is a burst of energy that accompanies nuclear events. It can ionize other chemicals (dangerous).

6Q. A beta particle is released when?

6A. When a neutron spontaneously decays into an electron (beta particle) and a proton.

7Q. When is the nuclear ratio of p^+ to n^0 in a perfect 1:1 balance?

7A. When the mass of the atom is 20 amu or less!

8Q. At what atomic number and above are all elements radioactive?

8A. Atomic number
83.

9Q. The strongest force in the universe (the one that holds together p^+ and n^0 is referred to as the . . . ?

9A. The strong nuclear
force.

10Q. Which of the three forms of radiation penetrates other material the lowest?

10A. alpha particles

11Q. What is a fancy
name for a radioactive
isotope?

11A. Radioisotope

12Q. What piece of equipment is used to detect the by-products of radioactive decay?

12A. A Geiger Counter

13Q. What is the definition of a half-life?

13A. One half-life is the time required for 50% of a radioactive sample to decay.

14Q. The process used to describe two hydrogen nuclei fusing together to form helium.

14A. fusion

15Q. If a scientist splits an atom, they are initiating what kind of process?

15A. Fission

16Q. An atomic bomb is
an example of nuclear
_____?

16A. Fission

17Q. The sun makes its energy from the process of nuclear _____.

17A. fusion

18Q. After 91 days a 50.0000 g sample of Scandium-42 contains 0.3906 g. What is the length of its half-life?

18A. 13 days

19Q. Describe two things that JJ Thompson's cathode ray experiments revealed.

19A.

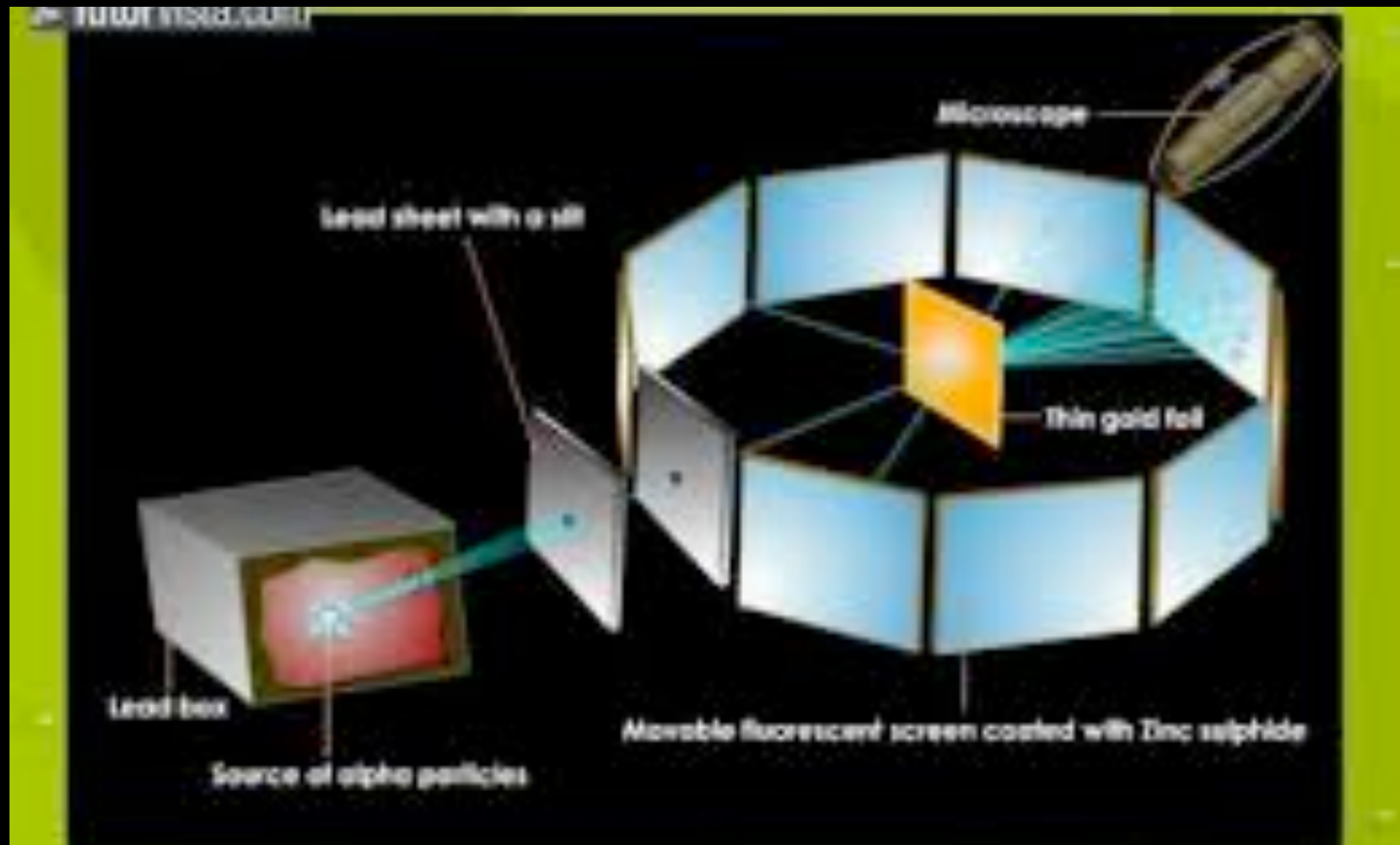
1. Cathode rays are electrons
2. Electrons are negatively charged
3. Electrons have magnetic properties

20Q. Name two
outcomes of Millikan's Oil
Drop Experiment

20A.

1. The charges on an oil droplet were in multiples of single electron charges.
2. The charge of an electron was determined
(1.60×10^{-19} coulombs)
3. The mass of an electron was determined to be
 $9.1095 \times 10^{-28}\text{g}$

21Q. Create a diagram that describes how Rutherford set-up his gold foil experiment.
Terms to use: Au foil, alpha particles, Pb box, Pb slit filter, photographic film



21A.

22Q. WHAT DID THE
RESULTS OF RUTHERFORD'S
EXPERIMENT DETERMINE?

22A. It determined that the majority of the mass of an atom exists in the nucleus (p^+ and n^0). The rest of the atom is mostly empty space.

23Q.

For a $2+$ ion of Dy-163
66

How many protons, neutrons and electrons
are there?

23A.

There are 66 p+, 97 n0
and 64 e's

24Q.

Name the five postulates
of Dalton's Atomic Theory.

24A.

1. elements are composed of atoms
2. All atoms of an element are identical
3. In chemical reactions atoms are not changed into other atoms
4. Atoms are not created or destroyed in rxns
5. Compounds are formed when elements combine.

25Q. Of the 5 postulates, which one of Dalton's statements are now known to be untrue (and why)?

25A. All atoms of an element are not identical. Isotopes exist, which have differing numbers of neutrons.

26Q. Name five amazing facts about Marie Currie.

26A.

1. She was radioactive
2. She discovered radioactivity
3. She was the first woman to win a Nobel prize
4. She is the only woman ever to win 2 Nobel prizes.
5. She discovered Polonium and Radium
6. She melted down her Nobel prizes to help people.

27Q. Draw out the alpha decay of
Tc-98
43

27A.

Have students draw
answer on the board.

28Q. Draw out the beta
decay of Ir-192

77

28A. Have students draw
out answer on board.

29Q. What are two
positive associations with
nuclear power?

29A.

1. Nuclear power produces no greenhouse gas.
2. Nuclear power can be used to produce power when the coal burning plants are at capacity.

30Q. What are three
negatives associated with
nuclear power?

30A.

1. Nuclear power creates nuclear waste.
2. Nuclear waste can produce plutonium (nuclear bombs)
3. Destructive mining is needed to get Uranium
4. Uranium plants are very expensive
5. Human errors and natural disasters can lead to nuclear fuel rods melting down.

31Q. Name two positive things about the potential of using nuclear fusion as an energy source.

31A.

1. Fusion requires H as a fuel (in all water)
2. The by-product of $H + H$ fusion is He

32Q. Why can't a fusion reactor operate right now?

32A. Temperatures greater than one million degrees celcius are required. At these temps everything is plasma (ionized gas). No current material can contain plasma.

[In the future large electromagnets could contain the ionized gas].

