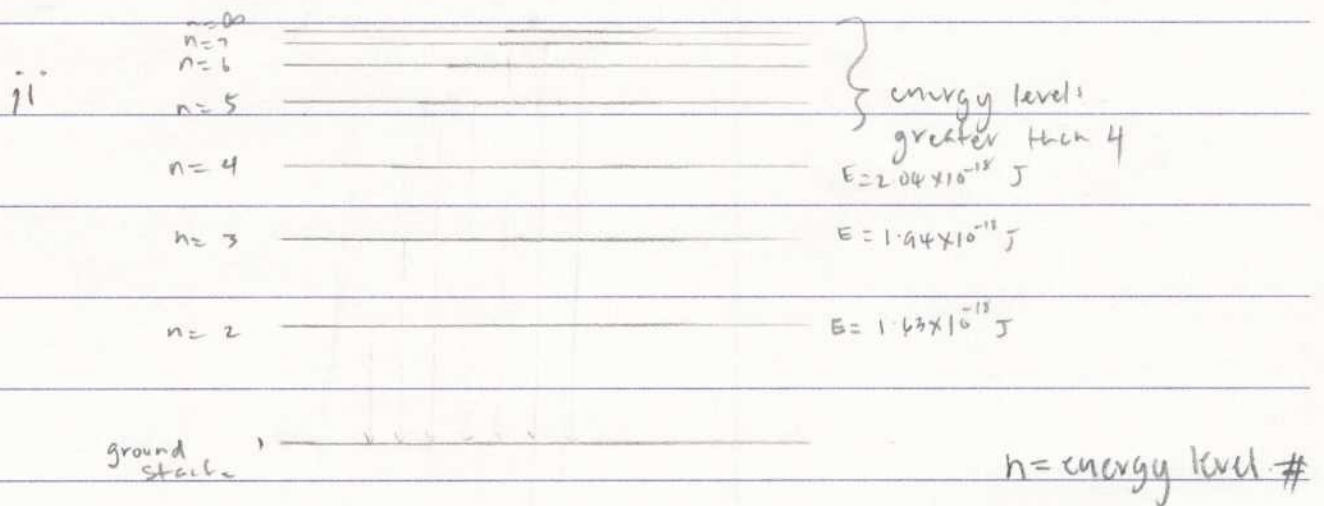


30 a i a ~~nucleus~~ nucleus consists of protons and neutrons ii a particle within the nucleus.

ii ~~nucleus~~ nucleons are protons and neutrons. Protons have a positive charge while neutrons have no charge.

b. i $2.04 \times 10^{-18} - 1.94 \times 10^{-18} = 1 \times 10^{-19} \text{ J}$



c. - get variable sources of radiation: Alpha, beta and gamma emitters.

- wear protective lead suit to avoid radiation from getting onto body.

- get number of known materials of known thickness.

- arrange alpha emitter in front of first material then use scintillation counter to ~~check~~ ^{measure} amount of radiation passed through material.
- repeat step for other material keeping a record of ~~radioactivity~~ radiation passed through material.
- use other radioactive substances so can check penetrating power of other types of radiation, namely gamma and beta.
- extra circuit needed with gamma radiation because of its ~~ex~~ wave nature and subsequent high penetrative strength.

- d. - the Manhattan Project had an enormous effect on society, not only because of its immense power for ~~destroying~~ destruction (and the power and security associated with it) but also because its killing power.
- Atomic bombs during World War II and at present are fighting machines aimed to kill thousands and thousands of people.

2 For the enemies of war (Japan in this case) fear was all ~~so~~ the society could feel. the fear of being terminated.

- In Japan, after Pearl Harbour, the first military use of the atomic bomb killed thousands of civilians but also stopped the war. Although this was successful in the eyes of the Americans society had taken a ^{sharp} turn.

We were now capable of destruction large enough to wipe out whole races and countries. The concept itself of something so powerful sent shudders ~~down~~ ^{down} society's back.

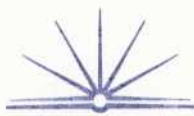
But it also provided ^{society} a sense of security and power which was ~~quite~~ extremely important at the time.

e.g. Chadwick's discovery of the neutron as well as Fermi's contribution of nuclear fission led to a greater understanding of the atom. It allowed ~~for the deepening~~ scientists to probe matter

into levels that had never been thought of before.

The discovery of neutrons gave us a more in-depth analysis of what comprises the atom. More specifically what the nucleus was made of. This opened huge gates into the use of neutrons to do other ~~more~~ experiments. Neutron scattering for instance is a method used to determine the structure and properties of a material with the use of neutrons. This provided analysis of materials that were considered 'impossible' at one time.

Chadwick demonstrated the existence of the neutron by the following experiment. He bombarded beryllium with alpha particles and noticed a strong uncharged radiation emerging from it. ~~The~~ Analysis showed that it was not gamma radiation. This radiation was then bombarded into paraffin (rich in protons) and alpha particles emerged from the block of paraffin. By the application of laws of energy and conservation

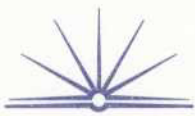


of momentum Chadwick ~~constructed~~ ~~that~~ proved the existence of the neutron.

Fermi's contribution to the ^{greater} understanding of the atom involved nuclear fission and the subsequent formation of new-before-seen particles. This led to a number of advances in various fields such as military ~~and~~ scientific and atomic fields.

This experiment demonstrated that elements could be broken ^{with force} ~~and split~~ into smaller ~~comp~~ sub divisions. The bombarding of atoms with neutrons produced new atoms ~~with~~ with different radioactive and mechanical properties. It also demonstrated the strength of the bonds between the atomic particles - protons, neutrons, electrons - giving us a greater understanding of the enormous powers involved with ~~some~~ particles within the atom.

Another important factor of Chadwick's experiment was the implications of the particles held within the atom. His experiment ~~gave us~~



demonstrated that the atom could be split.

In this way Chadwick and Fermi provided experiments and a subsequent understanding of the atom. The application of neutrons and nuclear fission has given us a deeper analysis of ~~the~~ what an atom is and how it works.