Study & Master

Support Pack | Grade 12

CAPS

Physical Sciences

Waves, sound and light

This support pack for the **Waves, sound and light** module in the **Physical Sciences Grade 12 CAPS curriculum** provides valuable practice exercises. All questions have the answers provided. Learners can work through these individually at home or these could form the basis of a catch-up class or online lesson. You have permission to print or photocopy this document or distribute it electronically via email or WhatsApp.

Cambridge University Press Africa is a proudly South African publisher – we are providing this material in response to the need to support teachers and learners during the school shutdown and for the remainder of the 2020 school year.

For more information on our *Study & Master* CAPS-approved textbooks and valuable resource materials, visit *www.cambridge.org*

We are all in this together!

Revision exercises for Waves, sound and light

Question 1

A rescue vehicle is travelling at a constant velocity of 25 m·s⁻¹ and sounds its siren at a frequency of 460 Hz.

a)   Determine the frequency of the siren as heard by the driver of a stationary car as the rescue vehicle approaches her.
b)   Determine the frequency of the siren heard by the driver of the car as the rescue vehicle moves away from her.

Question 2

A jet plane flying at 320 km·h⁻¹ flies over an airport. A stationary observer at the airport hears the sound of the jet engines at a frequency of 30 kHz as the plane flies away. Determine the frequency of the sound of the plane's engines when the plane is stationary on the runway.

Question 3

A train travelling at a constant speed sounds its whistle at a frequency of 530 Hz. A man standing at the side of the railway track hears the sound of the whistle at a frequency of 510 Hz.

a)   Is the train moving towards or away from the man? Explain.
b)   Calculate the speed of the train.
c)   If the train were travelling faster than the speed calculated in Question 3 b), will the frequency of the whistle as heard by the man be larger or smaller than 510 Hz?
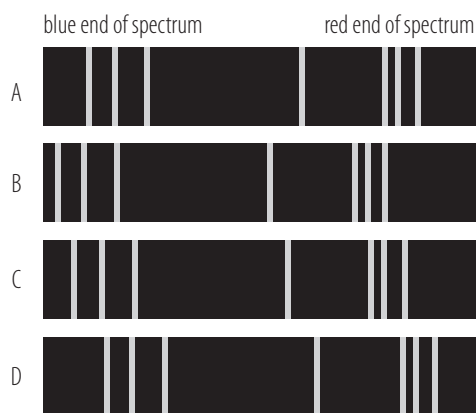
Question 4

Explain the meaning of the following terms:

a)   Doppler flow meter
b)   blue shift.

Question 5

The following are the spectra of the same gas found on four different stars:

a)   If star C is used as the reference star (stationary star), which star(s) is/are moving towards star C?
b)   If star A is used as the reference star (stationary star), which star(s) is/are undergoing a red shift?

Memorandum for revision exercises

1   a)   496,51 Hz

       b)   428,49 Hz

2   37,84 kHz

3   a)   Since the frequency of the whistle heard by the listener is less than the source frequency, the train is moving away from the listener.

       b)   13,33 m·s^{-1}

       c)   smaller

4   a)   The Doppler flow meter is an instrument that uses ultrasonic sound waves to determine the speed of blood flow.

       b)   Blue shift is the observed shifting of light towards the blue end of the spectrum when this light is emitted from distant galaxies moving towards us.

5   a)   Star B, since it is blue shifted.

       b)   Star D