

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE**

**A333/02/INS**

**PHYSICS A**

Unit 3: Ideas in Context plus P7 (Higher Tier)

**INSERT**

**Tuesday 7 June 2011  
Afternoon**

**Duration: 60 minutes**



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- This insert contains the article required to answer question 1.

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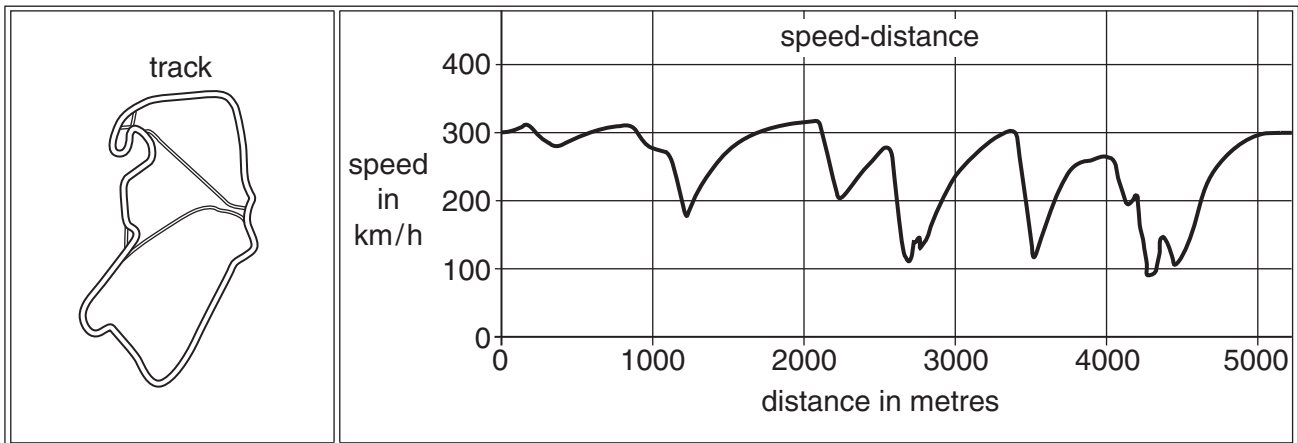
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## Telemetry in Motor Racing

Telemetry refers to the automatic measurement and transmission of data from a remote source. In motor racing this data includes vital information about engine performance, aerodynamic efficiency, oil pressure, tyre grip and brake wear, and how fast the car is travelling. This data is then transmitted securely, using radio and microwave technology, to the engineers in the pit lane. This data can then be analysed and used to calculate other quantities, for example momentum and kinetic energy.

The diagram below shows a small part of some telemetry recordings showing the speed of a racing car around a track.



Recently some Formula 1 teams have switched from analogue to digital systems for their radio connection with the racing car driver.

Telemetry has also proved very useful in improving the safety of motor sports. The main safety features of racing cars are designed structures that collapse in a crash, otherwise known as crumple zones. But by measuring the forces on the driver during crashes (using crash test dummies) new safety devices have been developed such as the HANS device (Head And Neck Support). The motor sport regulatory bodies have decided a HANS device must now be worn in nearly all races.

### HANS device

The HANS device fits snugly over the driver's shoulders. The tethers are attached to anchors on the helmet's sides using quick-release clips, and adjusted so that the driver can move his or her head enough to drive comfortably. Once the driver is seated in the car, the HANS device is attached to the seat belts so it cannot move.

During an impact the amount of helmet movement is controlled by these tethers. This dramatically reduces the energy absorbed by the driver's head and neck, and transfers the loading from the top of the spine to the forehead, which is far better suited to taking the force. It also helps to prevent the driver's helmet from hitting the steering wheel.

Tethers are attached from the HANS device to both sides of the driver's helmet.

