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| Week | | Topic | Student activities | Assessment |
| 1 | Tu4 | 27.9: The modern structure of the atom  27.10 mass defect and binding energy  28.1: The Atomic Age  28.2: Properties of Nuclear Radiation | Reading  Note-taking  Completing set exercises |  |
|  | Tu7 | 28.3: Detecting radiation  28.4: Nuclear stability & decay  28.5: Types of Decay |  |
| Tu8 |
|  | Th1 | 28.6: Half-Life  28.7: Laws of radioactive decay |  |
| 2 | Tu4 | 28.8: Analysis of experimental data | Reading  Note-taking  Completing set exercises |  |
|  | Tu7 | 28.9: transmutations by nuclear reaction  28.10 Nuclear fission and fusion  28.11: nucleus as a source of power |  |
| Tu8 |
|  | Th1 | 28.12: nuclear fission reactors  28:13 nuclear waste products  28:14; nuclear fusion |  |
| 3 | Tu4 | Discussion of ERT | Reading  Note-taking  Completing set exercises | Hand out tasksheet  (can issue earlier once approved) |
|  | Tu7 | 28:15: biological effects of radiation  28.16: measuring radiation – dosimetry  28.17: radiation risks to your health  28.18: applications of nuclear technology |
| Tu8 |
|  | Th1 |  | ***Research*** |
| 4 | Tu4 |  | ***Research*** |  |
|  | Tu7 |  | ***Research*** |  |
| Tu8 |
|  | Th1 |  | ***Research*** |  |
| 5 | Tu4 |  | ***Research*** |  |
|  | Tu7 |  | ***Research*** |  |
| Tu8 |
|  | Th1 |  |  | ERT due |
| 6 | Tu4 |  |  |  |
|  | Tu7 |  |  | EXIT results due |
| Tu8 |
|  | Th1 |  |  |  |

Term 4 - 11/12 Physics

**NUCLEAR PHYSICS**

This term is critical for many of you to maintain your result or to raise it to a Sound overall.

We have a lot of ideas to cover about nuclear physics. I have outlined the concepts and activities on the following pages. You will work through these and cross them off as you complete them. I will teach the hard concepts in class but you will have to

* READ
* TAKE NOTES and
* DO QUESTIONS

As you go through these concepts, many ideas about what interests you for your research assignment will come up. Make sure you note these ideas. Keep a journal at the back of your exercise book of possible ideas.

You will notice there are a lot of calculations that can be done to support an idea.

***A Physics ERT MUST CONTAIN CALCULATIONS, supporting DATA, TABLES, DIAGRAMS & FIGURES***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Week/Day | NEW CENTURY PHYSICS REFERENCE | Read | Define | Questions |
| W1 Tues | 27.9: The modern structure of the atom  ***REVISION*** |  | Draw diagram of atom (proton, neutron, electron, nucleus)  Atomic number; nuclides; nucleons  Copy table 27.1  Isotopes  Draw figure 27.17 and table 27.2  Draw figure 27.18  Table 27.3 isotopes of uranium | P 612  Q: 12, 13, 15 |
| 27.10 mass defect and binding energy |  | Write **bolded statement** p 612  amu  Mass defect; binding energy  *“The binding energy of a nucleus is....”*  Copy eg. P 613  Write sentence to explain figure 27.19 | P 614  Q: 17a and c  22 |
| 28.1: The Atomic Age |  | nil |  |
| 28.2: Properties of Nuclear Radiation |  | Ionising radiation; nuclear radiation  Explain figure 28.1 in your own words  Alpha particles  Beta particles  Gamma rays |  |
| 28.3: Detecting radiation |  | Fluorescence; electroscope; Geiger-Müller counter |  |
| 28.4: Nuclear stability & decay |  | Transmutation; strong force; n/p ratio  Positron  Copy Table 28.2  Copy grey box p 622  Read eg about radioactive decay | P 622  Q: 3, 4,  5 a b c d e f |
| 28.5: Types of Decay |  | Alpha decay – copy grey box  Beta decay – copy grey boxes  Positron decay – copy grey box  Stick into book copy of figure 28.7. This is a reference graph. | P 625  Q: 6, 7, 8, 9 |
| W1 Thurs | 28.6: Half-Life |  | Decay rate; half-life; Becquerel;  Study table 28.3 and figure 28.8  Note some half-lives from table 28.4  Do eg p 627  Stick in copy of uranium-lead decay series (this is important for nuclear energy from uranium sources) | P 630  Q: 10 |
| 28.7: Laws of radioactive decay |  | Disintegration constant  Exponential decay law | P 650  Q: 37 |
| W2 TUES | 28.8: Analysis of experimental data |  | Do example on p 631 – can we do it on calculator?  Explain radioactive dating | 13, 14,  15, 16 |
| 28.9: transmutations by nuclear reaction |  | Alpha bombardment – copy grey boxes  Deuteron bombardment – copy grey boxes (alchemy)  Neutron bombardment – copy grey box |  |
| 28.10 Nuclear fission and fusion |  | Define fusion and fission.  Fusion egs - Grey boxes p 634-635  Explain 1st, 2nd, 3rd gen neutrons in fission.  Define E=mc2  Write eg p 636 | 17, 18 |
| 28.11: nucleus as a source of power |  | Grey box p 638 – fission of U-235 |  |
| W2 Thurs | 28.12: nuclear fission reactors |  | Draw & label diagram p 638. Be ready to explain how it works.  Notes on fuel, enriched fuel, critical mass  Notes on moderator, multiplication factor, subcritical, supercritical, thermal neutrons, moderator  Notes on control rods, coolant, shielding, output,  Notes on FBR  Uncontrolled fission | Page 641  Activity 2  Write a paragraph |
| 28:13 nuclear waste products |  | Types of waste, disposal, storage | Write paragraphs about 2 nuclear reactor accidents |
| 28:14; nuclear fusion |  | Define fusion again  Grey box p 643  High temp fusion - Sun’s reaction grey box  Fusion reactors  Uncontrolled fusion – hydrogen bomb | P 644  Activity 28.6 Q1  Paragraph on Q 20 |
| W3 TUES | 28:15: biological effects of radiation |  | Dot points about what radiation can do in the body |  |
| 28.16: measuring radiation – dosimetry |  | Define absorbed dose  Dose equivalent |  |
| 28.17: radiation risks to your health |  | Copy table 28.10 p 646 | Perform activity 28.7 Q1 |
| 28.18: applications of nuclear technology |  | Choose 2 of:   * Food & medical irradiation * Industrial radiography * Neutron radiography * Gauging * Neutron activation analysis * Neutron transmutation doped silicon * Smoke detectors * Carbon dating   Note Chapter 33 is also relevant (medical applications) | End of chapter questions |