Subject: Science
Year 4: Sound and vibration
NC/PoS:

- Identify how sounds are made, associating some of them with something vibrating.
- Recognise that vibrations from sounds travel through a medium to the ear.
- Find patterns between the pitch of a sound and features of the object that produced it
- Find patterns between the volume of a sound and the strength of the vibrations that produced it.
- Recognise that sounds get fainter as the distance from the sound source increases.

Prior Learning (what pupils already know and can do)
Check the children can recall their learning about materials from the units *Science, Year 2, Materials: Uses of everyday materials* and *Science, Year 4, Materials: States of matter*:

- Identify and name a variety of everyday materials.
- Describe the simple physical properties of these materials.
- The uses of materials.
- The properties of solids, liquids and gases.
- Examples of solids, liquids and gases.

Know that the sense of hearing is linked to the ear. Know that there are loud and quiet sounds. Know sounds can be high or low. Know that there are many different sources of sounds.

End Goals (what pupils MUST know and remember)

- Know that sounds are made by continuous vibrations and the vibrations sends waves into the ear
- Know that sound can travel through varied materials and give examples – solid (metal, stone wood), liquid (water) and gas (air)
- Know that the louder the sound (the stronger the vibrations) and sounds become fainter as the distance increases
- Know that high pitch means fast vibrations and low pitch is slower vibrations

Key Vocabulary: sound, energy, vibrations, vibrate, vibrating, ear drum, cochlea, stirrup, hammer, anvil, auditory nerve, medium, solids, liquids, gases, pitch, higher, lower, frequency, volume, louder, quieter, strength, feint, distance

Session 1:
Use resources from Kapow Lesson 1: Vibrations
Recap and recall: hearing sense linked to ear. type of sounds – high/low, loud/quiet
LO: To describe how sounds are made.
Working scientifically LO: To observe closely how different instruments create a sound.
Children learn that sound is a form of energy that can be heard by living things and is produced when something vibrates. A vibrating object makes the air or material next to it vibrate as well, so the vibrations travel through the air in a wave
Focus of the lesson: set up the seven stations suggested within the 'Teacher Knowledge' section of the lesson. Children record the name of the instrument and which part is vibrating.
Vocabulary: sound, energy, vibrations, vibrate, vibrating, wave, bang, blow, shake, and pluck

Session 2:
Use resources from Kapow lesson 2: Sound waves
Recap and recall: How are sounds made? Use 'Mystery Sounds' and children identify how sounds are being made.
LO: I can describe how a sound wave travels through the air to the ear.
Children learn that the ear drum passes vibrations to the middle ear bones which are the hammer, anvil and stirrup. The stirrup pushes against the cochlea which contains thousands of tiny hair cells which change the vibrations to electrical signals. The auditory nerve sends electrical signals to the brain.
The focus of the lesson is 'How we hear' children should write a short explanation using the scientific vocabulary.
Vocabulary: ear drum, cochlea, stirrup, hammer, anvil, auditory nerve

Session 3:
Recap and recall: how does the ear work?
LO: I can compare how sound travels through different mediums.
LO: I can explain why sound travels faster and further in water than in air.

Use the 'Main Event' section of Lesson 2: Sound waves
The focus of the lesson is to learn that sound can travel through a variety of materials (string, metal, water) but not through a vacuum.
Sound travels faster through solids as the molecules are closer together. Vocabulary: medium, solids, liquids, gases

Session 4:
Use resources from Kapow Lesson 3: Volume
Recap and recall: Name mediums sound travels through
LO: To describe the relationship between vibration strength and volume.
Children learn the harder you hit something, the more energy the vibrations have so the louder the sound
Follow the lesson up to 'Dangerous Decibels'. Instead of recording on the given bar chart follow this suggested activity and record as follows:
Using a drum, cymbal (range of instruments) compare

Quietest	Quieter	Quiet	Medium	Loud	Louder	Loudest
Pressing a drum with finger	Scratching a drum	Scrapping a drum	Tapping a drum	Hitting the drum	Hitting the drum hard	Bashing the drum really hard

Measure decibels using a data logger around the school
Vocabulary: volume, louder, quieter, strength

Session 5:
Use resources from Kapow lesson 5: Pitch
Recap and recall: Use Recap and recall presentation 'Sirens' and use the questions provided.
LO: To describe pitch and how to change it.
Children learn the pitch is the highness or lowness of a note. The pitch of the sound is due to the frequency of the vibration. Frequency is the number of vibrations per second. If the particles vibrate quickly the sound produced will be high
The shorter the vibrating object, the higher the pitch of the note. The larger the vibrating object, the lower the pitch of the note - it's deeper. The tighter the string or elastic band, the higher the pitch of the note (The shorter bands will vibrate faster, producing a higher pitch).
Main focus of the lesson is to complete the 'Main event' section of the lesson and for the children to create their own tables as shown in the examples given:

Part of musical instrument	Pitch (hertz)
Rubber band 1 (thickest)	
Rubber band 2	
Rubber band 3	
Rubber band 4	
Rubber band 5 (thinnest)	

Part of musical instrument	Pitch (hertz)
Bottle 1 (least full)	
Bottle 2	
Bottle 3	
Bottle 4	
Bottle 5 (fullest)	

Part of musical instrument	Pitch (hertz)
Lid 1 (smallest)	
Lid 2	
Lid 3	
Lid 4	
Lid 5 (biggest)	

Vocabulary: pitch, higher, lower, frequency

Session 6:
Use resources from Kapow lesson 4: Volume and distance
Recap and recall: How might the pitch be altered?
LO: To describe the relationship between volume and distance.
Working scientifically LO: To suggest which variables to measure and for how long.
Children learn vibrations lose energy as they travel further and further and that sounds get fainter as the distance from the sound source increases
Use the 'Planning and investigation on distance and volume' hand-outs to plan and carry out an investigation to explore what happens to sound as it gets further away.
Vocabulary: feint, distance

Link to careers: Audio engineer
https://www.youtube.com/watch?v=S9WnYUUBl84 What does a sound engineer do?

Scientists who have helped develop understanding in this field:
The modern study of waves and acoustics is said to have originated with **Galileo Galilei** (1564–1642), who elevated to the level of science the study of vibrations and the correlation between pitch and frequency of the sound source.