AP PHYSICS 2 • EXERCISE SHEET

14.5 The Doppler Effect

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS doppler effect 多普勒效应 • redshift 红移 • frequency 频率 • wave 波 • wavelength 波长

Objective

Build the skills to answer exam questions on **the Doppler effect**.

You must be able to:

- describe the **Doppler effect** 多普勒效应 as a change in observed frequency due to relative motion
- explain why an approaching source is heard higher and a receding source lower
- give applications such as radar, sonar, and astronomical **redshift** 红移

1 Worked examples

Study these first. Each one shows the method for a question type used later.

The Doppler effect

When a source and observer move relative to each other, the **observed frequency changes**.

Higher or lower

- **Approaching** — waves bunch up → shorter wavelength → **higher** frequency (higher pitch).
- **Receding** — waves stretch out → **lower** frequency.

Applications

Speed-camera radar, sonar, and the **redshift** of distant galaxies (showing the Universe is expanding).

2 Practice

2.1 State what the Doppler effect is. [1]

2.2 State whether an approaching siren sounds higher or lower in pitch. [1]

2.3 Give one application of the Doppler effect. [1]

3 Exam-style questions

3.1 As a sound source moves toward you, the frequency you hear is [1]

A B
C D

A higher
B lower
C unchanged
D zero

3.2 The redshift of distant galaxies shows that they are [1]

A B
C D

A approaching us
B receding from us
C stationary
D exploding

3.3 A car sounding its horn drives past a stationary listener.

(a) Describe the change in pitch the listener hears as the car approaches and then recedes. [2]

(b) Name the effect responsible. [1]