Linear Motion:

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

Pearson Physics 11 pp. 283-285

Science Understanding:

- Distinguish between scalar and vector quantities, and *add and subtract vectors in one dimension*
  Pearson Physics 11 Sections 6.1-6.3
  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*:

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

  Pearson Physics 11 Sections 7.1-7.4
  WACE Study Guide pp. 93-95
  Exploring Physics p. 141; 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

  Pearson Physics 11 Section 7.3
  WACE Study Guide pp. 84-97
- vertical motion is analysed by assuming the acceleration due to gravity is constant near Earth's surface

  Pearson Physics 11 Section 7.5
  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

  Pearson Physics Sections 8.3-8.5
  WACE Study Guide pp. 103-108, 112-113
  Exploring Physics p. 149-150; 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

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

  Pearson Physics 11 Section 8.7
  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

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

  Pearson Physics Sections 8.1, 8.2, 8.7
  WACE Study Guide pp. 106-111,114-116
  Exploring Physics pp. 160-161; 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

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

Pearson Physics 11 Section 9.1, 9.2, 9.4, 9.5
WACE Study Guide pp. 118-119
- collisions may be elastic and inelastic; kinetic energy is conserved in elastic collisions

    This includes applying the relationship

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

Pearson Physics 11 Section 9.3
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

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

Pearson Physics Section 9.6
WACE Study Guide pp. 121-123
Exploring Physics pp. 167-168; Set 18: 18.6, 18.8, 18.12, 18.13, 18.15, 18.19, 18.21

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

Waves:
<u>Science as a Human Endeavour:</u>
- Application of the wave model has enabled the visualisation of imaging techniques. These can include:
    - medical applications, such as ultrasound
      Pearson Physics 11 pp. 383-384
    - geophysical exploration, such as seismology.
      Pearson Physics 11 p. 355
      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.
  Pearson Physics 11 pp. 384-386

<u>Science Understanding:</u>
- waves are periodic oscillations that transfer energy from one point to another
  WACE Study Guide pp. 130
  Pearson Physics 11 Section 10.1
  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
  Pearson Physics 11 Section 10.1
  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
  Pearson Physics 11 Section 10.2
  Exploring Physics p. 180; 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
  Pearson Physics 11 Section 10.3

Exploring Physics p. 188-189; 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
  Pearson Physics 11 Sections 10.4, 10.5
  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
  Pearson Physics 11 pp. 364-365
  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

$$I \; \alpha \; \frac{1}{r^2}$$

  WACE Study Guide pp. 135-137
  Pearson Physics 11 pp. 380-382

General:
WACE Study Guide has Linear Motion Review Questions pp. 124-128 and a Trial Test pp. 175-18
WACE Study Guide has Waves Review Questions pp. 150-156 and a Trial Test pp. 182-189