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| --- | --- | --- | --- |
| Week | Topic | Student activities | Assessment |
| 1 | Tu4 | 27.9: The modern structure of the atom27.10 mass defect and binding energy28.1: The Atomic Age28.2: Properties of Nuclear Radiation | ReadingNote-takingCompleting set exercises |  |
|  | Tu7 | 28.3: Detecting radiation28.4: Nuclear stability & decay28.5: Types of Decay |  |
| Tu8 |
|  | Th1 | 28.6: Half-Life28.7: Laws of radioactive decay |  |
| 2 | Tu4 | 28.8: Analysis of experimental data | ReadingNote-takingCompleting set exercises |  |
|  | Tu7 | 28.9: transmutations by nuclear reaction28.10 Nuclear fission and fusion28.11: nucleus as a source of power |  |
| Tu8 |
|  | Th1 | 28.12: nuclear fission reactors28:13 nuclear waste products28:14; nuclear fusion |  |
| 3 | Tu4 | Discussion of ERT | ReadingNote-takingCompleting set exercises | Hand out tasksheet(can issue earlier once approved) |
|  | Tu7 | 28:15: biological effects of radiation28.16: measuring radiation – dosimetry28.17: radiation risks to your health28.18: 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; nucleonsCopy table 27.1IsotopesDraw figure 27.17 and table 27.2Draw figure 27.18Table 27.3 isotopes of uranium | P 612Q: 12, 13, 15 |
| 27.10 mass defect and binding energy |  | Write **bolded statement** p 612amuMass defect; binding energy*“The binding energy of a nucleus is....”*Copy eg. P 613Write sentence to explain figure 27.19 | P 614Q: 17a and c22 |
| 28.1: The Atomic Age |  | nil |  |
| 28.2: Properties of Nuclear Radiation |  | Ionising radiation; nuclear radiationExplain figure 28.1 in your own wordsAlpha particlesBeta particlesGamma rays |  |
| 28.3: Detecting radiation |  | Fluorescence; electroscope; Geiger-Müller counter |  |
| 28.4: Nuclear stability & decay |  | Transmutation; strong force; n/p ratioPositronCopy Table 28.2 Copy grey box p 622Read eg about radioactive decay | P 622Q: 3, 4, 5 a b c d e f |
| 28.5: Types of Decay |  | Alpha decay – copy grey boxBeta decay – copy grey boxesPositron decay – copy grey boxStick into book copy of figure 28.7. This is a reference graph. | P 625Q: 6, 7, 8, 9 |
| W1 Thurs | 28.6: Half-Life |  | Decay rate; half-life; Becquerel;Study table 28.3 and figure 28.8Note 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 630Q: 10 |
| 28.7: Laws of radioactive decay |  | Disintegration constantExponential decay law | P 650Q: 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 boxesDeuteron 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 634-635Explain 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 massNotes on moderator, multiplication factor, subcritical, supercritical, thermal neutrons, moderatorNotes on control rods, coolant, shielding, output, Notes on FBRUncontrolled 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 againGrey box p 643High temp fusion - Sun’s reaction grey boxFusion reactorsUncontrolled fusion – hydrogen bomb | P 644Activity 28.6 Q1Paragraph 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 doseDose 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 |