General 2 2018 Q28e

Sophie is driving at 70 km/h. She notices a branch on the road ahead and decides to apply the brakes. Her reaction time is 1.5 seconds. Her braking distance (D metres) is given by $D = 0.01v^2$, where v is speed in km/h.

What is Sophie's stopping distance, to the nearest metre?　　　　　　3

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Solution
78 m

Blood Alcohol Content

Standard

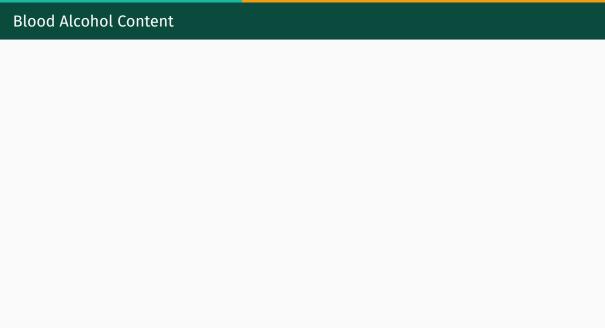MS-A1 Formulae and Equations
updated: 2021-01-26

Learning Outcome
Topic:
Blood Alcohol Content

Syllabus:
- calculate and interpret blood alcohol content (BAC) based on drink consumption and body weight
    - use formulae, both in word form and algebraic form, to calculate an estimate for blood alcohol content (BAC), including $BAC_{Male} = \dfrac{10N7.5H}{6.8M}$ and $BAC_{Female} = \dfrac{10N7.5H}{5.5M}$ where N is the number of standard drinks consumed, H is the number of hours of drinking, and M is the person's weight in kilograms.
    - determine the number of hours required for a person to stop consuming alcohol in order to reach zero BAC, eg using the formula $time = \dfrac{BAC}{0.015}$
    - describe the limitations of methods estimating BAC

Activities/Tasks:
- Cambridge Ex 3F Q1-11

Definition 1
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For example a BAC of 0.10 means there is 0.10 g of alcohol for every 100 mL of blood, or 1 g for every 1 L of blood.

Estimating BAC

BAC can be estimated using the following formulae:

Formula

$$BAC_{\text{Male}} = \frac{10N - 7.5H}{6.8M} \quad \text{or} \quad BAC_{\text{Female}} = \frac{10N - 7.5H}{5.5M}$$

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Where:

BAC - Blood alcohol content

N - Number of standard drinks consumed

H - Hours drinking

M - Mass in kilograms

Important Note
These formulae are **not** on the reference sheet.
You are **not** expected to remember these formulae.

These formulae are only good for calculating *estimates* of a person BAC.

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There are other factors that influence BAC including:

- Fitness
- Health
- Liver function
- Food in the stomach
- Medications

Example 1

Osman is 87 kg and has consumed 3 standard drinks in the past hour. Estimate Osman's BAC to 3 decimak places using the following formula where N represents the number of standard drinks, H is the number of hours drinking and M is his mass in kilograms.

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Solution

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\begin{aligned}
BAC_{\text{Male}} &= \frac{10N - 7.5H}{6.8M} \\
&= \frac{10(3) - 7.5(1)}{6.8(87)}
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&= 0.038032... \\
&\approx 0.038
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Osman's BAC is estimated to be 0.038.

Reaching zero BAC

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Important Note
This formula is **not** on the reference sheet.
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Example 2
Fiona has a BAC of 0.027. Use the following formula to estimate the time she will need for her BAC to reach zero. Answer to the nearest minute.

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Fiona needs to wait 1 hour and 48 minutes.

- Cambridge Ex 3F Q1-11