Rustle

for cello, electronics, brainwave and heartbeat data, field recordings, live processing, and video

Composition : Penelope Bekiari

Cello: Semeli Kostourou

Rustle is a live electroacoustic work that unfolds as a dialogue between the human body, its inner states, and its acoustic environment. Rooted in the interaction between a cellist and a responsive electronic system, the piece draws from real-time physiological data (brainwave activity (EEG) and heartbeat rate (HR) data) to shape both the live cello's timbral spectrum and the structure of its surrounding soundscape.

Rather than functioning solely as a data sonification piece, *Rustle* integrates affective technology: the performer's emotional states (pre-mapped and categorized through machine learning algorithms trained in Python) dynamically inform the electronic layer. In this way, the system does not merely translate data into sound, but interprets and responds to affective states; rendering them musically audible and shaping the trajectory of the piece.

Field recordings—captured in locations selected for their emotional or acoustic resonance—form the basis of the electronic material. These recordings are continuously transformed and spatialized in real time, influenced by the fluctuating bio-signals of the performer. The cello, treated through subtle live processing, is not simply accompanied by electronics; it is entangled with them in a complex, adaptive feedback loop. The line between performer and environment dissolves, and sound becomes the medium through which cognition, emotion, and external space converge.

Crucially, *Rustle* also includes a visual layer: a video projection that evolves in tandem with the sonic and physiological transformations. The visual material—composed of abstract textures, environmental footage, and algorithmically generated imagery—reacts to both the sound and the affective states driving it. This is achieved through real-time processing in Max/MSP, which synchronizes video content with incoming EEG and HR data, allowing the visual narrative to unfold organically alongside the music. As the performer's emotions shift, the video's colors, rhythm, and shapes change too, blending sound and visuals into a unified, synaesthetic experience.

Drawing on interdisciplinary perspectives—from neuroscience to philosophy and the arts—*Rustle* transforms the brain's and heart's hidden rhythms into sound, revealing how emotion moves through the nervous system and takes form as movement, light, and sonic gesture. The title *Rustle* evokes the quiet disturbances at the edges of awareness—bodily microstates, environmental whispers, inner fluctuations—that here become compositional material. The piece is presented to its audience as an evolving landscape of perception, where sound and image are not only heard and seen, but also felt, both as internal vibration and as a shared, immersive experience.

Rhoē Project:
Wavelets & Rustle

Technical Requirements

Audio Interface (Soundcard):
– Minimum 2 input / 4 output soundcard with low-latency performance
– Max/MSP and Ableton Live

Software & Devices:
– **Max/MSP**
– **Muse 2 Headset** (by InteraXon): for capturing EEG, heart rate, and motion data
– **Mind Monitor App** (running on an Android or iOS device): required for streaming brainwave data via OSC into Max/MSP

Additional Notes:

– Stable WiFi connection required for OSC data transmission from the Muse 2 via Mind Monitor
– Performer will wear the Muse headset throughout the performance
– Contact mic signal may require isolation from floor vibrations (please ensure cello is on an isolated mat if stage resonance is high)

Instructions

Performance Notes

This piece is deeply rooted in expression and physical engagement with both the instrument and the electronics. It invites the performer into an embodied dialogue with sound—where gestures, bowing pressure, and interpretative choices shape the live electronics in real time.

The interpretation of phrasing, timing, and bow movement is intentionally left open. The performer is encouraged to explore their own expressive arc within the structure, responding intuitively to the acoustic and electronic feedback.

Certain extended techniques and motion-based symbols appear throughout the score. While these are described in the following legend (see below), they are not meant to suggest a physical and sonic texture that can be sculpted uniquely in each performance.

Ultimately, this work exists as a live, evolving relationship between body, sound, and system—no two performances are alike.

Play on beat & beat position

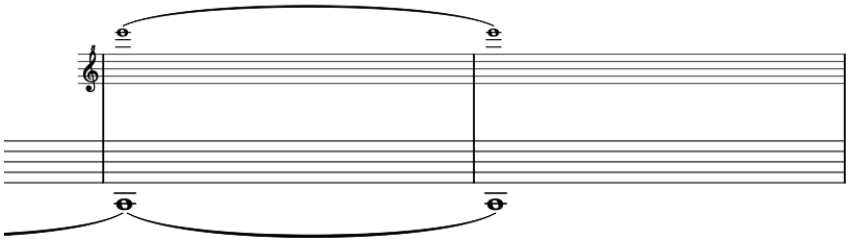
Two-hands pizzicato: Play open strings with both hands, like an harp.

Let the bow spring and bounce on the string randomly for 3 measures.

Play approximate pitches between the two notes: high C and low C.

Ele.

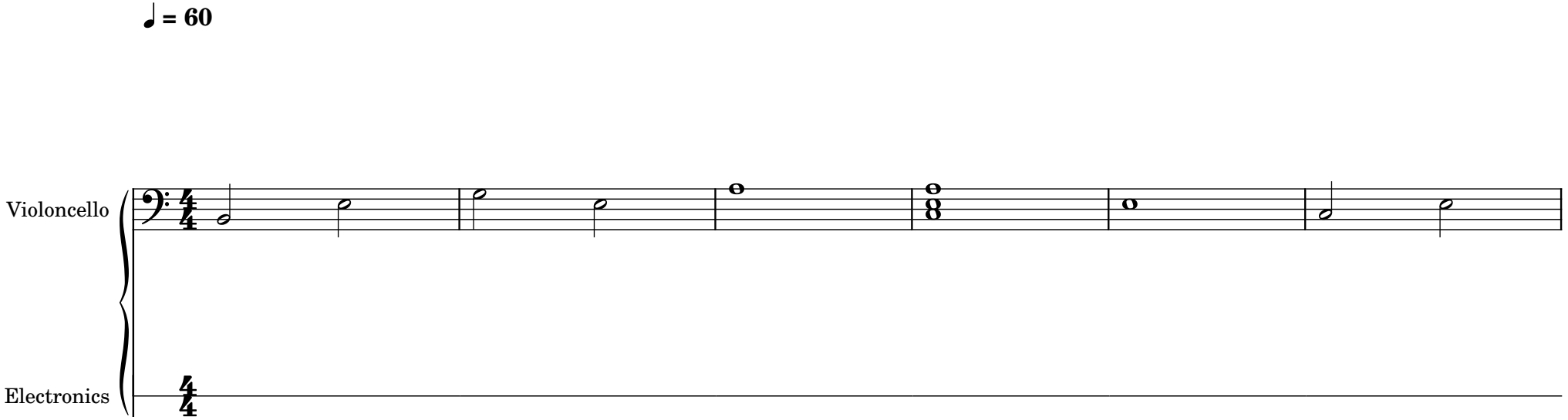
Electronics: atmos only.

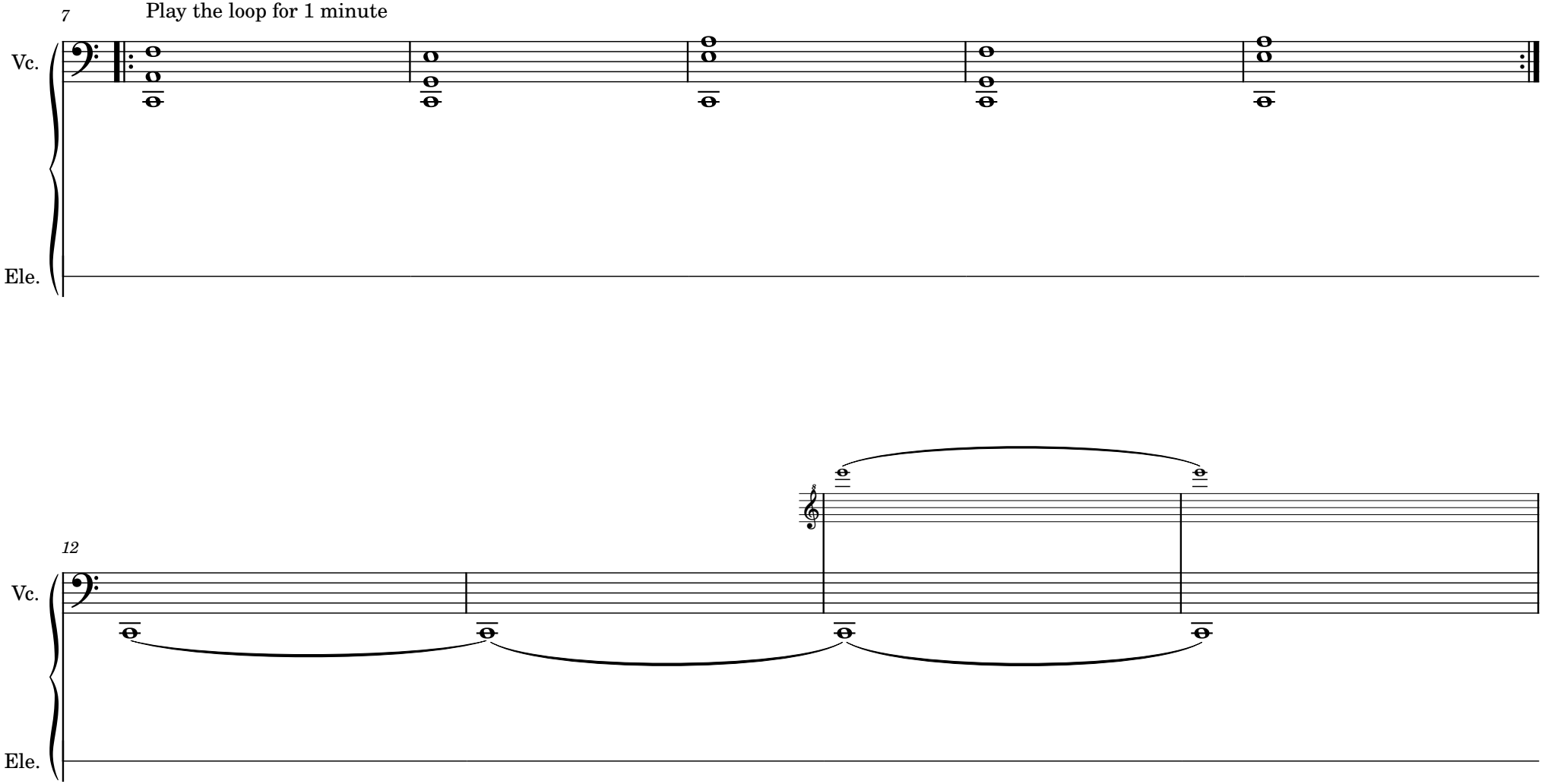


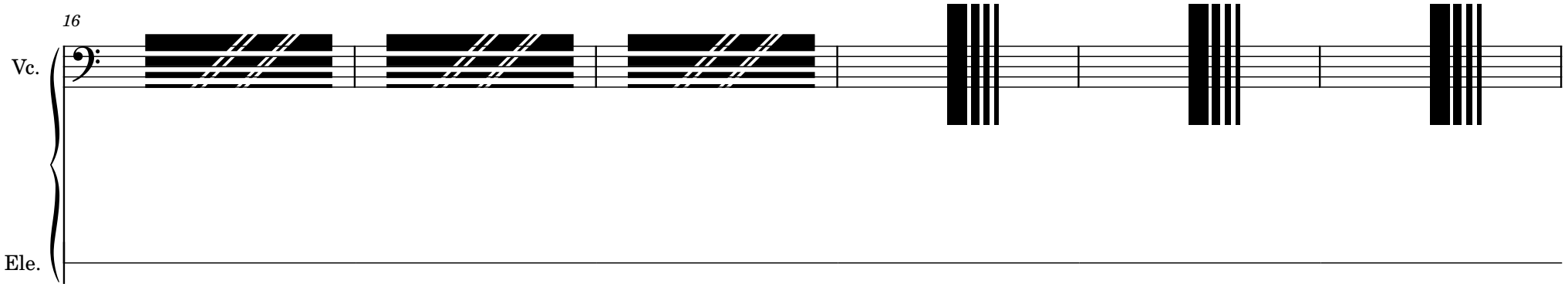
Two-bow phrase:
1.Modulate the sound between sul ponticello and sul tasto.
2.Tenuto on the A string, played below the bridge.

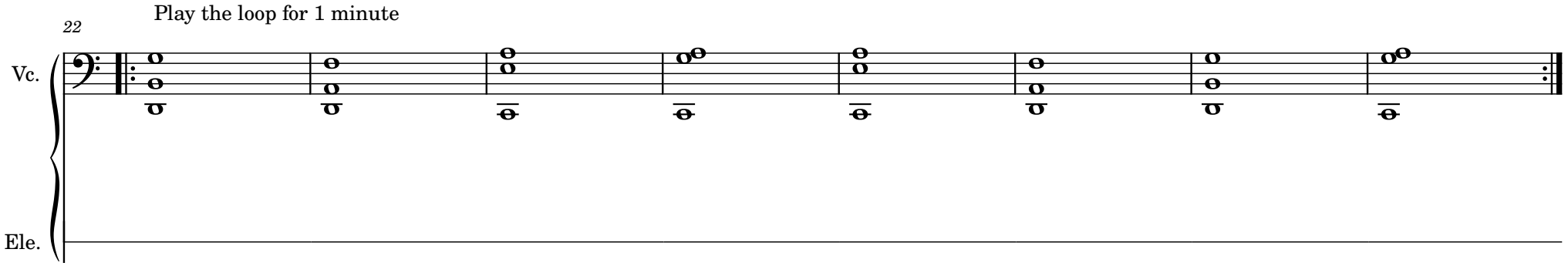
Rustle

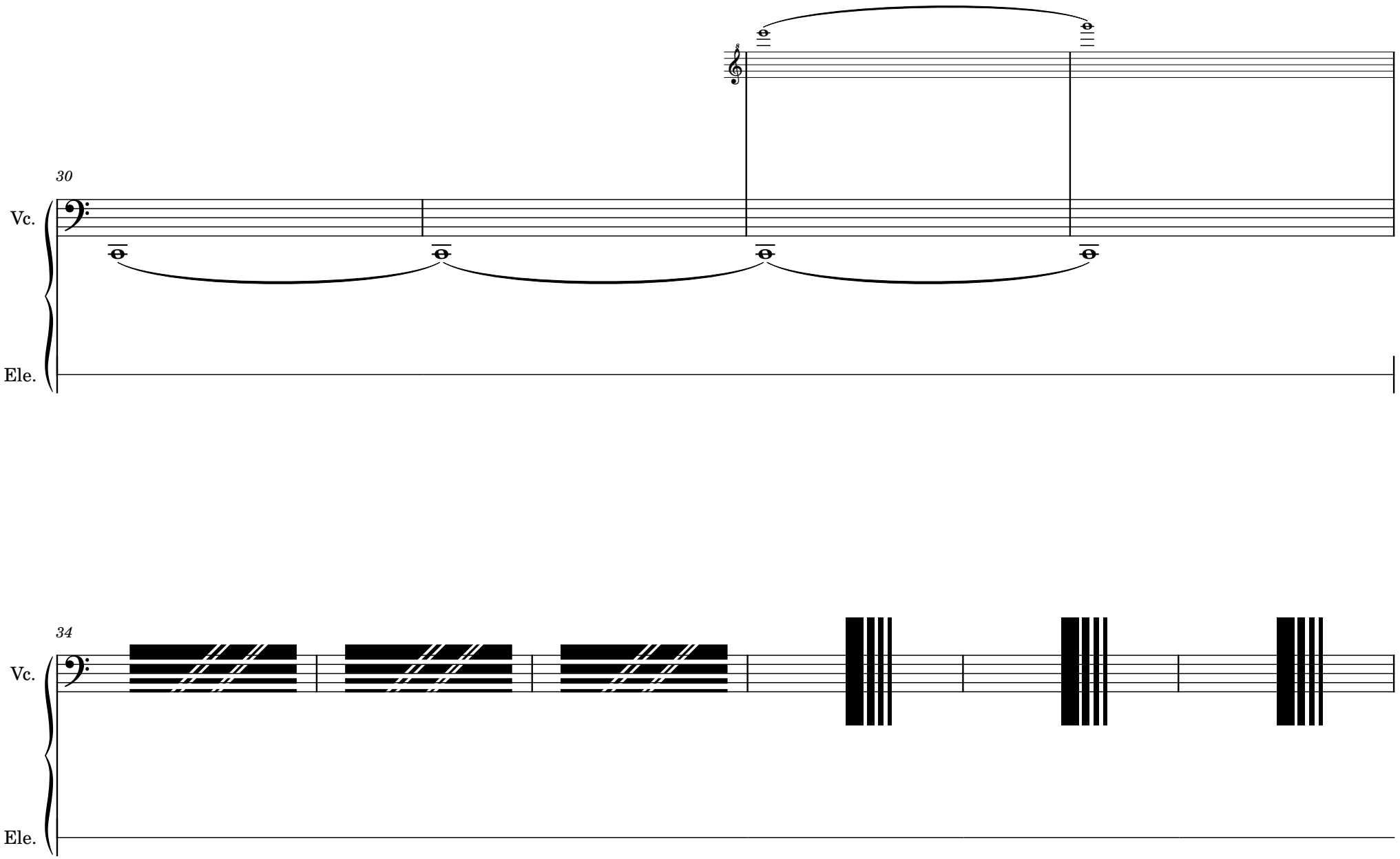
[Dynamics are at the discretion of the performer.
In this piece, the cello's A string is to be tuned a quarter tone above standard pitch.]

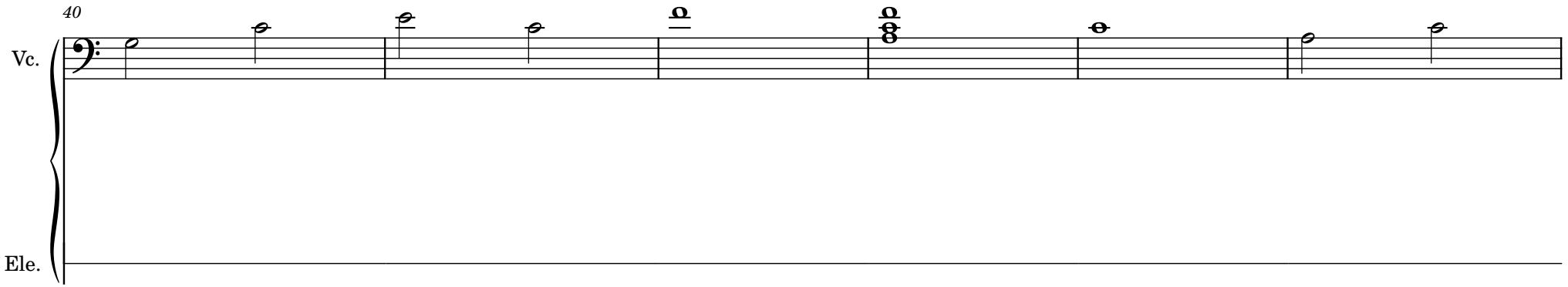


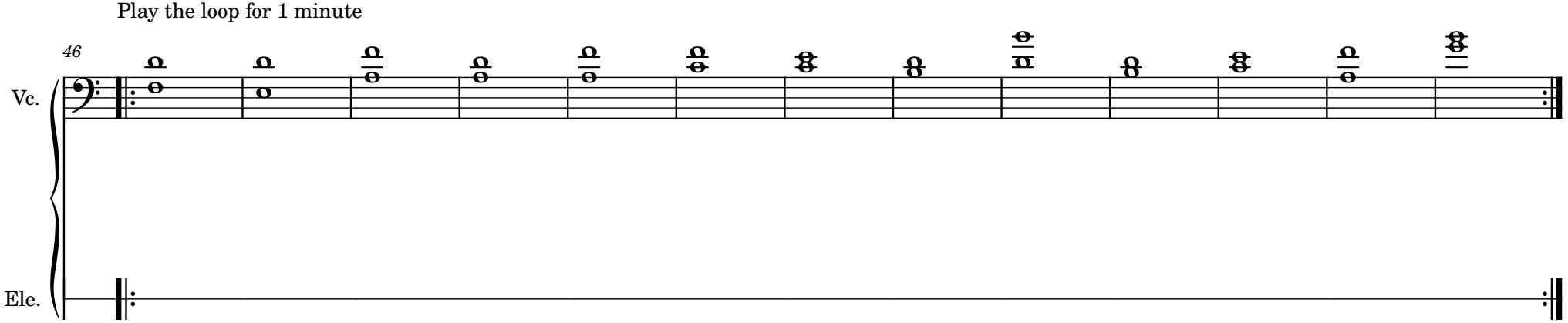

7
Play the loop for 1 minute
Vc.
Ele.
12
Vc.
Ele.


16
Vc.
Ele.


Play the loop for 1 minute
22
Vc.
Ele.


30
Vc.
Ele.
34
Vc.
Ele.

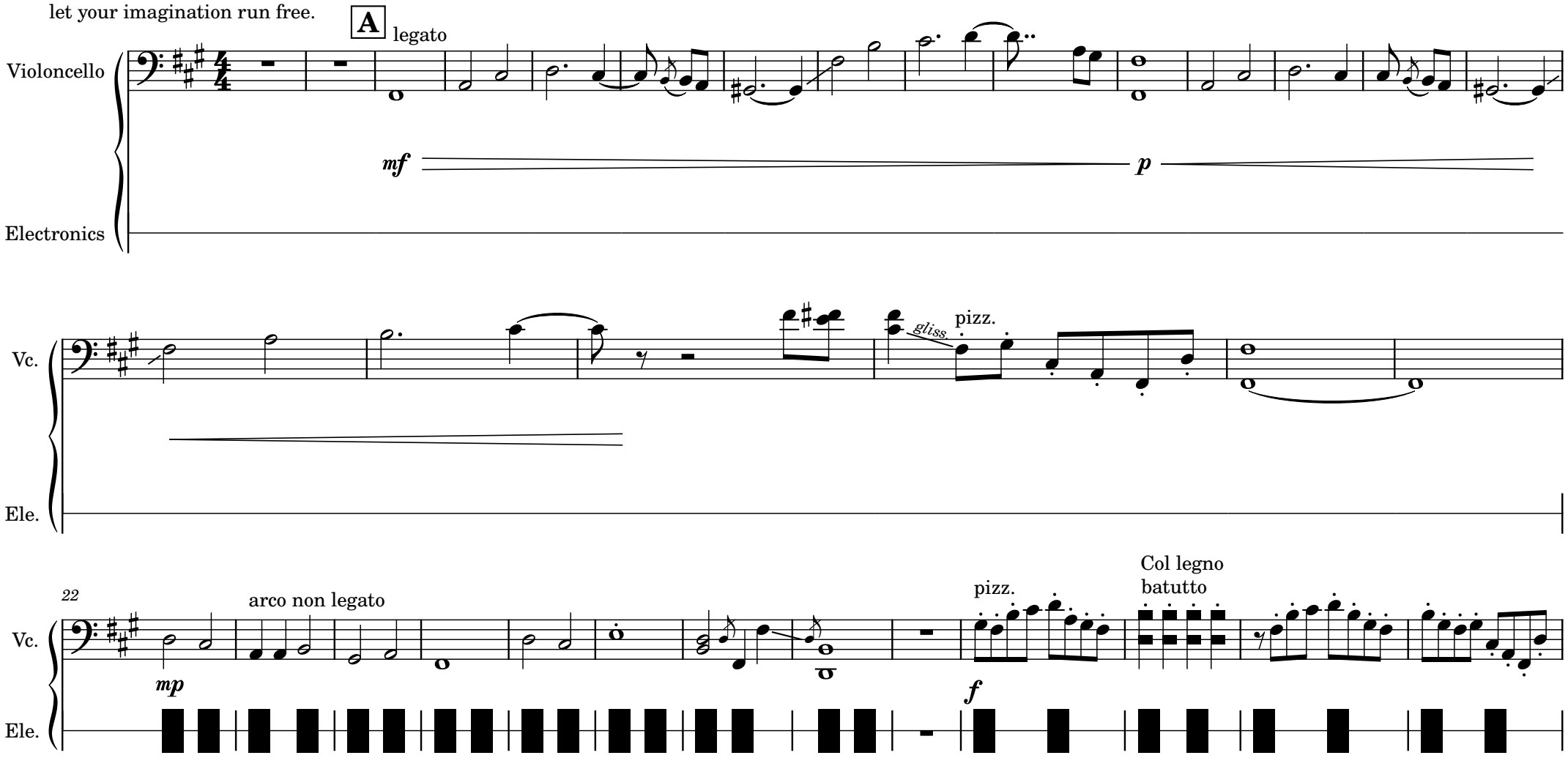

40
Vc.
Ele.

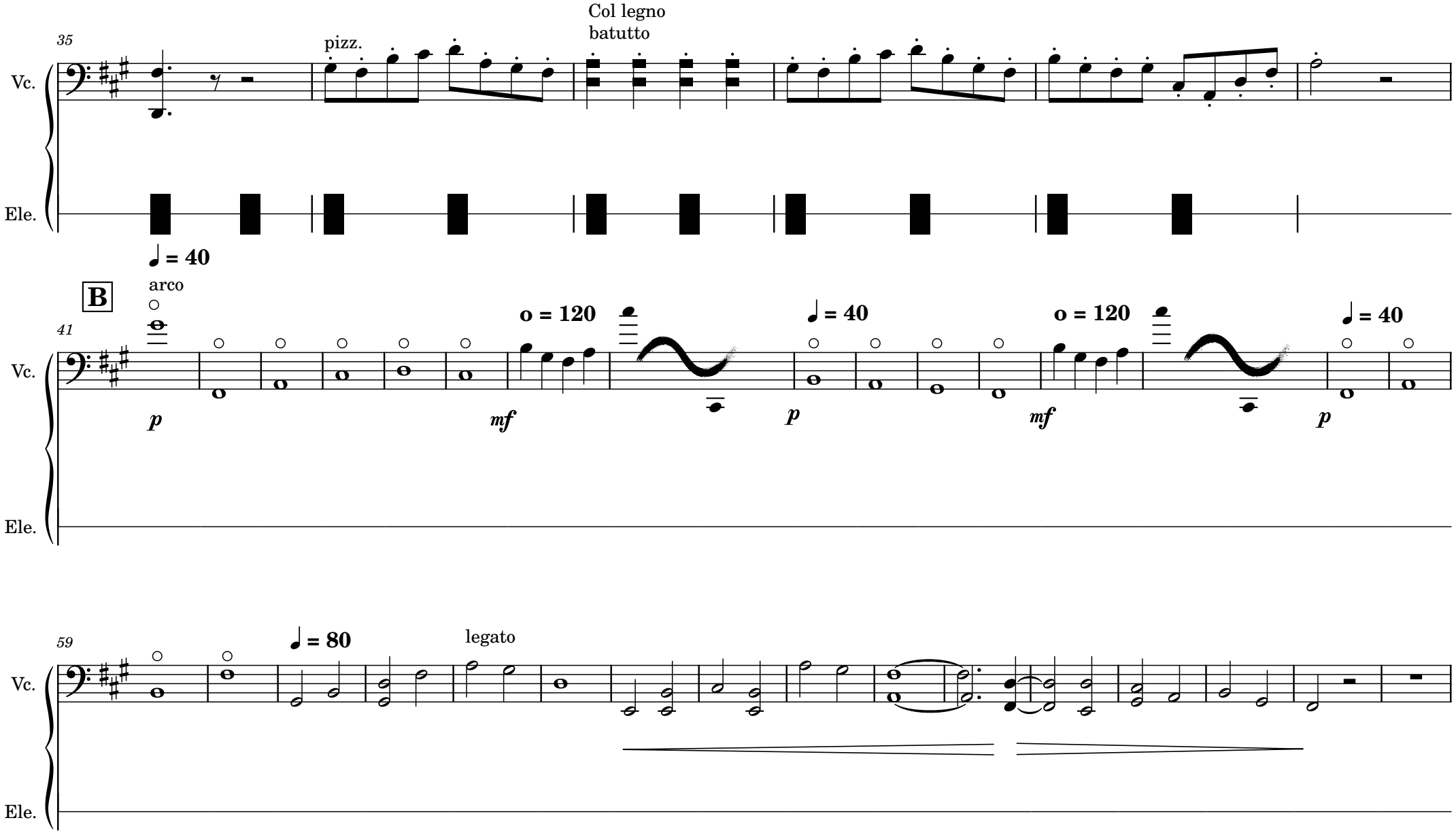

Play the loop for 1 minute
46
Vc.
Ele.

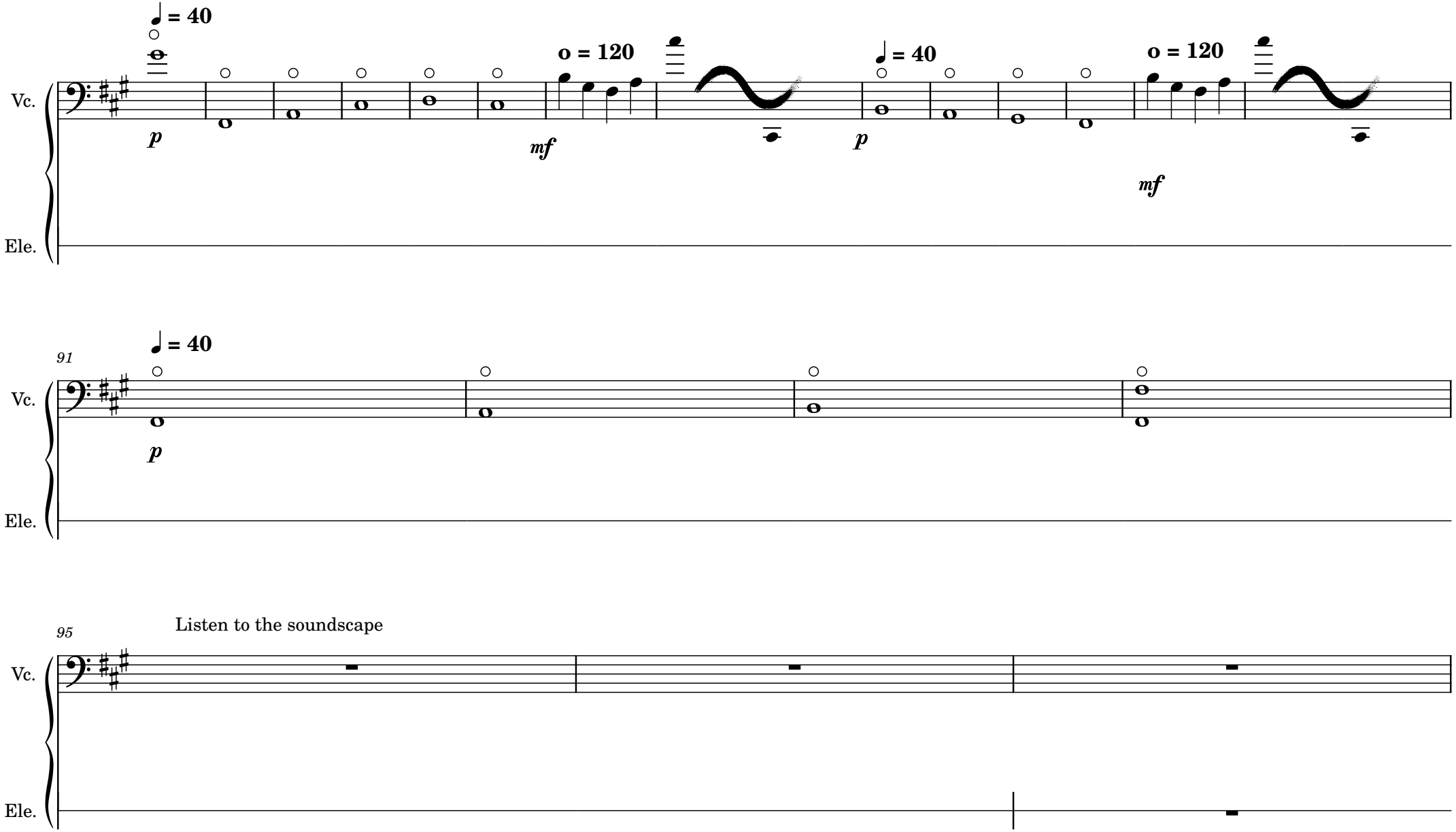
Wavelets

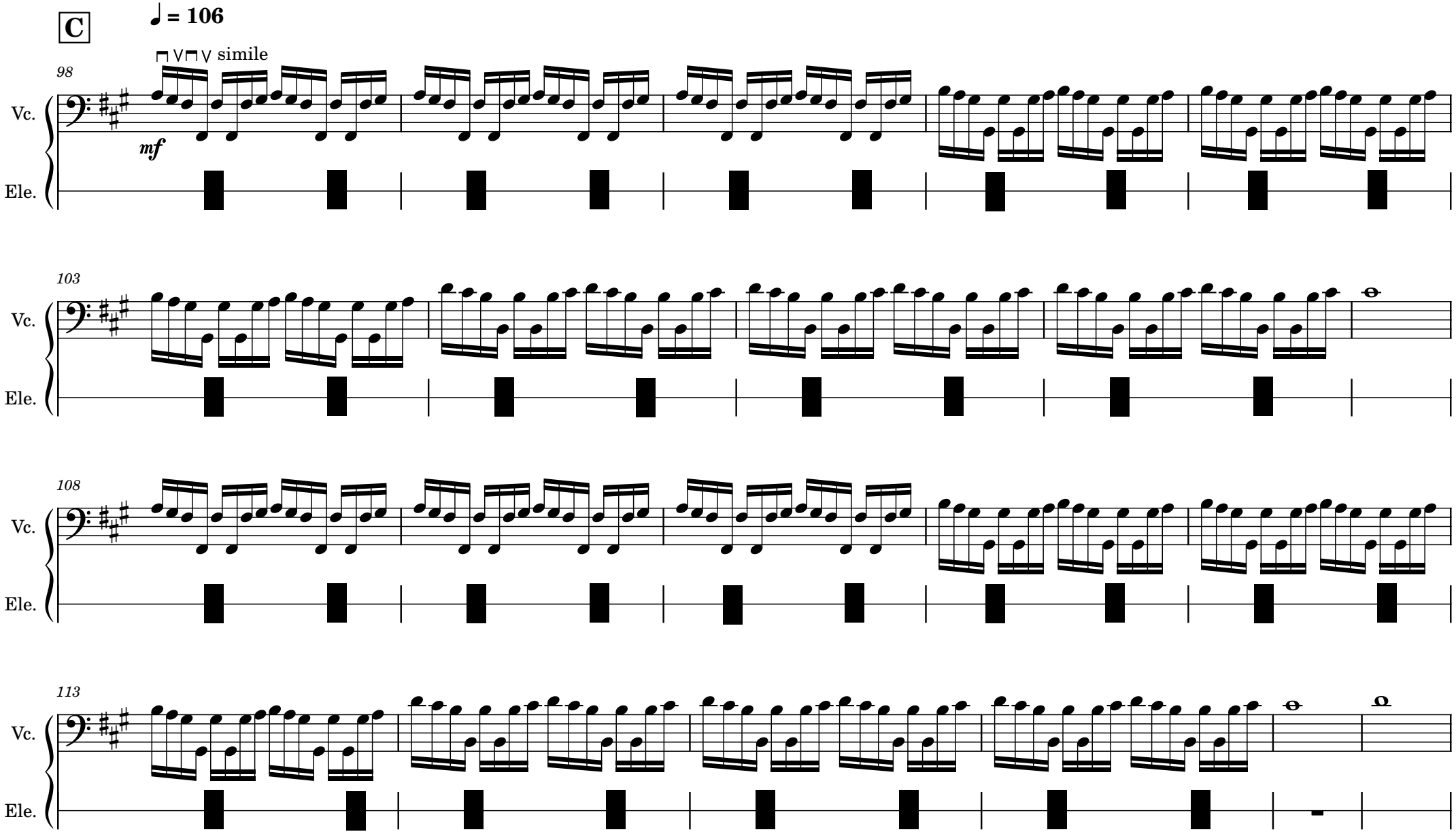
♩ = 80

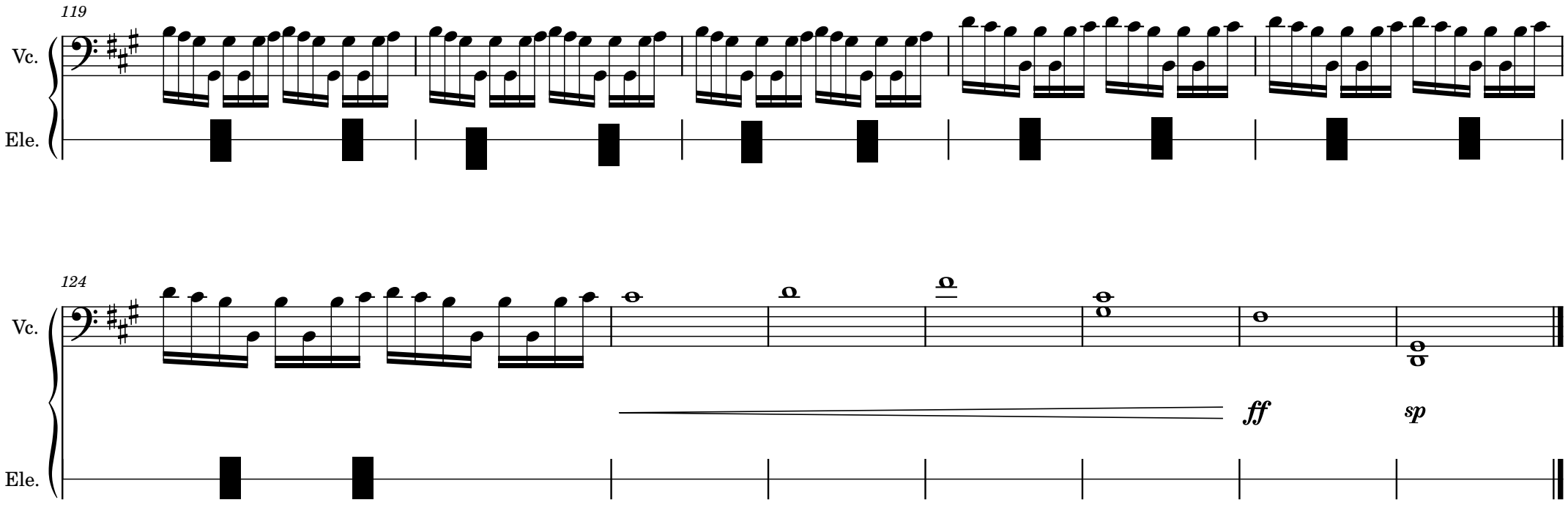
Listen to the soundscape and
let your imagination run free.




35
Vc.
pizz.
Col legno
batutto
Ele.
♩ = 40
B
arco
41
Vc.
p
mf
o = 120
♩ = 40
p
o = 120
mf
♩ = 40
p
Ele.
59
Vc.
♩ = 80
legato
Ele.


♩ = 40
o = 120
♩ = 40
o = 120
Vc.
Ele.
p
mf
p
mf
91
♩ = 40
Vc.
Ele.
p
95
Listen to the soundscape
Vc.
Ele.


C
♩ = 106
simile
98
mf
Vc.
Ele.
103
Vc.
Ele.
108
Vc.
Ele.
113
Vc.
Ele.


119
Vc.
Ele.
124
Vc.
ff
sp
Ele.