NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ GRADED: NUCLEAR APPLICATIONS

Directions: Using your notes, your friends and your brain, complete each of the following.

For questions 1-4 complete the matching column. A choice from COLUMN B may be **used only once**, or it may not be used at all. Select the BEST answer. Place the letter of Column B next to the number of column A

COLUMN A COLUMN B

1 used to split heavy atoms in a a)

fission reaction

2 the primary **product** of a **fusion** reaction b)

3 a nucleus used as fuel for a fission c)

reaction

4 could be a **reactant** for a **fusion** reaction d)

e)

For questions 5-9 complete the matching column. A choice from COLUMN B may be used only once.

COLUMN A COLUMN B

5 → \_\_\_\_ + a) an example of a beta decay

6 Half-life period b) an example of an artificial transmutation

7 → + c)



8 the symbol for a proton d)

9 + → + 2  e) the time for one half of the mass of a

radioactive sample to transmute

FOR QUESTIONS 10 - 20 USE THE FOLLOWING TERMS

a) FISSION, ONLY b) FUSION, ONLY c) BOTH FISSION AND FUSION

10 Used in the Atomic Bomb

11 Produces energy

12 Helium is a major product

13 Considered to be a nuclear reaction

14 Uses hydrogen isotopes as fuel

15 Occurs at a nuclear power plant

16 The term, "nuclear chain reaction" applies

17 Cannot yet be controlled

18 Uses a uranium isotope for fuel

19 Slow neutron capture or neutron bombardment is used to start the reaction

20 The energy producing nuclear reaction occurring in the Sun

Using the following choices, identify the primary thrust of each passage. The following passages deal with :

a) the processes associated with fission, **primarily**

b) the processes associated with fusion, **primarily**

c) concept(s) **not** really associated primarily with nuclear fission or nuclear fusion

21 This process, which occurs in the sun and the stars, is a process of transforming matter into energy. If we can

harness this process on Earth, it opens the way to assuring that future generations will not want for energy.

22 The reason why fuel supplies would not be endangered is because the fuels are rich in energy and so only

small amounts are needed, relative to traditional fuels like coal and oil. One gram of a such a fuel could

generate 100,000 kilowatt-hours of energy. About 8 tons of coal must be burned to achieve this output of

energy. The most common fuel for this process would be a mixture of deuterium and tritium, which are

isotopes of hydrogen.

23 Natural radiation exposure varies throughout the country. Due to the higher elevation and the presence of

radioactive materials, the increased exposure of the residents of the State of Colorado to natural radiation

amounts to the equivalent of about four chest x-rays per year.

24 Enrico Fermi demonstrated on December 2,1942 that piling blocks of graphite, which contained lumps of a

special fuel, resulted in a self-sustaining nuclear reaction. Although the power level was only a few watts,

the experiment demonstrated that a nuclear reaction could generate heat in a controlled manner. Fermi's

experiment is the foundation of today’s nuclear power industry.

25 An unborn child is vulnerable to many consequences of the mother's activities. That is why a pregnant

woman should take care that she has proper nutrition and healthy habits for her baby's development. If

your doctor advises an x-ray, be sure he or she knows if you are pregnant or suspect you may be pregnant.

One reason why the fetus is so sensitive to radiation is that this is a period of rapid growth and cell

Using the following choices, identify the primary thrust of each passage. The following passages deal with :

a) the processes associated with fission, **primarily**

b) the processes associated with fusion, **primarily**

c) concept(s) **not** really associated primarily with nuclear fission or nuclear fusion

26 On August 2, 1939, Albert Einstein sent a letter to President Roosevelt

"Some recent work...leads me to expect that the element uranium may be turned into a new and important

source of energy in the immediate future...that it may become possible to set up a nuclear chain reaction in

a large mass of uranium, by which vast amounts of power and large quantities of new radium-like

elements would be generated.... This new phenomenon would also lead to the construction of bombs, and

it is conceivable -- though much less certain -- that extremely powerful bombs of a new type may thus be

constructed. A single bomb of this type...might very well destroy the whole port together with some of the

surrounding territory."

Einstein drafted the letter with the help of Hungarian physicist Leo Szilard, one of many scientists who

had fled Europe to escape Nazi and Fascist repression. Szilard was a vocal advocate of a U.S. program to

develop bombs based on the latest findings in nuclear physics. In the letter, they encouraged Roosevelt to

fund American atomic research. This letter prompted Roosevelt to form a special committee to investigate

the military implications of atomic research. Roosevelt approved uranium research in the United States in

October 1939. This was the first decision among many that led to establishment of the Manhattan Project

27 Edward Teller had begun theoretical work on the hydrogen bomb at Los Alamos Scientific Laboratory during

World War II. After the war, he lobbied scientists, congressmen, the military, and the AEC to begin work

on the hydrogen bomb. The General Advisory Committee of the AEC, chaired by Robert Oppenheimer,

condemned the H-bomb on moral grounds as a "weapon of genocide." The committee also believed that

developing the H-bomb would lead the United States into an arms race with the Soviet Union. The AEC

and the President's advisors, however, were undecided.

28 In January 1950, President Truman summoned his advisors and asked them one question, "Can the Soviets

do this?" His advisors believed the Soviets could eventually develop a hydrogen bomb, and Truman decided

to go ahead with its development. This decision triggered the establishment and/or expansion of three U.S.

sites: Savannah River Plant, Los Alamos Scientific Laboratory, and Lawrence Livermore Laboratory. The

United States exploded the H-bomb in November 1952 at the Eniwetok Atoll in the Pacific.

29 On July 17, 1955, Arco, Idaho became the first U.S. town to be powered by nuclear energy. The

demonstration lasted for one hour in the 1,350-person community. The National Reactor Testing Station,

now called the Idaho National Engineering Laboratory, supplied the power from its Borax-III reactor. It

was part of the Atomic Energy Commission's (AEC) Five-Year Reactor Development Program in the

mid-1950's. The AEC tested five types of experimental reactors. The Borax-III was an early prototype of

a boiling water reactor, a type of reactor, which still produces electricity for utilities today.

30 Natural decays are generally recognized by having a single reactant, capable of breaking apart with no

outside force causing the decay.