

PART A: MULTIPLE CHOICE (10 MARKS)

Choose the best response in each case and place your answer in the appropriate space on your answer sheet.

- Which one of the following cannot transmit sound?
 - fibreglass
 - alcohol
 - iron
 - vacuum
- A siren is located due north of your position. The sound is transmitted to your ear by:
 - air vibrating in a north-south direction only.
 - air vibrating in a west-east direction only.
 - air moving continuously northward only.
 - light travelling from the siren.
- What is the speed of sound in air at 20.0°C?
 - 308 m/s
 - 320 m/s
 - 332 m/s
 - 344 m/s
- If the temperature of the air decreases by 15°C, the speed of sound in the air:
 - decreases by 15 m/s.
 - increases by 15 m/s.
 - decreases by 8.9 m/s.
 - increases by 8.9 m/s.
- A sound wave with a frequency of 30 000 Hz is said to be:
 - subsonic
 - ultrasonic
 - supersonic
 - infrasonic
- For humans, an example of an infrasonic sound is:
 - 4000 Hz
 - 400 Hz
 - 40 Hz
 - 4 Hz
- The speed of sound in sea water is 1531 m/s. If a sonar echo returns from an undersea cliff 1.60 s after it was emitted, how far away is the cliff?
 - 0.306 km
 - 0.612 km
 - 1.22 km
 - 2.45 km
- You can easily hear sounds travelling through an open window or even around the corner of a building because of:
 - diffraction
 - dispersion
 - reflection
 - refraction
- In order for two sound waves to produce audible beats, it is essential that the two waves have:
 - slightly different amplitudes.
 - slightly different frequencies.
 - the same frequency.
 - the same number of overtones.
- When two trumpets are played together, 20 beats are heard in 4.0 s. If the frequency of the higher-pitched trumpet is 440 Hz, what is the frequency of the lower-pitched trumpet?
 - 420 Hz
 - 435 Hz
 - 445 Hz
 - 460 Hz

PART B: MATCH (5 MARKS)

Match the definition from the 1st column to the best term in the 2nd column and place the matching letter in the appropriate space on your answer sheet.

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|---|--------------------------|
| 1. Explosive sound that radiates from an aircraft travelling at supersonic speeds. | A) beat frequency |
| 2. Common unit used to measure sound intensity level. | B) beats |
| 3. Form of energy produced by rapidly vibrating objects. | C) decibel |
| 4. The number of beats heard per second in hertz. | D) Doppler effect |
| 5. Process of the locating objects through the analysis of reflected sound (sonar for example). | E) echo |
| | F) echolocation |
| | G) sonar |
| | H) sonic boom |
| | I) sound |
| | J) sound intensity level |

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1	2	3	4	5	6	7	8	9	10
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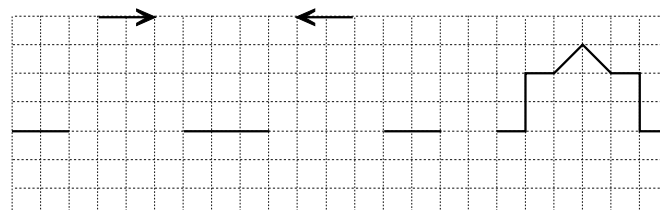
PART B: MATCH (5 MARKS)

1	2	3	4	5
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PART C: SHORT ANSWER (10 MARKS)

Answer the following questions in the space provided.

- {2} 1. The following diagram shows a waveform generated by the addition of two separate waveforms using a synthesizer. Draw one complete wavelength of each waveform used to create the waveform shown.



- {2} 2. For each of the following pairs, state the number of times the intensity level of the 1st sound exceeds the 2nd:
- | | |
|---------------|--------------------|
| (a) 4 B & 3 B | (b) 100 dB & 70 dB |
| _____ | _____ |
- {6} 3. State what happens to the apparent frequency of a sound source (increases, decreases, no change) in each of the following situations:
- (a) The listener is stationary and the source is approaching. _____
- (b) The source is stationary and the listener is receding. _____
- (c) Both the listener and the source are travelling in the same direction at the same speed. _____

PART D: PROBLEMS (25 MARKS)

Answer the following questions on a separate sheet of paper. You may use the back of this sheet if you wish.

- {4} 1. A fan at a baseball game is 100 m from home plate. If the air temperature is 20°C, how long after the batter actually hits the ball does the fan hear the crack?
- {4} 2. Assume that a person's eardrum vibrates with an amplitude of 2.0×10^{-10} m when listening to a 3.0 kHz sound. Through what total distance will the eardrum vibrate in one minute?
- {4} 3. A student stands 86 m from the foot of a cliff, claps her hands, and hears the echo 0.50 s later. Calculate the speed of sound in air.
- {6} 4. A violin string is vibrating at a frequency of 880 Hz. How many vibrations does it make when the sound produced travels 332 m through air at a temperature of 0°C?
5. A 440 Hz tuning fork is sounded together with the A string on a guitar, and 21 beats are heard in 3 seconds.
- {4} (a) What are the possible frequencies of the guitar string?
- {3} (b) When an elastic band is wrapped tightly around one prong of the tuning fork (which lowers the pitch), a new beat frequency of 2 Hz is heard. What is the frequency of the guitar string? Explain.