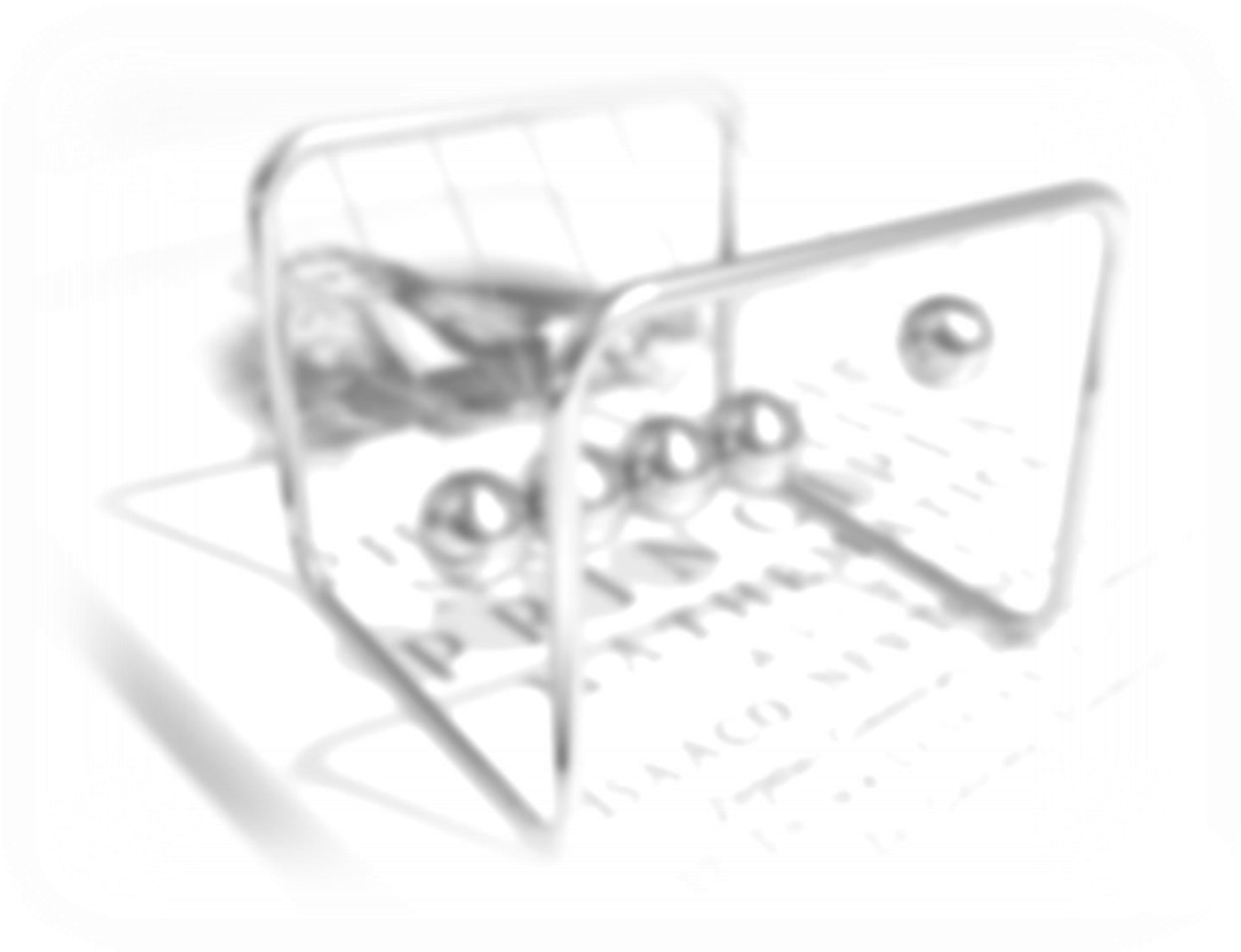
Name:

PHYSICS

Topics 6 & 7

LEARNING OUTCOMES



Maintain a record of your progress

Use the booklet to guide revision

Close the Gap

Contemporary record of the Topics / Learning outcomes that I am finding toughest:

Topic 6 - Radioactivity

6.1	Describe an atom as a positively charged nucleus, consisting of protons and neutrons, surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with almost all of the mass in the nucleus	☹ 😐 ☺
6.2	Recall the typical size (order of magnitude) of atoms and small molecules	☹ 😐 ☺
6.3	Describe the structure of nuclei of isotopes using the terms atomic (proton) number and mass (nucleon) number and using symbols in the format using symbols in the format $^{13}_{6}C$	☹ 😐 ☺
6.4	Recall that the nucleus of each element has a characteristic positive charge, but that isotopes of an element differ in mass by having different numbers of neutrons	☹ 😐 ☺
6.5	Recall the relative masses and relative electric charges of protons, neutrons, electrons and positrons	☹ 😐 ☺
6.6	Recall that in an atom the number of protons equals the number of electrons and is therefore neutral	☹ 😐 ☺
6.7	Recall that in each atom its electrons orbit the nucleus at different set distances from the nucleus	☹ 😐 ☺
6.8	Explain that electrons change orbit when there is absorption or emission of electromagnetic radiation	☹ 😐 ☺
6.9	Explain how atoms may form positive ions by losing outer electrons	☹ 😐 ☺
6.10	Recall that alpha, β– (beta minus), β+ (positron), gamma rays and neutron radiation are emitted from unstable nuclei in a random process	☹ 😐 ☺
6.11	Recall that alpha, β– (beta minus), β+ (positron) and gamma rays are ionising radiations	☹ 😐 ☺
6.12	Explain what is meant by background radiation	☹ 😐 ☺
6.13	Describe the origins of background radiation from Earth and space	☹ 😐 ☺
6.14	Describe methods for measuring and detecting radioactivity limited to photographic film and a Geiger–Müller tube	☹ 😐 ☺
6.15	Recall that an alpha particle is equivalent to a helium nucleus, a beta particle is an electron emitted from the nucleus and a gamma ray is electromagnetic radiation	☹ 😐 ☺
6.16	Compare alpha, beta and gamma radiations in terms of their abilities to penetrate and ionise	☹ 😐 ☺
6.17	Describe how and why the atomic model has changed over time including reference to the plum pudding model and Rutherford alpha particle scattering leading to the Bohr model	☹ 😐 ☺
6.18	Describe the process of β– decay (a neutron becomes a proton plus an electron)	☹ 😐 ☺
6.19	Describe the process of β+ decay (a proton becomes a neutron plus a positron)	☹ 😐 ☺
6.20	Explain the effects on the atomic (proton) number and mass (nucleon) number of radioactive decays (α, β, γ and neutron emission)	☹ 😐 ☺

6.21	Recall that nuclei that have undergone radioactive decay often undergo nuclear rearrangement with a loss of energy as gamma radiation	☹ 😐 ☺
6.22	Use given data to balance nuclear equations in terms of mass and charge	☹ 😐 ☺
6.23	Describe how the activity of a radioactive source decreases over a period of time	☹ 😐 ☺
6.24	Recall that the unit of activity of a radioactive isotope is the Becquerel, Bq	☹ 😐 ☺
6.25	Explain that the half-life of a radioactive isotope is the time taken for half the undecayed nuclei to decay or the activity of a source to decay by half	☹ 😐 ☺
6.26	Explain that it cannot be predicted when a particular nucleus will decay but half-life enables the activity of a very large number of nuclei to be predicted during the decay process	☹ 😐 ☺
6.27	Use the concept of half-life to carry out simple calculations on the decay of a radioactive isotope, including graphical representations	☹ 😐 ☺
6.29	Describe the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions needed	☹ 😐 ☺
6.31	Explain the precautions taken to ensure the safety of people exposed to radiation, including limiting the dose for patients and the risks to medical personnel	☹ 😐 ☺
6.32	Describe the differences between contamination and irradiation effects and compare the hazards associated with these two	☹ 😐 ☺

Topic 7 - Astronomy

7.1	Explain how and why both the weight of any body and the value of g differ between the surface of the Earth and the surface of other bodies in space, including the Moon	
7.2	Recall that our Solar System consists of the Sun (our star), eight planets and their natural satellites (such as our Moon); dwarf planets; asteroids and comets	
7.3	Recall the names and order, in terms of distance from the Sun, of the eight planets	
7.4	Describe how ideas about the structure of the Solar System have changed over time	
7.5	Describe the orbits of moons, planets, comets and artificial satellites	
7.6	Explain for circular orbits how the force of gravity can lead to changing velocity of a planet but unchanged speed	
7.7	Explain how, for a stable orbit, the radius must change if orbital speed changes (qualitative only)	
7.8	Compare the Steady State and Big Bang theories	
7.9	Describe evidence supporting the Big Bang theory, limited to red-shift and the cosmic microwave background (CMB) radiation	
7.10	Recall that as there is more evidence supporting the Big Bang theory than the Steady State theory, it is the currently accepted model for the origin of the Universe	
7.11	Describe that if a wave source is moving relative to an observer there will be a change in the observed frequency and wavelength	

7.12	Describe the red-shift in light received from galaxies at different distances away from the Earth	
7.13	Explain why the red-shift of galaxies provides evidence for the Universe expanding	
7.14	Explain how both the Big Bang and Steady State theories of the origin of the Universe both account for red-shift of galaxies	
7.15	Explain how the discovery of the CMB radiation led to the Big Bang theory becoming the currently accepted model	
7.16	Describe the evolution of stars of similar mass to the Sun through the following stages: a nebula b star (main sequence) c red giant d white dwarf	
7.17	Explain how the balance between thermal expansion and gravity affects the life cycle of stars	
7.18	Describe the evolution of stars with a mass larger than the Sun	
7.19	Describe how methods of observing the Universe have changed over time including why some telescopes are located outside the Earth's atmosphere	

Notes:

You must know, and be able to use, these equations:

wave velocity = frequency x wavelength

$v = f \times \lambda$

metres per second (m/s) = hertz (hz) x metres (m)

wave velocity = distance / time

$v = x / t$

metres per second (m/s) = metres (m) / seconds (s)