

# Ear

Level: S.2

Subject: Science

### **Introduction**

This set of ELA materials consists of two connected parts: Part I 'How We Hear' and Part II 'Limitations of Our Ears'. It is suggested that about 80 minutes should be allocated to Part I and 40 minutes to Part II.

Part 'I How We Hear' is an introductory lesson; it includes three tasks which are designed for students to learn the names and functions of different parts of the ear, using English as the medium of instruction. Students will be learning this topic for the first time.

Part II 'Limitations of Our Ears' is an extension of Part I. It covers the concepts of audible frequency ranges, ultrasound and infrasound. Before this lesson, some ideas covered by the ELA have been discussed using Chinese. In this lesson, students' understanding of the topic is developed further through three activities, using English medium.

### ***Acknowledgement***

This set of materials was produced jointly by the teachers of King Ling College and the ELA research team.

## ELA Lesson Plan: Ear – PART I How We Hear

**Description:** This ELA covers Section 11.5, Unit 11 of the CDC Science syllabus. Students are expected to learn the structure of the ear, the functions of its parts, and how the ear works. Three tasks are developed for this lesson. The lesson starts with an introduction to the different parts of the ear by showing students a model of the ear (Task A); both English and Chinese terms are introduced. The task also requires students to match these names with their functions. Task B introduces how the different parts of the ear work. It is designed to show students the process of hearing. The final task (Task C) consolidates student learning of the vocabulary learned in the previous tasks.

**Content Objective:** After completing the activity, students should be able to:

- label the different parts of the ear and state the functions of each main part; and
- describe how the ear works.

**Language Objective:** After completing the activity, students should be able to:

- understand and use the English terms for describing different parts of the ear (e.g., *hear, outer, middle, inner, ear, structure, auditory nerve, ear canal, cochlea, eardrum, ear bones, pinna, collect, sound, environment, separate, vibrate, vibration, carry message, magnify, transmit, detect, direct, interpret as*);
- use simple English to describe how the ear works.
  - *The sound in the environment is collected by the pinna.*
  - *The sound travels along the ear canal to the eardrum.*
  - *The sound causes the eardrum to vibrate.*
  - *The ear bones magnify the vibrations of the eardrum and transmit them to the cochlea.*
  - *The cochlea detects the vibrations and changes them into messages.*
  - *The messages are sent along the auditory nerve to the brain.*
  - *The brain interprets the messages as sounds.*

**Activities:** Task A: Structure of the Ear (35 mins)

- names of different parts of the ear
- functions of different parts of the ear

Task B: How Does the Ear Work? (pair work:30 mins)

- steps of how the ear processes sounds

Task C: Vocabulary ( Individual work: 10 mins)

- review the vocabulary learnt in previous tasks

- Material/Tools
- Worksheets – Task A, Task B and Task C
  - An ear model for demonstration
  - An internet accessible computer and a projector for showing online video clips.

### Steps

#### **Task A: The Structure of the Ear** ( ~ 35 mins)

1. Distribute the worksheet.
2. Use a model of the ear, together with a chart showing the ear structure, to introduce the different parts of the ear. Both English and Chinese terms should be introduced.
3. Then, ask a few students to name each part in English. Arrange students in pairs and provide a few minutes for them to read out the English terms to their neighbours. The teacher will help students to improve their pronunciation during his or her supervision of pair work.
4. Ask students to complete the table (Item 1) of Task A.
5. Remove any terminology displayed on the chalkboard and ask students to complete Item 2.
6. Check answers.
7. Ask students to read the paragraph in Item 3 and ask the teacher if there are words or phrases that they do not understand.
8. Ask students to complete Item 3.
9. Check answers by asking students to read aloud their answers in complete sentences.
10. Use the ear model to explain the function of different parts of the ear. Re-visit the first part of the passage in Item 3, highlighting the key words and phrases that describe the functions of the ear.
11. After explanation, ask students to complete Item 4.
12. Check answers by asking students to read aloud their answers in complete sentences.

**Task B: How Does the Ear Work?** (pair work: ~ 30 mins)

13. Go through steps a) to g) with the class so that students understand the description of each step.
14. Ask students to watch the video, *How the Ear Works* <http://www.youtube.com/watch?v=skXQ6PuIc4s&NR=1> . Remind students to pay attention to how the sound travels in the ear. Play the video again if necessary.
15. Ask students to complete Items 1 to 7.
16. Check answers by asking students to read aloud their answers in complete sentences.
17. Ask students to complete Items 8 to 17 based on the answers to Items 1 to 7.
18. If more support is needed, show students how to complete the paragraph by filling in Item 8 as an example.
19. Check answers by asking students to read aloud their answers in complete sentences.

Reference: The animation provided in the following link may be helpful.

<http://www.childrensuniversity.manchester.ac.uk/interactives/science/brainandsenses/ear.asp>

**Task C: Vocabulary** ( Individual work: ~ 10 mins)

20. Ask students to complete the vocabulary box in Task C.
21. Check answers
22. Ask the class to practise the pronunciation of the vocabulary.

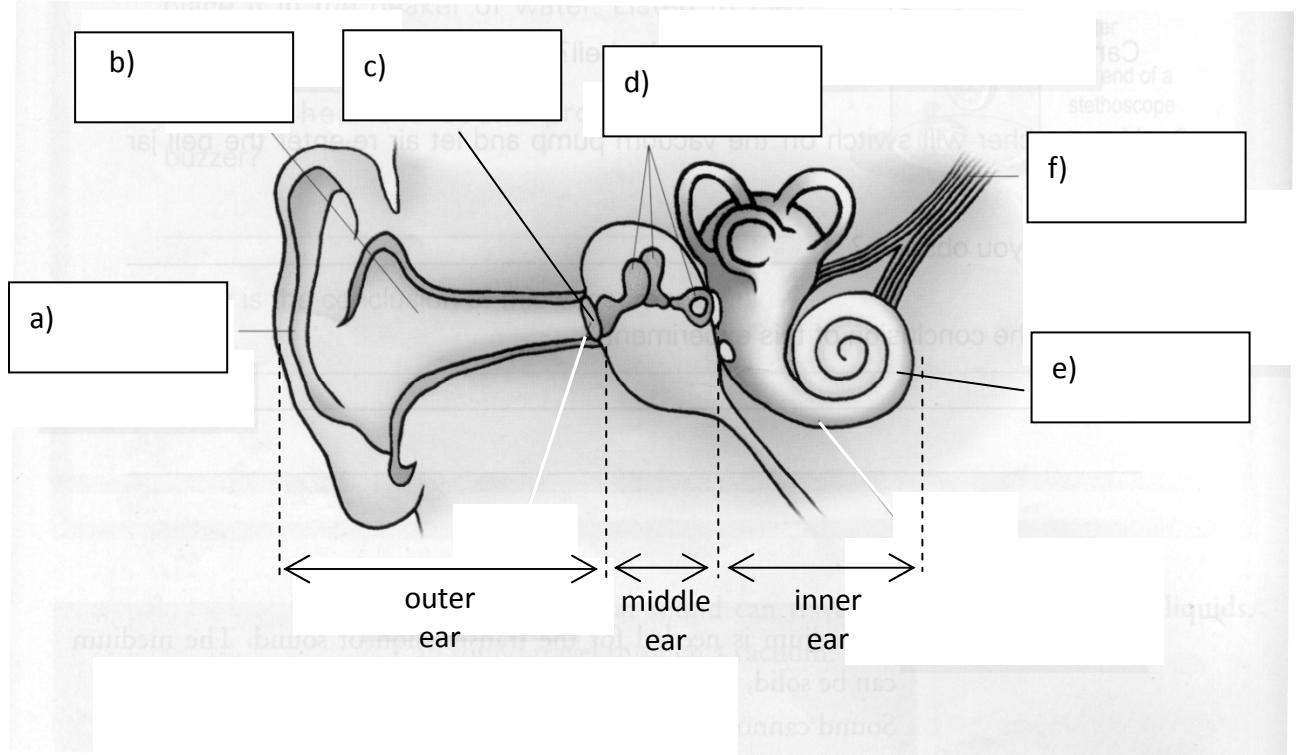
## PART I. How We Hear

### Task A: The structure of the Ear

1. Write down the English terms for different parts of the ear based on the display on the chalkboard.

聽覺神經	耳蝸	耳骨
外耳道	耳鼓	耳廓

2. Label different parts of the ear by writing the names of the parts of the ear in the boxes.



3. Fill in the blanks.

### Our Ears

You can hear sound around you by using your ears! Your ears collect sounds, process them, and send sound signals to your brain. Besides hearing your ears also help to keep you balanced. So, if you bend over to pick something up, you will not fall down.

The ear is made up of three different sections: the outer ear consists of a) the \_\_\_\_\_, b) the \_\_\_\_\_ and c) the \_\_\_\_\_; the middle ear has d) \_\_\_\_\_; and the inner ear is made up of e) the \_\_\_\_\_ and f) the \_\_\_\_\_. All these parts work together for hearing.

4. What is the function of each part of the ear?

The a) \_\_\_\_\_ collects sound in the environment.

The b) \_\_\_\_\_ separates the outer ear from the middle ear. It **vibrates** when it is hit by sound.

The c) \_\_\_\_\_ carries the message to the brain.

The d) \_\_\_\_\_ **magnify** 放大 the vibrations of the eardrum and **transmit** 傳送 them to the cochlea.

The e) \_\_\_\_\_ **detects** 探測 the vibrations and changes them into messages.

The f) \_\_\_\_\_ directs sound to the middle ear.

**Task B: How does the ear work?**

Watch the video, *How the Ear Works*

<http://www.youtube.com/watch?v=skXQ6PuIc4s&NR=1> .

Arrange the following steps into the correct order describing how the ear works.

1	e	a) The brain <b>interprets</b> the messages <b>as</b> sounds.
2		b) The <b>ear bones</b> magnify the vibrations of the <b>eardrum</b> and transmit them to the <b>cochlea</b> .
3		c) The sound travels along the <b>ear canal</b> to the eardrum.
4		d) The messages are sent along the <b>auditory nerve</b> to the brain.
5		e) The sound is collected by the <b>pinna</b> .
6		f) The <b>cochlea</b> detects the vibrations and changes them into messages.
7		g) The sound causes the eardrum to vibrate.

Based on the above steps to complete the paragraph below.

Our ears detect sound. First, 8) \_\_\_\_\_..

Then, it travels 9) \_\_\_\_\_ and causes 10) \_\_\_\_\_.

The ear bones 11) \_\_\_\_\_ and 12) \_\_\_\_\_.

\_\_\_\_\_.

13) \_\_\_\_\_ detects 14) \_\_\_\_\_ and 15) \_\_\_\_\_.

Finally, 16) \_\_\_\_\_

and the brain 17)\_\_\_\_\_.

**Task C: Vocabulary**

pinna 耳廓	c	收集
ear canal 外耳道	v	震盪
eardrum 耳鼓	m	放大
ear bones 耳骨	t	傳送
cochlea 耳蝸	d	探測
auditory nerve 聽覺神經	interpret... as...	理解...為...

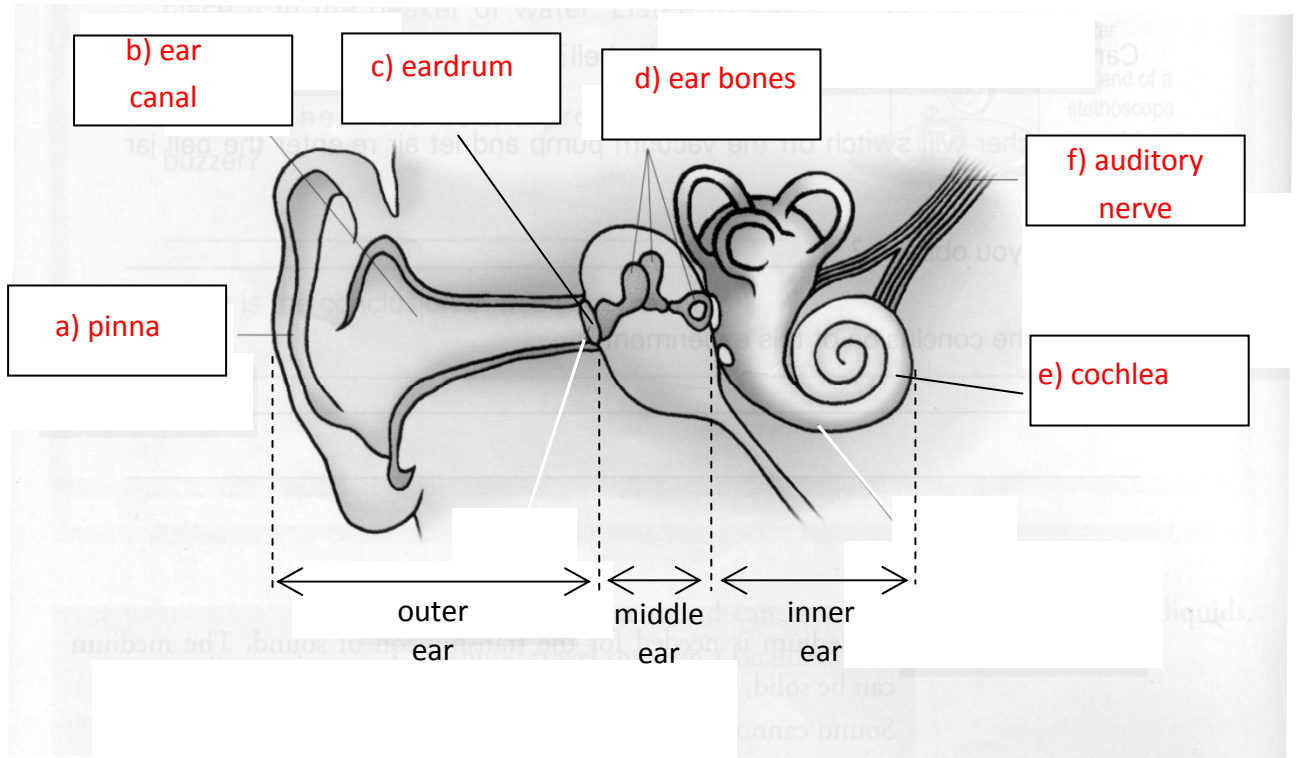
## PART I. How We Hear (Teacher's Version)

### Task A : The Structure of the Ear (15 mins)

1. Write down the English of different parts of the ear.

auditory nerve 聽覺神經	cochlea 耳蝸	ear bones 耳骨
ear canal 外耳道	eardrum 耳鼓	pinna 耳廓

2. Label different parts of the ear in the boxes.



3. Fill in the blanks.

### Our Ears

You can hear sound around you by your ears ! Your ears collect sounds, process them, and send sound signals to your brain. Besides hearing your ears also help to keep you balance . So, if you bend over to pick up your book, you will not fall down. The ear is made up of three different sections: the outer ear consists of a) the pinna \_\_\_\_\_, b) the ear canal \_\_\_\_\_ and c) the ear drum \_\_\_\_\_; the middle ear has d) ear bones \_\_\_\_\_; and the inner ear is made up of e) the cochlea \_\_\_\_\_ and f) the auditory nerve . These parts all work together so you can hear sounds.



4. What is the function of each part of the ear?

The a) pinna collects sound in the environment.

The b) eardrum separates the outer ear from the middle ear. It **vibrates** when it is hit by sound.

The c) auditory nerve carries the message to the brain.

The d) ear bones **magnify** 放大 the vibrations of the eardrum and **transmit** 傳送 them to the cochlea.

The e) cochlea **detects** 探測 the vibrations and changes them into messages.

The f) ear canal directs sound to the middle ear.

**Task B: How does the ear work?** (Pair work: 30 mins)

Watch the video, *How the Ear Works*

<http://www.youtube.com/watch?v=skXQ6PuIc4s&NR=1> .

Arrange the following steps into the correct order describing how the ear works.

1	e	a) The brain <b>interprets</b> the messages <b>as</b> sounds.
2	c	b) The <b>ear bones</b> magnify the vibrations of the <b>eardrum</b> and transmit them to the <b>cochlea</b> .
3	g	c) The sound travels along the <b>ear canal</b> to the eardrum.
4	b	d) The messages are sent along the <b>auditory nerve</b> to the brain.
5	f	e) The sound is collected by the <b>pinna</b> .
6	d	f) The <b>cochlea</b> detects the vibrations and changes them into messages.
7	a	g) The sound causes the eardrum to vibrate.

Based on the above steps to complete the paragraph below.

Our ears detect sound. **First**, 8) the sound is collected by the pinna. **Then**, it travels

9) along the ear canal to the eardrum and causes 10) the eardrum to vibrate. The ear bones

11) magnify the vibrations of the eardrum and 12) transmit them to the cochlea. 13) The cochlea detects 14) the vibrations and 15) changes them into messages. **Finally**, 16) the messages are sent along the auditory nerve to the brain and the brain 17) interprets the messages as sounds.

### Task C: Vocabulary

pinna 耳廓	collect	收集
ear canal 外耳道	vibrate	震盪
eardrum 耳鼓	magnify	放大
ear bones 耳骨	transmit	傳送
cochlea 耳蝸	detect	探測
auditory nerve 聽覺神經	interpret... as...	理解...為...

## ELA Lesson Plan: Ear – PART II. Limitations of Our Ears

**Description:** This set of ELA material covers Section 11.6, Unit 11 of the CDC Science syllabus. This is a 40-minute lesson to extend students' understanding of hearing by focusing on the concepts of audible frequency ranges, ultrasound and infrasound. Task A exposes students to sounds at different frequencies and they will also find out their own audible frequency range. Then Task B extends the same concepts to other animals. Finally, Task C exposes students to these concepts again through a reading task. The four skills of English are practised in these tasks.

**Content** After completing the activity, students should be able to:

**Objective:**

- understand the concepts of audible frequency ranges, ultrasound and infrasound

**Language** After completing the activity, students should be able to:

**Objective:**

- understand and use the English terms related to the concepts of audible frequency ranges, ultrasound and infrasound (e.g., *Hz, hertz, sound, unit of frequency, audible frequency range, high pitch, low pitch, ultrasound, infrasound*)
- understand and use the correct English expressions for discussing the key concepts, e.g.,
  - *Hz or hertz is the unit of frequency.*
  - *Sounds at a frequency higher than 20,000 Hz are called ultrasounds.*
  - *Sounds at a frequency lower than 20 Hz are called infrasounds.*
  - *Humans and animals have different audible frequency ranges.*
  - *We can hear sounds at a frequency between 20 Hz and 20,000 Hz.*
  - *We cannot hear the sound of an ultrasonic dog whistle because its sound is at a frequency higher than 20,000 Hz.*
  - *Dogs and some other animals can hear ultrasounds (sounds at a frequency higher than 20,000 Hz).*
  - *Mice, dog, elephants and dolphins can hear infrasounds (sounds at a frequency lower than 20 Hz).*

**Activities:** Task A: Audible Frequency Range (Individual work: 5 mins)

- experience the limitation of our hearing
- understand the term, audible frequency ranges

Task B: Listening – Audible Frequency Range of Humans and Animals  
(Individual work: 10 mins)

- understand the fact that humans have different hearing ability to other animals.
- learn the concept of ultrasound

Task C: Reading – Audible Frequency Range of Humans and Animals  
(Pair work: 20-25mins)

- learn the concepts of audible frequency ranges, ultrasound and infrasound through reading and writing.

- Material/Tools
- Worksheets – Task A, Task B and Task C
  - A dog whistle for demonstration
  - An internet accessible computer and a projector for showing online video clips.

Steps:

**Task A: Audible Frequency Range** (Individual work: 5 mins)

1. Start the lesson with a hearing test.
2. Explain Task A in the worksheet.
3. Ask students to listen attentively to the sound and pay attention to the frequency shown in the video.
4. Play the video, *Dog whistle sound* <http://www.youtube.com/watch?v=fFmiLHaKXhI>
5. Ask students to answer Item 1.
6. Play the video, *Ultimate Sound Test [10000 hz - 1 hz]*  
<http://www.youtube.com/watch?v=igGroIcga3g&feature=related>
7. Ask students to answer Item 2.
8. Explain what audible frequency range means and ask students to answer Item 3.
9. Select some students to report their answers. (See TN1)

**Task B: Listening – Audible Frequency Range of Humans and Animals** (Individual work: 10 mins)

10. Introduce the idea that humans and animals have different audible frequency ranges.
11. Show students the dog whistle and demonstrate and explain how it works.
12. Direct students' attention to Task B.
13. Quickly go through Items 1 to 4 with class but stress the pronunciation of difficult words.

14. Play the video, *What frequency can you hear?*  
<http://www.youtube.com/watch?v=UfkvbKHYFls&feature=related>
15. Ask students to complete Items 1 to 4.
16. Check answers by asking students to report their answers in complete sentences.
17. Move on to Item 5.
18. Review the vocabulary learnt in Tasks A and B by asking students to complete Item 5.
19. Check answers.
20. Read aloud again the vocabulary with class.

**Task C: Reading – Audible Frequency Range of Humans and Animals** (Pair work: 20-25mins)

21. Move on to Task C.
22. Tell students the passage in Task C has similar content to that of the video shown in Task B.
23. Ask students to read the passage and complete Task C by working in pairs.
24. Check answers by asking students to report their answers in complete sentences (see TN2).
25. If time is available, review the vocabulary again by reading the words aloud with the class.

### **Teacher's Notes**

TN1: Students' answers may be slightly different from each other.

TN2: If time allows, go through the passage with the class before checking answers.

## PART II. Limitations of Our Ears

### Task A: Audible Frequency Range 聽頻範圍

Let's test our ears!

1. How high can you hear?

\_\_\_\_\_ Hz

2. How low can you here?

\_\_\_\_\_ Hz

3. What is your audible frequency range?

\_\_\_\_\_ to \_\_\_\_\_

### Task B: Listening – Audible Frequency Range of Humans and Animals

Watch the video *What frequency can you hear?*.

<http://www.youtube.com/watch?v=UfkvbKHYFls&feature=related>

Circle the correct answers.

1. Ultrasonic sound waves (ultrasound) are at a frequency **higher** / **lower** than 20,000 Hz.
2. Humans **can** / **cannot** hear ultrasound.
3. Dogs can hear sound at a frequency higher than **20,000 Hz** / **80,000 Hz**, but humans cannot.
4. Elephants can hear sound at a very **low** / **high** frequency.
5. Complete the table by writing in the English terms. One item is done for you as an example.

超音波	a)
超音波的	b)
頻率	c)
聽頻	d)
聽頻範圍	e.g. audible frequency range

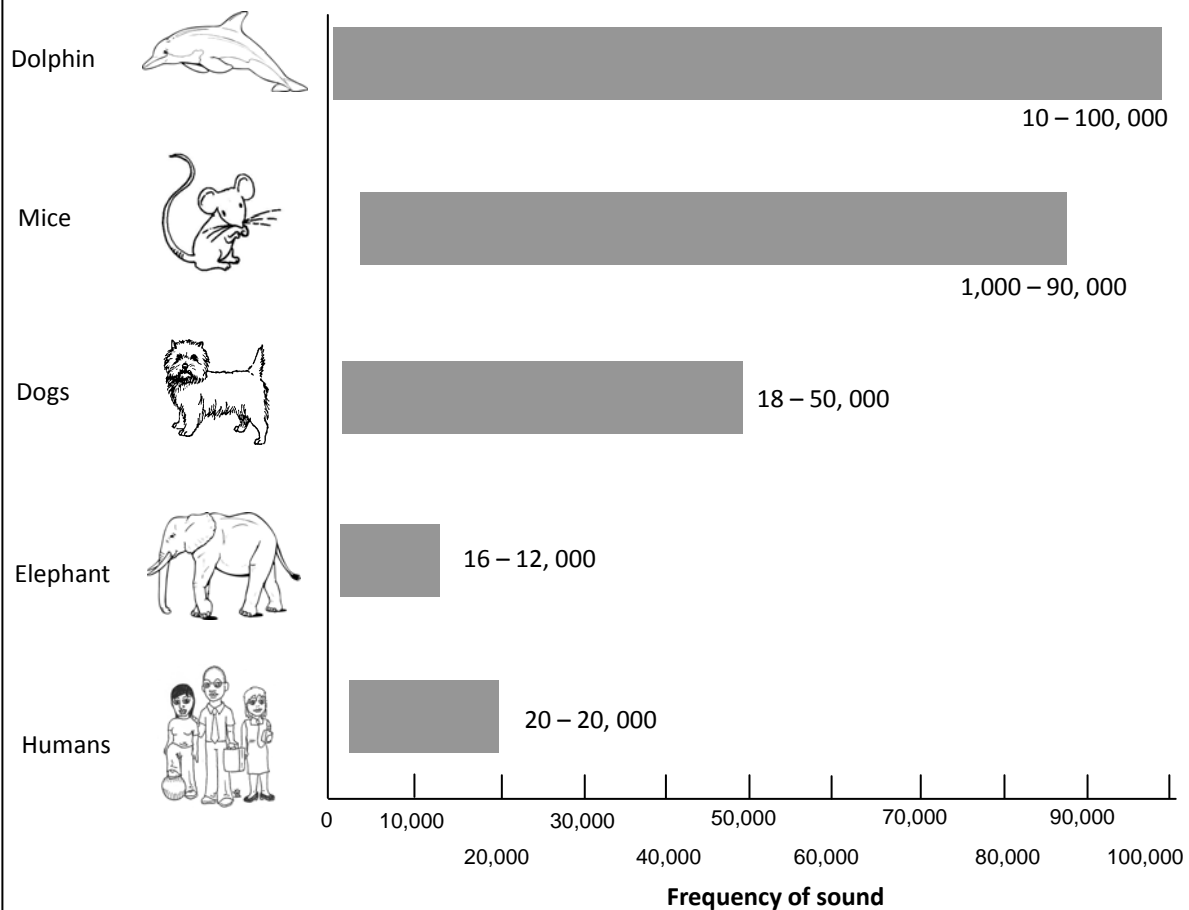
### Task C: Reading – Audible Frequency Range of Humans and Animals

(Pair work: 20-25mins)

Read the passage below and answer the questions that follow.

#### Audible Frequency Range of Humans and Animals

Humans and animals have different **audible frequency ranges**. For example, young people usually can hear sounds at a frequency between 20 Hz and 20,000 Hz; while dogs and some other animals can hear sounds at a frequency higher than 20,000 Hz. Sound at such high frequency is called **ultrasound**. An **ultrasonic dog whistle** 哨子 gives out sound higher than 20,000 Hz; that people cannot hear the sound of the whistle, but dogs can. The following chart shows the ranges of sound frequency that humans and various animals can hear.



#### *Audible frequency ranges of some animals*

Look at the lower part of the chart. Humans and elephants cannot hear ultrasound but they can hear **infrasound**. Infrasound frequency is lower than 20 Hz. Usually elephants can hear sound at a frequency as low as 16 Hz; but some studies reported that elephants calls could be as low as 5 Hz. Some scientists believe that elephants' low pitch voice helps them to communicate with each other over a long distance, even several kilometres.

## Questions

1. What is the unit of frequency?

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2. What is ultrasound?

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3. Can we hear the sound of an ultrasonic dog whistle? Why?

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4. Look at the chart. What is the audible frequency range of mice?

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5. Which kinds of animals can hear infrasound?

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6. How does infrasound help elephants to communicate?

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## PART II. Limitations of Our Ears (Teacher's version)

### Task A: Audible Frequency Range 聽頻範圍 (Individual work: 5 mins)

Let's test our ears!

1. How high can you hear?

\_\_\_\_\_ Hz

2. How low can you here?

\_\_\_\_\_ Hz

3. What is your audible frequency range? \_\_\_\_\_ to \_\_\_\_\_

### Task B: Audible Frequency Range of Humans and Animals (Individual work: 10 mins)

Watch the video *What frequency can you hear?*

<http://www.youtube.com/watch?v=UfkvbKHYFls&feature=related>

Circle the correct answers.

1. Ultrasonic sound waves (ultrasound) are at a frequency **higher** / **lower** than 20,000 Hz.
2. Humans **can** / **cannot** hear ultrasound.
3. Dogs can hear sound at a frequency higher than **20,000 Hz** / **80,000 Hz**, but humans cannot.
4. Elephants can hear sound at a very **low** / **high** frequency.
5. Complete the table by writing in the English terms. One item is done for you as an example.

超音波	a). ultrasound
超音波的	b). ultrasonic
頻率	c). frequency
聽頻	d). audible frequency
聽頻範圍	e.g. audible frequency range

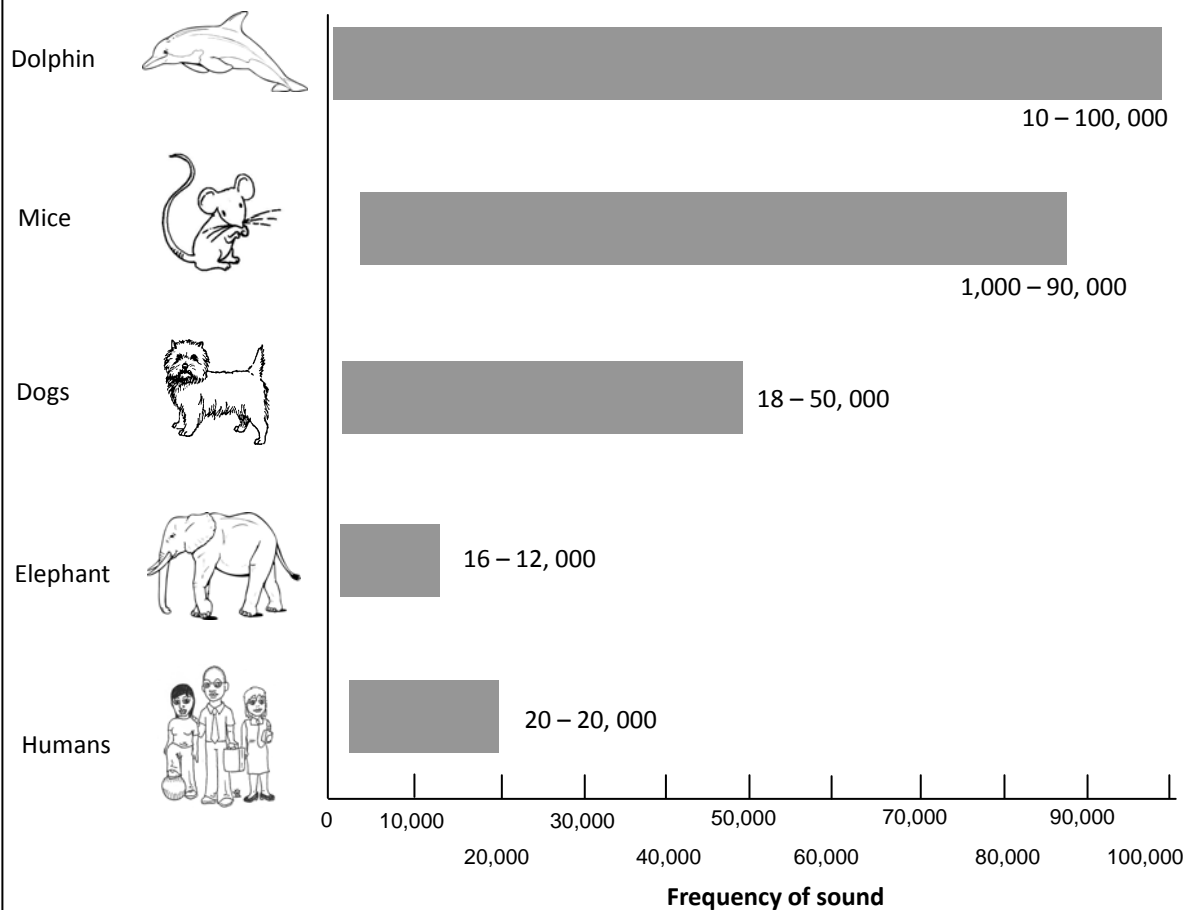
### Task C: Reading – Audible Frequency Range of Humans and Animals

(Pair work: 20-25mins)

Read the passage below and answer the questions that follow.

#### Audible Frequency Range of Humans and Animals

Humans and animals have different **audible frequency ranges**. For example, young people usually can hear sounds at a frequency between 20 Hz and 20,000 Hz; while dogs and some other animals can hear sounds at a frequency higher than 20,000 Hz. Sound at such high frequency is called **ultrasound**. An **ultrasonic dog whistle** 哨子 gives out sound higher than 20,000 Hz; that people cannot hear the sound of the whistle, but dogs can. The following chart shows the ranges of sound frequency that humans and various animals can hear.



#### *Audible frequency ranges of some animals*

Look at the lower part of the chart. Humans and elephants cannot hear ultrasound but they can hear **infrasound**. Infrasound frequency is lower than 20 Hz. Usually elephants can hear sound at a frequency as low as 16 Hz; but some studies reported that elephants calls could be as low as 5 Hz. Some scientists believe that elephants' low pitch voice helps them to communicate with each other over a long distance, even several kilometres.

## Questions

1. What is the unit of frequency?

hertz or Hz

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2. What is ultrasound?

Sound at a frequency higher than 20,000 Hz is called ultrasound

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3. Can we hear the sound of an ultrasonic dog whistle? Why?

No. The pitch / frequency of the sound from an ultrasonic dog whistle is too high for us to hear. OR

No. The sound of an ultrasonic dog whistle is at a frequency higher than 20,000 Hz that we can't hear. OR

No. The ultrasonic dog whistle produces sound at a frequency higher than 20,000 Hz that we can't hear

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4. Look at the chart. What is the audible frequency range of mice?

1,000 – 90, 000 Hz

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5. Which kinds of animals can hear infrasound?

Mice, dog, elephants and dolphins.

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6. How does infrasound help elephants to communicate?

Infrasound / Elephants' low pitch voice helps them to communicate with each other over a long distance, even several kilometers.

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