Year 11 ATAR Physics Checklist + Revision Exercises 2019

Linear Motion:

- Distinguish between scalar and vector quantities, and *add and subtract vectors in one dimension*
  Hamper p. 36
  WACE Study Guide pp. 89-92
- uniformly accelerated motion is described in terms of relationships between measurable scalar and vector quantities, including displacement, speed, velocity and acceleration —this includes *applying the relationships*:

$$v_{av} = \frac{s}{t}, \qquad a = \frac{v - u}{t}, \quad v = u + at, \quad s = ut + \tfrac{1}{2}at^2, \quad v^2 = u^2 + 2as$$

  Hamper p. 37-48
  WACE Study Guide pp. 93-95
  Exploring Physics Set 14: 14.2, 14.4, 14.6, 14.8; Set 15: 15.1; 15.4, 15.8, 15.10, 15.11, 15.14, 15.16
- representations, including graphs, vectors, and equations of motion, can be used qualitatively and quantitatively to describe and predict linear motion

  Hamper p. 37-48
  WACE Study Guide pp. 84-97

- vertical motion is analysed by assuming the acceleration due to gravity is constant near Earth's surface

  Hamper p. 44-45 – but do <u>not</u> use the value of 9.81 m s^{-2}; the value for g on your data sheet is 9.80 m s^{-2}
  WACE Study Guide pp. 99-100
- Newton's three Laws of Motion describe the relationship between the force or forces acting on an object, modelled as a point mass, and the motion of the object due to the application of the force or forces

  Hamper p. 56,61-69
  WACE Study Guide pp. 103-108, 112-113
  Exploring Physics Set 16: 16.6, 16.8, 16.10, 16.12, 16.14
- free body diagrams show the forces and net force acting on objects, from descriptions of real-life situations involving forces acting in one or two dimensions

  This includes applying the relationships

$$\text{resultant } F = ma, \qquad F_{weight} = m\,g$$

  Hamper p. 52-60
  WACE Study Guide p. 116-117 (not good on free body diagrams)
  Exploring Physics Set 16: 16.1, 16.3, 16.5
- momentum is a property of moving objects; it is conserved in a closed system and may be transferred from one object to another when a force acts over a time interval

  This includes applying the relationships

$$p = m\,v, \qquad \sum mv_{before} = \sum mv_{after}, \qquad m\,v - m\,u = \Delta p = F\,\Delta t$$

  Hamper p. 61-62
  WACE Study Guide pp. 106-111,114-116
  Exploring Physics Set 17: 17.1, 17.3, 17.5, 17.8, 17.9, 17.10, 17.12, 17.15, 17.19, 17.22
- energy is conserved in isolated systems and is transferred from one object to another when a force is applied over a distance; this causes work to be done and changes the kinetic (E_k) and/or potential (E_p) energy of objects

  This includes applying the relationships

$$E_k = \tfrac{1}{2}m\,v^2, \qquad E_p = m\,g\,\Delta h, \qquad W = F\,s, \qquad W = \Delta E$$

  Hamper p. 69-72
  WACE Study Guide pp. 118-119
- collisions may be elastic and inelastic; kinetic energy is conserved in elastic collisions

  This includes applying the relationship

$$\sum \tfrac{1}{2}m\,v^2_{before} = \sum \tfrac{1}{2}m\,v^2_{after}$$

Hamper p. 82-83
WACE Study Guide p. 120
Exploring Physics Set 18: 18.1, 18.2, 18.3

- power is the rate of doing work or transferring energy

  This includes applying the relationship

$$P = \frac{W}{t} = \frac{\Delta E}{t} = F v_{av}$$

Hamper p. 84-85
WACE Study Guide pp. 121-123
Exploring Physics Set 18: 18.6, 18.8, 18.12, 18.13, 18.15, 18.19, 18.21

Science as a Human Endeavour:

Safety for motorists and other road users has been substantially increased through application of Newton's laws and conservation of momentum by the development and use of devices, including:

- helmets
- seatbelts
- crumple zones
- airbags
- safety barriers

WACE Study Guide has Linear Motion Review Questions pp. 124-128 and a Trial Test pp. 175-181

Waves

Science as a Human Endeavour

- Application of the wave model has enabled the visualisation of imaging techniques. These can include:
- medical applications, such as ultrasound
  Nelson p. 351
- geophysical exploration, such as seismology.
  Nelson pp. 347, 350
  WACE Study Guide pp. 141-142
- Noise pollution comes from a variety of sources and is often amplified by walls, buildings and other built structures. Acoustic engineering, based on an understanding of the behaviour of sound waves, is used to reduce noise pollution. It focuses on absorbing sound waves or planning structures so that reflection and amplification do not occur.
  Nelson p. 348

Science Understanding

- waves are periodic oscillations that transfer energy from one point to another
  WACE Study Guide pp. 130
  Hamper p. 150
  Heinemann Ch. 5.1, p. 184
  Nelson p. 313
  Exploring Physics Problem Set 19
- mechanical waves transfer energy through a medium; longitudinal and transverse waves are distinguished by the relationship between the directions of oscillation of particles relative to the direction of the wave velocity
  WACE Study Guide pp. 130-131
  Hamper p. 167,170-171
  Heinemann Ch. 5.1, pp. 184-187
  Nelson p. 313-322
  Exploring Physics Problem Set 19
- waves may be represented by displacement/time and displacement/distance wave diagrams and described in terms of relationships between measurable quantities, including period, amplitude, wavelength, frequency and velocity
  This includes applying the relationships

$$v = f \lambda , \qquad T = \frac{1}{f}$$

WACE Study Guide pp. 131-134
Hamper pp. 152, 154-155, 167-168, 170-171
Heinemann Ch. 5.1, pp. 188-191; 5.1 Questions p. 191
Nelson p. 313-322

Exploring Physics Problem Set 19

- the mechanical wave model can be used to explain phenomena related to reflection and refraction, including echoes and seismic phenomena
  WACE Study Guide pp. 137-142
  Hamper pp. 162-166, 172-175, 178, 186-189
  Heinemann Ch. 5.2, pp. 192-200; 5.2 Questions pp. 200-201
  Nelson p. 323-329; 368-379
  Exploring Physics Problem Set 20
- the superposition of waves in a medium may lead to the formation of standing waves and interference phenomena, including standing waves in pipes and on stretched strings
  This includes applying the relationships for
  strings attached at both ends and pipes open at both ends

$$\lambda = \frac{2\ell}{n}$$

  pipes closed at one end

$$\lambda = \frac{4\ell}{(2n-1)}$$

  WACE Study Guide pp. 143-149
  Hamper pp. 168-170, 176-177, 179-181
  Heinemann Ch. 5.3, pp. 201-203; 206-213; 5.3 Questions pp. 213-214
  Nelson p. 330-332; 334-341; 392-395
  Physics Problems (handout): Set 28 Beats & Resonating Air Columns including additional formula:
  $\lambda = 2(L_1 - L)$ – <u>not on data sheet</u>
  Exploring Physics Problem Set 20
- a mechanical system resonates when it is driven at one of its natural frequencies of oscillation; energy is transferred efficiently into systems under these conditions
  WACE Study Guide pp. 146
  Hamper pp. 465-470
  Heinemann Ch. 5.3, pp. 204-205;
  Nelson p. 322-333
  Exploring Physics Problem Set 20
- the intensity of a wave decreases in an inverse square relationship with distance from a point source
  This includes applying the relationship

$$I \propto \frac{1}{r^2}$$

  WACE Study Guide pp. 135-137
  Hamper p. 186
  Nelson p. 343

WACE Study Guide has Waves Review Questions pp. 150-156 and a Trial Test pp. 182-189