Answer

FORM 4
CHAPTER 2

Paper 1

1	A	**2**	D	**3**	B	**4**	A	**5**	B
6	B	**7**	C	**8**	C	**9**	D	**10**	B

Paper 2

Structured question

1 (a) ✓ Rate of change of displacement.

(b) From P to Q, the bus moves with a constant//uniform acceleration and its velocity increases from 0 to 20 m s^{-1} in 10 seconds.
From Q to R, the bus moves with constant//uniform deceleration and its velocity decreases from 20 m s^{-1} to 0 in 15 s.

(c) Total distance = Area under velocity-time graph

$$= \frac{1}{2}(25)(20)$$

$$= 250 \text{ m}$$

Average speed, $v = \dfrac{\text{Total distance}}{\text{Total time}}$

$$v = \frac{250 \text{ m}}{25 \text{ s}}$$

$$= 10.0 \text{ m s}^{-1}$$

2 (a) Impulsive force.

(b) The magnitude of the force on the athlete's leg will increase.
Impulsive force, $F = \dfrac{\text{Change in momentum}}{\text{Time of impact}}$ increases because the impact time decreases.

(c) Rate of change in momentum $= \dfrac{mv - mu}{t}$

$$= \frac{(52 \text{ kg})(7.0 \text{ m s}^{-1}) - (52 \text{ kg})(0)}{4.0 \text{ s}}$$

$$= 91.0 \text{ kg m s}^{-1} \text{ or } 91.0 \text{ N}$$

(d) The athlete can bend his leg to extend the time of impact.

Essay questions

3 (a) Impulsive force is an impact force which is produced in a short time when a collision occurs.

(b) Impulsive force, $F = \dfrac{mv - mu}{t}$

$$F = \frac{(0.22 \text{ kg})(45 \text{ m s}^{-1}) - (0.22 \text{ kg})(0)}{5 \times 10^{-3} \text{ s}}$$

$$F = 1980 \text{ N}$$

(c)
- The material is made from carbon fibre so it is lighter // low mass // does not break easily // stronger.
- The density of the head protector is low so it is low mass // lighter // easy to carry.
- The protective material is made from a hard foam sponge to stop the movement of the ball // capable of absorbing impulse forces.
- The thickness of the leg protector is thick to increase the impact time // reduce the impulsive force.
- Set Y was chosen because it has a carbon fibre bat, a low-density head guard, a hard foam left hand guard and a thick leg guard.

(d) Materials used:
- is lightweight // flexible // elastic to prevent injury.
- is strong // thicker to withstand impact // durable // not easy to break.

Safety airbags have:
- larger size to cover a larger area // bright colour for easy visibility // low mass for easy lifting.