Into the Bends of Time and Musical Forces in Jazz: Group Interaction and Double-time in "My Foolish Heart" as performed by the Bill Evans Trio with Scott LaFaro and Paul Motian.

by

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Department of Music
Duke University

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Approved:

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Stephen Jaffe, Supervisor

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Scott Lindroth

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Philip Rupprecht

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Paul Berliner

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Stephen Anderson

Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
Music in the Graduate School
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2016

ABSTRACT

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ABSTRACT

Into the Bends of Time is a 40-minute work in seven movements for a large chamber orchestra with electronics, utilizing real-time computer-assisted processing of music performed by live musicians. The piece explores various combinations of interactive relationships between players and electronics, ranging from relatively basic processing effects to musical gestures achieved through stages of computer analysis, in which resulting sounds are crafted according to parameters of the incoming musical material. Additionally, some elements of interaction are multi-dimensional, in that they rely on the participation of two or more performers fulfilling distinct roles in the interactive process with the computer in order to generate musical material. Through processes of controlled randomness, several electronic effects induce elements of chance into their realization so that no two performances of this work are exactly alike. The piece gets its name from the notion that real-time computer-assisted processing, in which sound pressure waves are transduced into electrical energy, converted to digital data, artfully modified, converted back into electrical energy and transduced into sound waves, represents a "bending" of time.

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JAMIE KEESECKER

INTO THE BENDS OF TIME

for large chamber ensemble with electronics

Full Score

INSTRUMENTATION

Flute (doubling Alto Flute and Piccolo)

Clarinet (doubling Bass Clarinet)

Tenor Saxophone (doubling Soprano Saxophone)

Horn

Percussion

Indefinite pitch:

Woodblocks (2 differing pitches)
Triangle
Tam-Tam
Tom-Toms (2 differing pitches)
Large Bass Drum

Definite pitch:

Marimba (lowest note: G♭2)
Vibraphone
Xylophone
Glockenspiel
Crotales (2 octaves)

Piano (doubling Celesta)

Electronic processing

Violin (doubling Guitar)

Viola

Cello

Double Bass

Score is in C. Octave-transposing instruments are transposed.

PERFORMANCE NOTES

Note on Electronics Used in Live Performance:

The realization of the piece requires that most instruments are individually mic'ed and fed into a multi-channel audio interface. An array of four speakers should be placed on the stage according to the stage diagram below. An additional mono output is needed, to be sent to the guitar amplifier on stage (for movement VII). Electronic effects are written in the SuperCollider programming environment, and are adaptable to whatever interface devices are available for performance. An independent electronics operator is highly recommended. Files containing the electronic patches are available from the composer upon request.

Suggested stage diagram

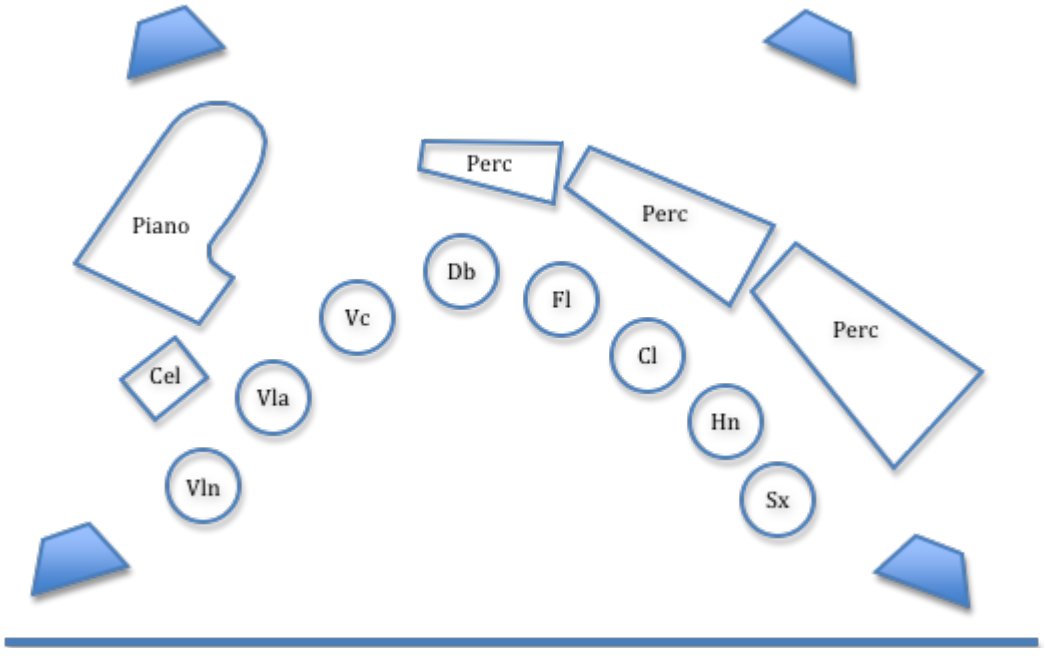


Figure 1: Suggested stage diagram

Note on the two-channel recording:

Into the Bends of Time was recorded on April 21, 2015 in Baldwin Auditorium at Duke University. The musicians were:

Alex Sopp, Flutes

Hideaki Aomori, Clarinets

Susan Fancher, Saxophones

C.J. Camerieri, Horn

Cameron Britt, Percussion

Michael Trinastic, Piano & Celesta

Rob Moose, Violin & Electric Guitar

Nadia Sirota, Viola

Andrea Lee, Cello

John V. Brown, Double Bass

Verena Mösenbichler-Bryant, Conductor

Rick Nelson, Recording Engineer

The stereo recording of the work approximates the placement of the four-channel speaker array through panning, a sample delay on the rear pair (≈5ms), and additional reverb applied to the rear speaker pair. The mixing and mastering were accomplished over many months in post-production using careful splicing, crossfading, and flex-time techniques in Logic Pro X. Effects were rendered using SuperCollider 3.6.5, and multichannel outputs were routed into Logic Pro using Soundflowerbed v1.6.6. The stereo recording is available for listening at:

https://soundcloud.com/jamie-keesecker/sets/into-the-bends-of-time

Notes on Processing of Each Movement:

I. Breakout

At various points throughout the movement, auto-harmonization is applied to two pairs of instruments. The Bass Clarinet and Tenor Saxophone function as one pair; the Viola and Cello make up the other. Within each pair, one instrument is harmonized to an "empty seventh chord" pitch set, [0,7,10][1], while the other is harmonized as a major 6/4 triad, [0,5,9][2]. (B. Cl. and Vc. are harmonized with the empty seventh chord; T. Sx. and Vla. are harmonized with the 6/4 triad.) In all cases, the harmonies are built up on top of the pitches played by the respective instruments, so that the notes performed acoustically coincide with the lowest notes of each trichord.

The points at which harmonization occurs are notated in the score with dotted brackets under the Electronics staves and the staves of the parts being harmonized. The inputs to the synth are gated and must be assigned to an interface control operated by an independent electronics operator or one of the performers.

The [0,7,10] set is panned to the left speaker pair, while the [0,5,9] set is panned to the right speaker pair. When a new onset is detected in one of the instruments, its panning position along the front-to-back axis of its respective speaker pair is randomly assigned a new value, creating a sense of spatial depth

---

[1] [0,7,10] is [0,2,5] in prime form according to Allen Forte's *The Structure of Atonal Music* (New Haven: Yale University Press, 1973).
[2] [0,5,9] is [0,4,7] in normal form, [0,3,7] in prime form in Forte's list.

based on rhythmic activity. In this sense, the harmonized gestures give the impression of "breaking out" of the texture.

II. Parallel Existence

This movement uses a percussion-triggered flute harmonizer, a multi-dimensional synth. The flautist uses a midi pedal according to the pedaling notated in the Flute part. When the melodic line ascends to certain sustained notes, the pedal is depressed, which activates the computer to record a short sample of the sustained note. The buffered sample is enveloped and looped on an inaudible bus. It is superimposed with an offset version of the looped, enveloped sample, creating a secondary vibrato effect on an infinitely sustaining line. The silently sustained bus is harmonized according to an input array.

The computer then listens for an onset from the Triangle. When it detects an onset, the harmonized Flute chord is sounded, accompanied by a swirling low-frequency noise sweep. Individual voices of the Flute harmony are punctuated with small randomized gaps, which are sent to a delay line. The resultant effect is a sustained texture with granular holes, which are followed by individual grains of sound.

Additionally, there is a tracking phase vocoder effect on the sound of the Triangle. It is sampled into a buffer upon a new onset detection (similar to the sampling process used on the Flute), and played back three times, alternating between normal and reversed playback of the buffer. Parameters of the

tracking phase vocoder effect and delay times of the buffer playback are refreshed upon detection of a new onset.

The Flute harmony is sustained until the flautist releases the midi pedal, allowing the performers to control the flow of the performance. Changes in harmony are notated in the score as "H-1", "H-2", etc. and should be assigned to a midi controller operated by an independent user.

III. Broken Things

An electronic interlude of approximately 50 seconds in duration occurs during the fermata in the measure before rehearsal letter L. The downbeat of the previous measure, m. 119 is sampled and bussed into four different groups: (1) Winds (Fl., T. Sx., Hn.) and Xylophone, (2) Upper three strings (Vln., Vla., Vc.), (3) sustained basses (B. Cl., Pno.), and (4) Double bass.

Each group is subjected to a different electronic process, simultaneously mixed to create multiple layers of musical activity:

(1) Winds and Xyl. and combined and the spectrum is frozen using an FFT process. Selected bins (corresponding to fundamental frequencies) are highlighted, while all others are filtered out. The resulting sonority is applied to a series of staccato impulses in a repeating rhythmic profile based on a rhythm found throughout the movement:

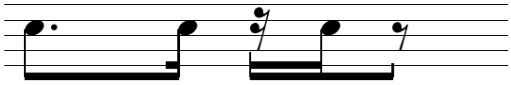


Figure 2: Rhythmic gesture found throughout movement III

The rhythm is repeated in two channels, but one channel contains an extra 16th note in its repeating pattern, so the alignment of the two channels is constantly shifting.

(2) High strings are subjected to a similar process. All frequency bins other than those corresponding with odd harmonics are filtered out. The chord is repeated according to the same rhythmic pattern as the winds and xyl. group, but is gradually sped up over approximately 20 seconds until achieving a percussive stream of noisy attacks roughly resembling repeated 16th notes. This layer of the texture is maintained longer than the others, sustained at varying volume levels until Rehearsal Q.

(3) The sustained basses are sampled into a longer buffer and played back using an FFT process that allows the sample to be scrubbed through extremely slowly (similar to a spectral freeze). Individual bins are arpeggiated according to pre-programmed and randomly configured arpeggiation patterns in sequence.

(4) The double bass sample is likewise lengthened by an FFT process that scrubs through the buffer slowly. The sample is played twice. The first time, it is chopped up by a "waveloss" process that drops a given

number of consecutive zero-crossings from the audio signal. The second time it is played as a timestretched sample with no waveloss attenuation.

IV. Divergence

This movement makes extensive use of an FFT-based random comb filtering combined with a waveloss process that drops a given number of consecutive zero-crossings from an incoming audio signal. When activated, the computer listens for onsets above a variable threshold. A detected onset causes an FFT filter to zero-out all but one bin chosen at random, then accumulate new bins in a random ordering until the sound is completely present. This is then subject to the waveloss process. Since the arrangement of zero-crossings changes with spectral content, as new bins are faded in, the rate of "tremolo" created by the waveloss process changes accordingly. The signal flow is represented in the following figure:

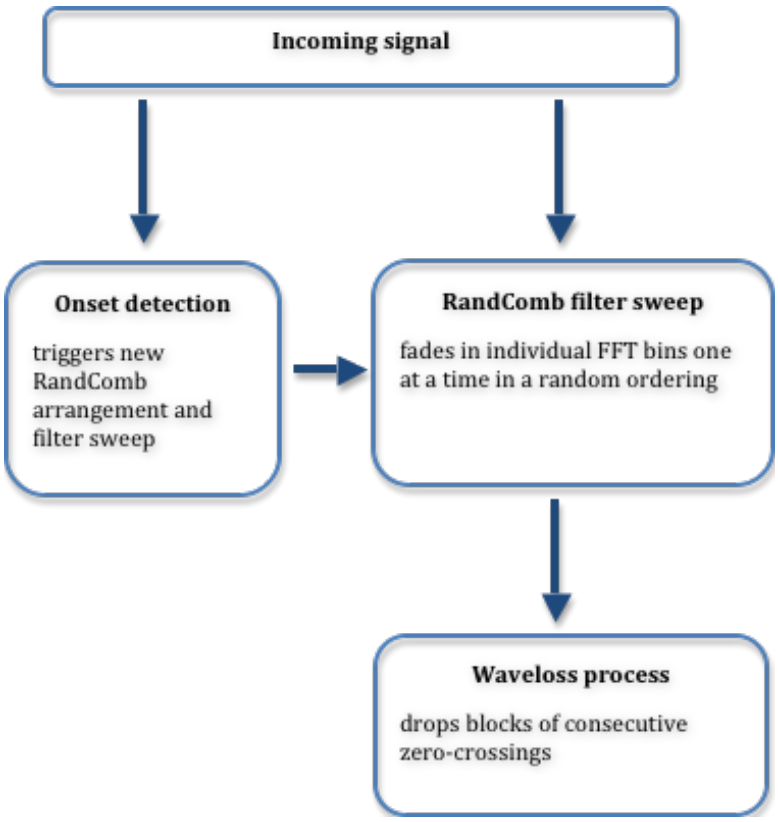


Figure 3: Signal flow of the "waveloss sweep effect"

Since the detection of a new onset causes the gesture to be reset, the variable onset threshold is set low for soft applications of the synth (e.g., the Cello and Double Bass harmonics at reh. G through reh. H, and set higher when used in louder sections (e.g., Vibes and Celesta at reh. O).

This effect is notated as "waveloss sweep effect" in the score, above the staff of each instrument upon which it is implemented. It occurs in three sections of the movement: (1) on the muted Piano gestures from the beginning until reh. B, (2) on the Cello and Double Bass harmonics from reh. G to two mm. after reh. H, and (3) on the Vibraphone and Celesta from reh. N to the end of the movement.

Additionally, the first five measures of reh. F use an "electric tremolo" effect, which consists of just the waveloss process by itself, in the winds and Double Bass. This is notated with an appropriately labelled dotted bracket beneath the corresponding staves.

V. Eat the Damage

At several points throughout the movement, the computer listens for a pair of onsets occurring within a given window of time from a specific instrument. Upon detection of a pair of onsets, the computer responds with an auto-gesture based on the tempo provided by the performer. The auto-gestures fall into one of two groups, synthesized gestures, which use an Atari chipset emulator to generate material; and real-time processing gestures, which sample the second of the two notes that triggered the onset detection, and use the sampled note to generate material.

The synthesized gestures use a first-order Markov chain on a pre-programmed set of available pitches to determine the exact pitches of each gesture. A process of controlled randomness selects from a predetermined set of short rhythmic fragments, which are then assembled into a single gesture. There are two types of synthesized gestures:

(1) A percussive, "chippy" descending gesture triggered by the Xylophone (occurring in mm. 89-80, mm. 103-104, mm. 118-119, and mm. 130-131), and

(2) two-voice "grooves" triggered by the Saxophone, each two measures in duration, that step through a repeating cycle of pitches (occurring in mm. 69-70, mm. 77-78, mm. 95-96, and mm. 97-98)

The real-time gestures use a similar process of controlled randomness to trigger playback of the sampled note into a stream of notes assigned to a rhythmic profile. Each triggered note is transposed according to random selection process based on a given input array of possible transposition levels. There are two different types of real-time processing gestures:

(1) solo gestures, in which a single instrument is sampled, and
(2) combination gestures, in which notes from two instruments are independently sampled and subjected to different processes that are combined into a single polyphonic gesture.

Solo gestures occur in the Flute (mm. 65-66, mm. 68-69, and mm. 76-77) and Horn (mm. 66-67, mm. 75-76:, mm. 92-93, mm. 106-107, mm. 131-132, mm. 133-134, and mm. 135-136). Combination gestures occur at five points when the Flute and Bass Clarinet play in conjunction (mm. 90-91, mm. 104-105, mm. 131-132, and mm. 133-134). In each instance, the Flute is shaped into a gesture similar to the output of the solo gesture process, while the Bass Clarinet cycles through a pattern of 16th notes that outline a minor 7th sonority [0, 10, 15]. In both types of real-time gestures, as new notes are triggered, they are more heavily treated with effects to make them sound like artificially created sounds, so that each

gesture is imbued with a motion from a natural instrument timbre to a more synthetic sound.

In the Percussion part, the Toms are treated with a bitcrushed ringing filter. The specific frequencies of the filter peaks are organized into four-voice harmonies, as noted in the score above the Electronics staves. There are three different harmonic possibilities, an E7#5, (reh. E and reh. Q), Em11 (m. 93), and Dm9 (m. 172). The parameters of the bitcrushing phase, which occurs after the ringing filter in the signal flow, are randomly determined based when the computer detects onsets above a variable threshold. Additionally, a separate onset detector, set to a higher threshold, triggers the harmony of the ringing filter to alternate between an upper and lower octave. Consequently, soft drum strokes induce no change to the effect, medium strokes trigger a change of bitcrushing parameters, and loud strokes induced both a change to the bitcrushing parameters and an octave jump of the ringing filter harmony.

Lastly, the end of the movement utilizes a buffered spectral freeze and fade-in gesture across all instruments of the ensemble. In measure 206 (bar before reh. Q), the downbeat of each instrument is sampled. The chord in the Piano is immediately crossfaded to a spectral freeze and overlaid with a fade-in (approximately 20 seconds in duration) to a spectral freeze for each sampled note of the other instruments of the ensemble. The downbeat of m. 215 (the bar before reh. R) releases the sustained notes, and the process is repeated for a subset of the ensemble (T. Sx., Vla., Vc., and Db) in a similar but subtler effect over approximately 12 seconds.

VI. Echoes In the Current

Pitch-constant, time-variable delay lines are applied to the Alto Flute and Viola throughout most of this movement. An operator must continuously tap the tempo in order for the effect to proceed normally. Two taps within a given window of time initiate the delay process. (The conductor must begin the movement with two preparatory beats, with which the electronics operator must sync the first two taps). If the computer determines a subsequent beat to be longer than the previous beat, the delayed signal is crossfaded from a direct, buffered representation of the signal to an FFT buffer, where an exponential slowdown approaching a spectral freeze sustains the signal until receiving a new tempo tap, at which point the delayed signal is quickly crossfaded back to a direct representation of the delayed signal. If the period between taps exceeds the duration of two full beats, a subsequent tap initiates an enveloped release of the sustained sound.

The delayed signals travel along a "figure-8" path across the speaker arrangement. Panning from one node of to the next occurs over the duration of the previous beat (as indicated by tempo taps). The figure below demonstrates this pattern:

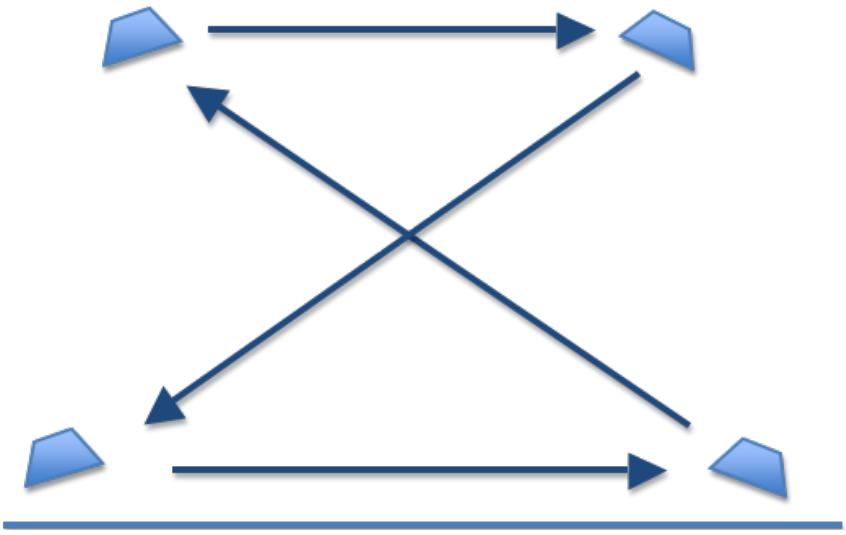


Figure 4: "Figure-8" panning pattern

The Alto Flute and Viola travel this "figure-8" path in opposite directions. The perceived distance of the rear speaker pair is exaggerated by the use of reduced volume and increased reverb. The resulting effect is one of the delayed signals occasionally coming into and out of focus, at times emerging from the ensemble texture, and other times being buried within it.

A pitch-dependent auto-harmonizer is used on the Tenor Saxophone throughout the movement. A pitch-tracking stage determines what note is being played and adjusts the auto-harmonization according to a set pre-programmed harmonic possibilities based on the recognition of specific pitches. Latency in the process creates a portamento effect reminiscent of a homophonic choral texture.

VII. Over the Long Arc

This movement uses a rhythmic chopping effect on the Electric Guitar signal. Unlike the Guitar part in movement V, in which the Guitar and amplifier

function as an acoustic instrument, for this movement the Guitar's signal should be sent directly to the computer, and the fifth mono output from the audio interface should be sent to the guitar amp. That is, the Guitar should not be audible except through the chopping effect.

The guitarist must tap a midi pedal upon the articulation of a new chord. This triggers the computer to record a brief sample into a buffer. The sample is enveloped and overlaid with an out-of-phase version of itself (similar to the process used in the Flute-Percussion effect in movement II). The Guitar signal is crossfaded from the live input to this sustained version and subsequently chopped into a stream of 16th notes (with a slight emphasis on every fourth note), allowing the chopping effect to be infinitely sustained until the guitarist taps the pedal again (or until the effect is released by the electronics operator). Additionally, a tap of the pedal initiates a panning spread. The sound of the chopped Guitar initially emanates from the amplifier on stage, then gradually spreads out to the quadraphonic speaker array, giving each chord a "blossoming" effect. Upon each new pedal tap, the sound is again limited to just the Guitar amp, and the panning spread is repeated.

INTO THE BENDS OF TIME

I. Breakout

II. Parallel Existence

III. Broken Things

IV. Divergence

V. Eat the Damage

VI. Echoes in the Current

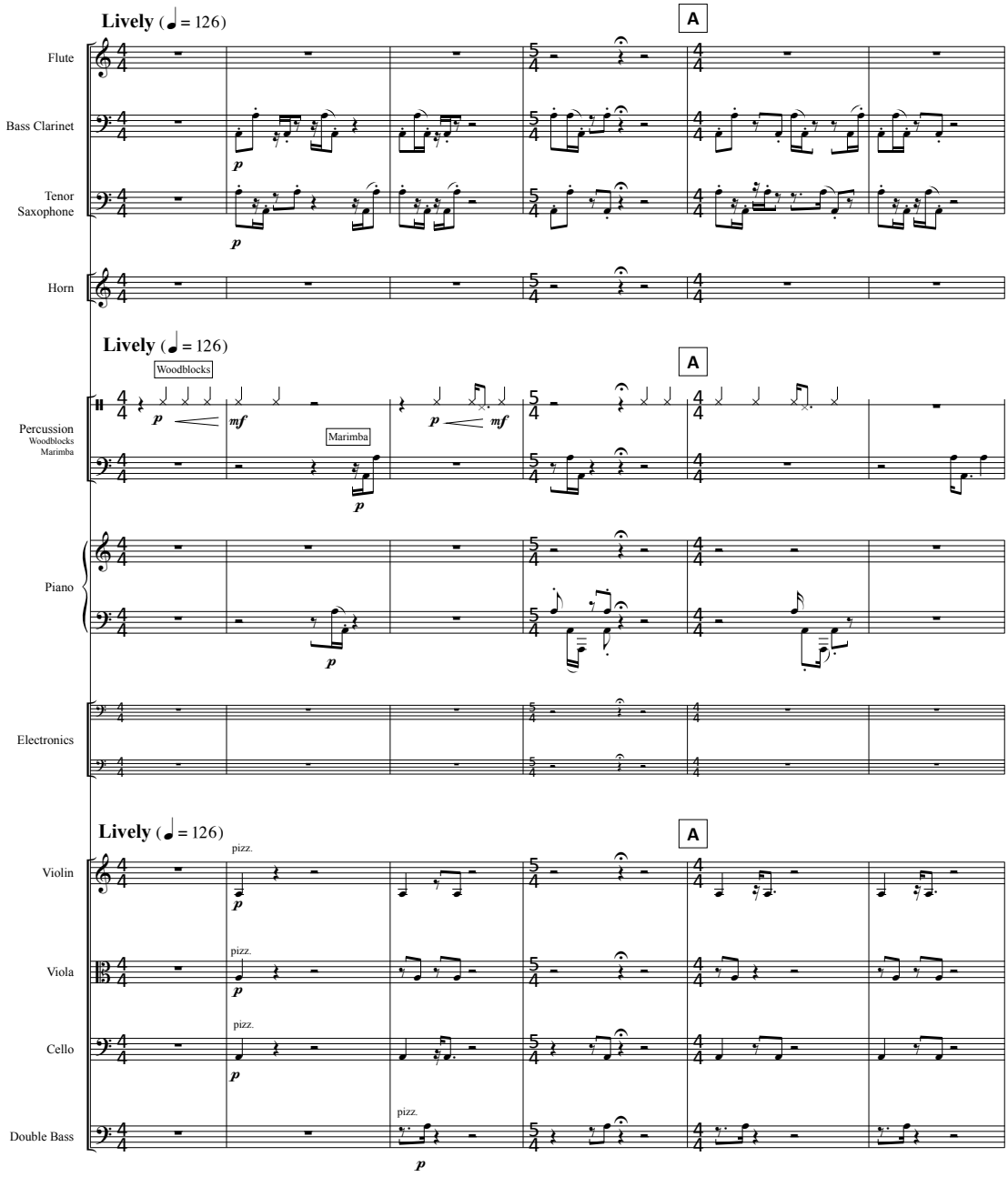
VII. Over the Long Arc

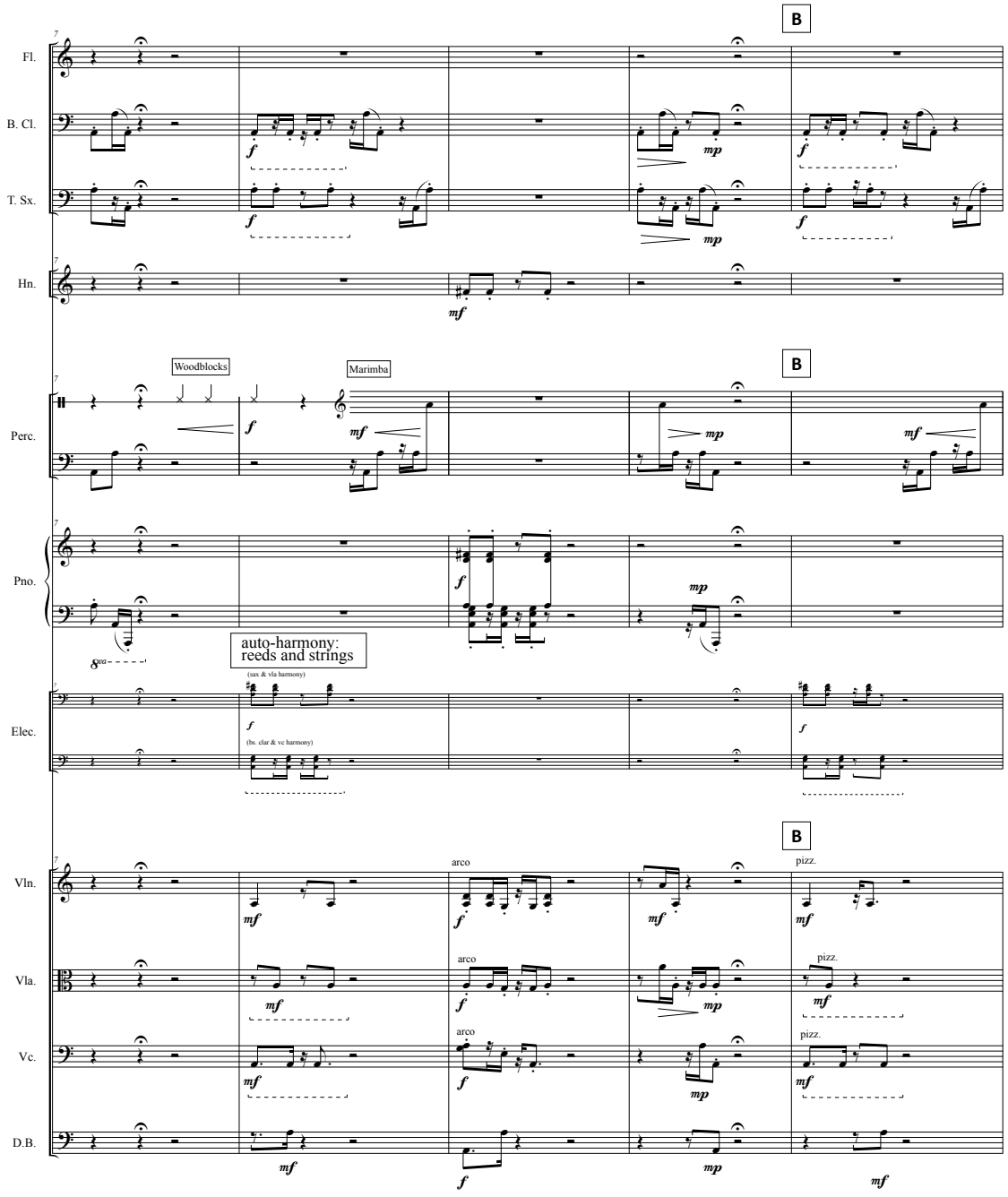
Score in C

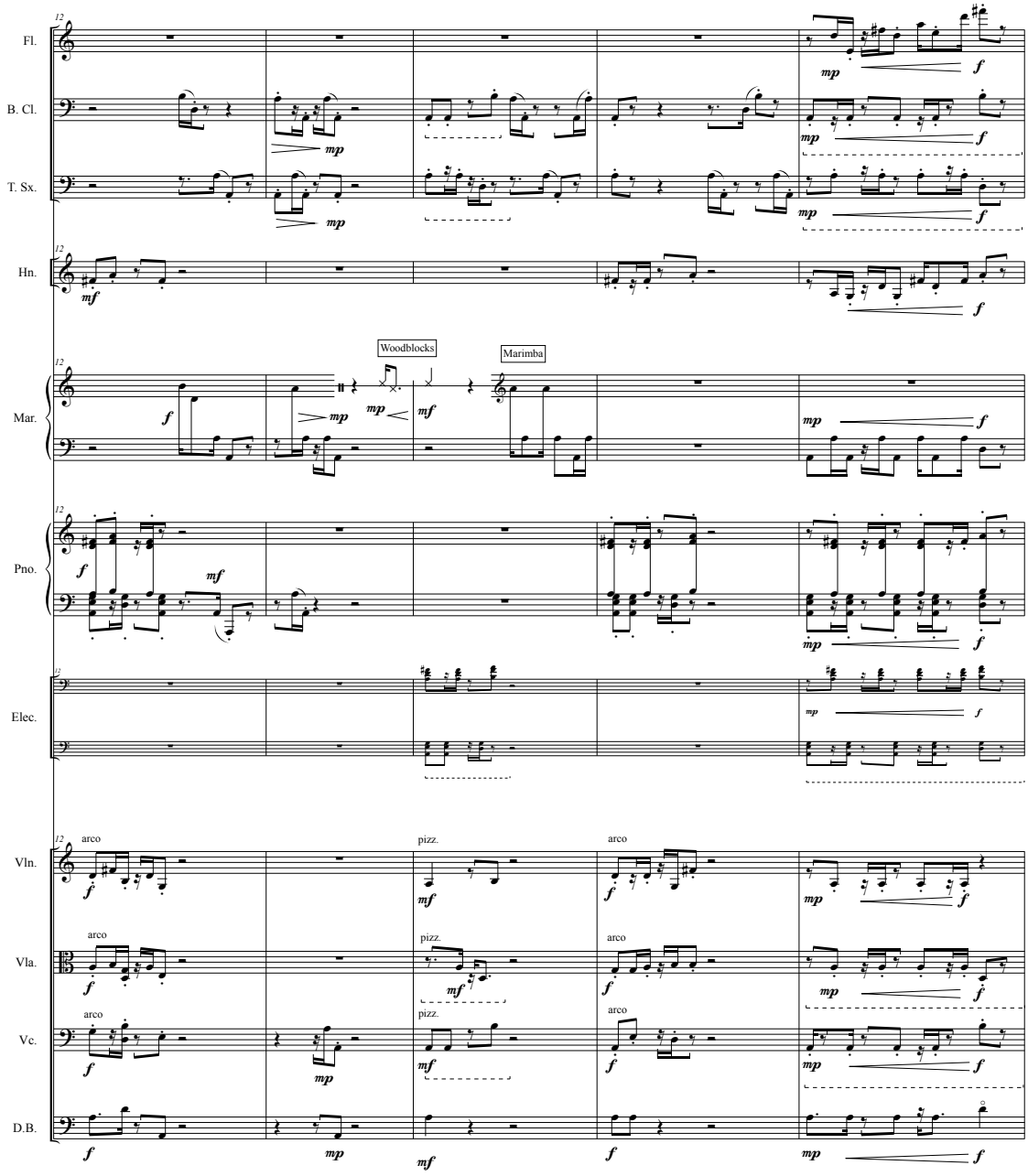
INTO THE BENDS OF TIME

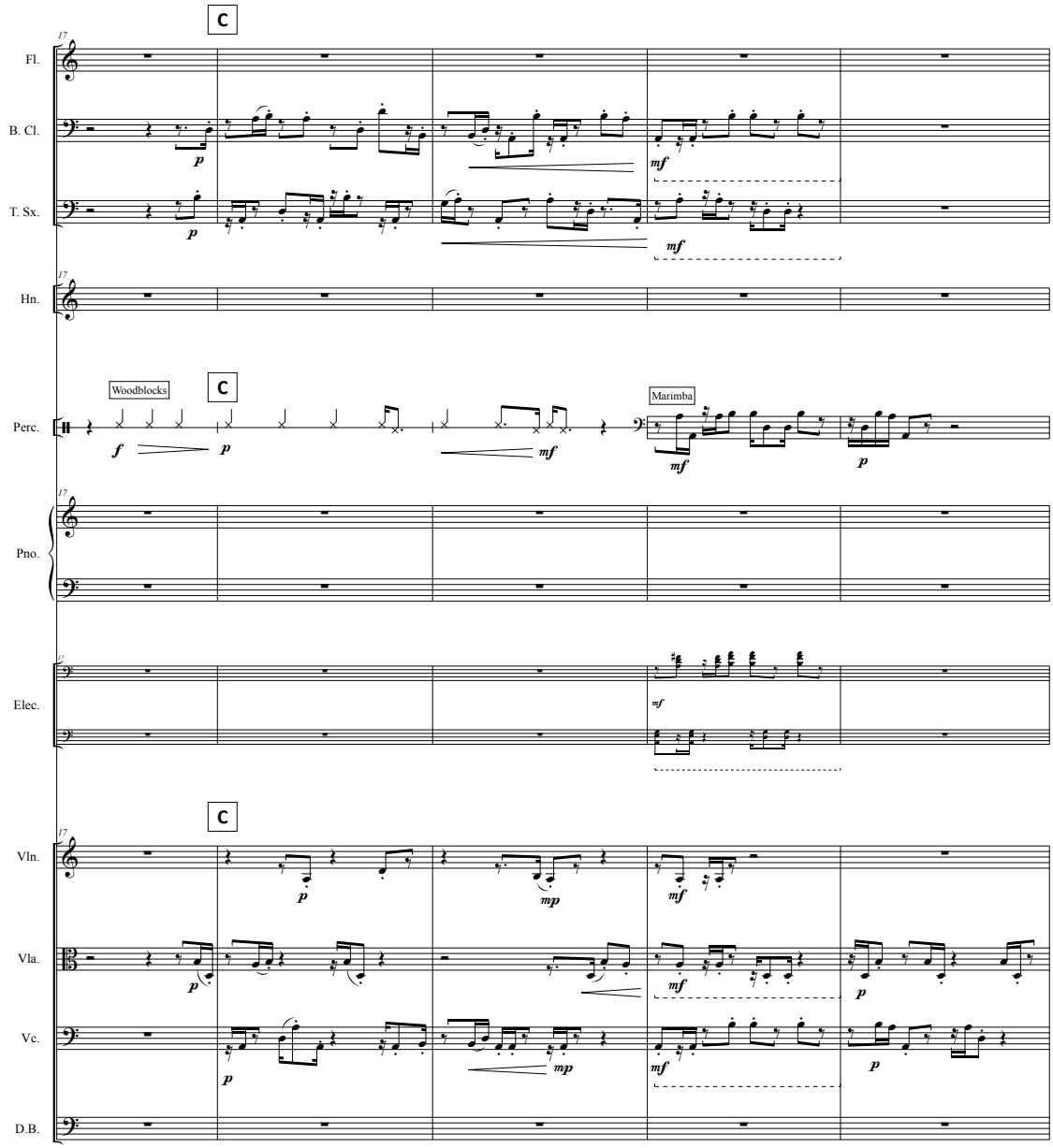
I. Breakout

Jamie Keesecker
2015




B
Fl.
B. Cl.
T. Sx.
Hn.
Woodblocks
Marimba
Perc.
Pno.
auto-harmony:
reeds and strings
(sax & vla harmony)
(bs. clar & vc harmony)
Elec.
arco
pizz.
Vln.
Vla.
Vc.
D.B.


Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Woodblocks
Marimba
Pno.
Elec.
Vln.
Vla.
Vc.
D.B.
arco
pizz.
arco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T. Sx.
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C
Marimba
Perc.
Pno.
Elec.
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Vln.
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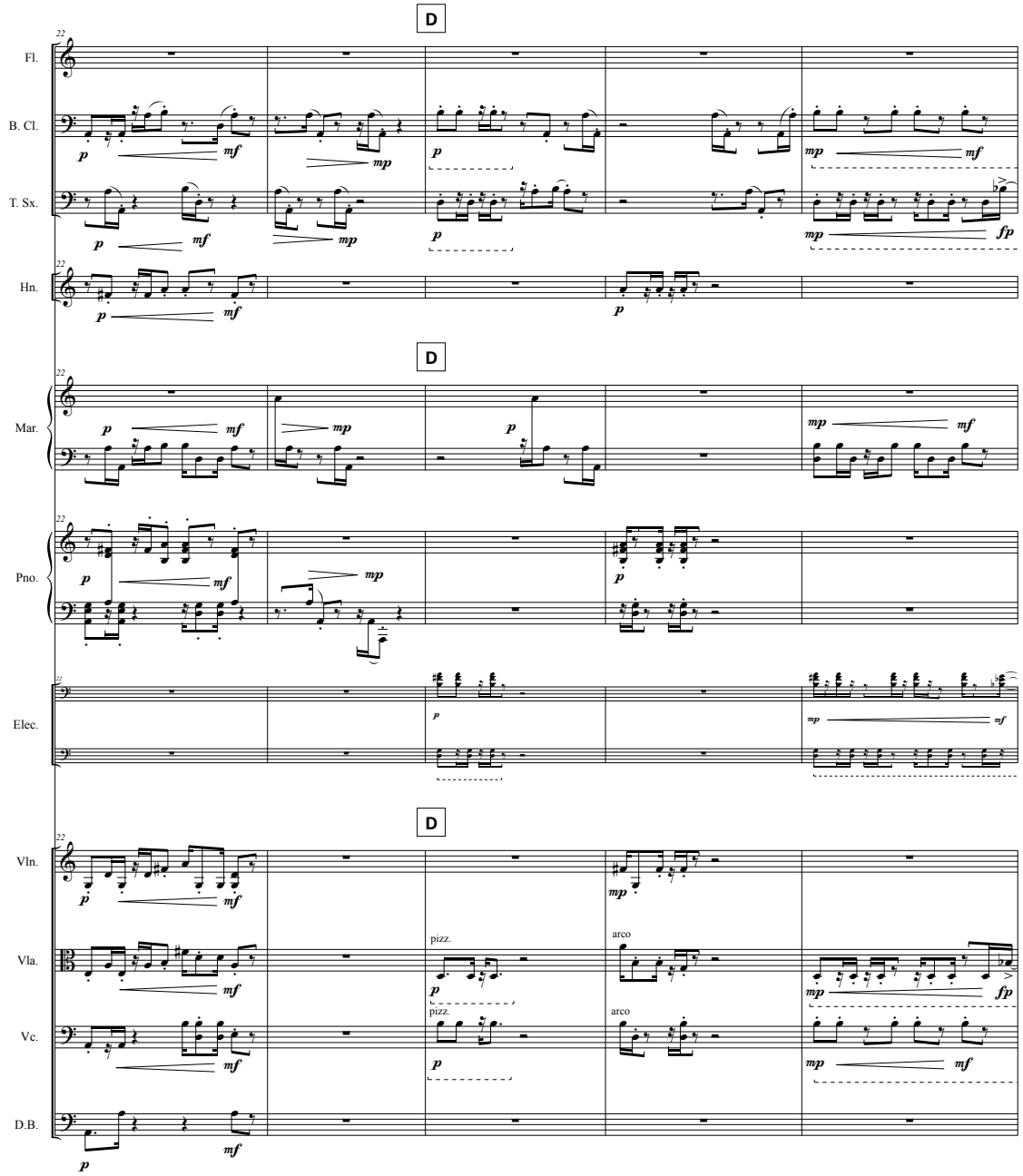
Vc.
D.B.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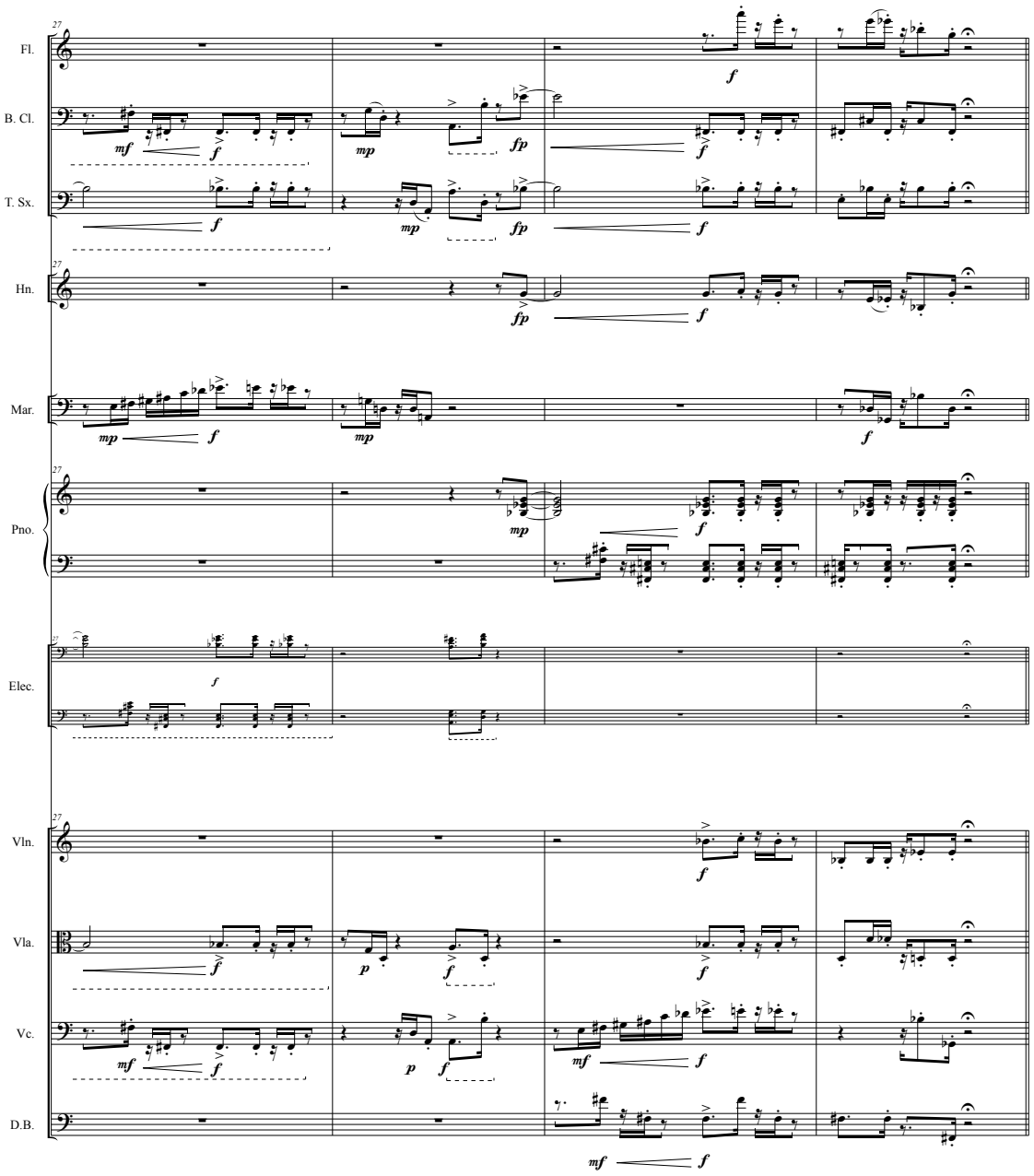
pizz.
arco
pizz.
arco


27
Fl.
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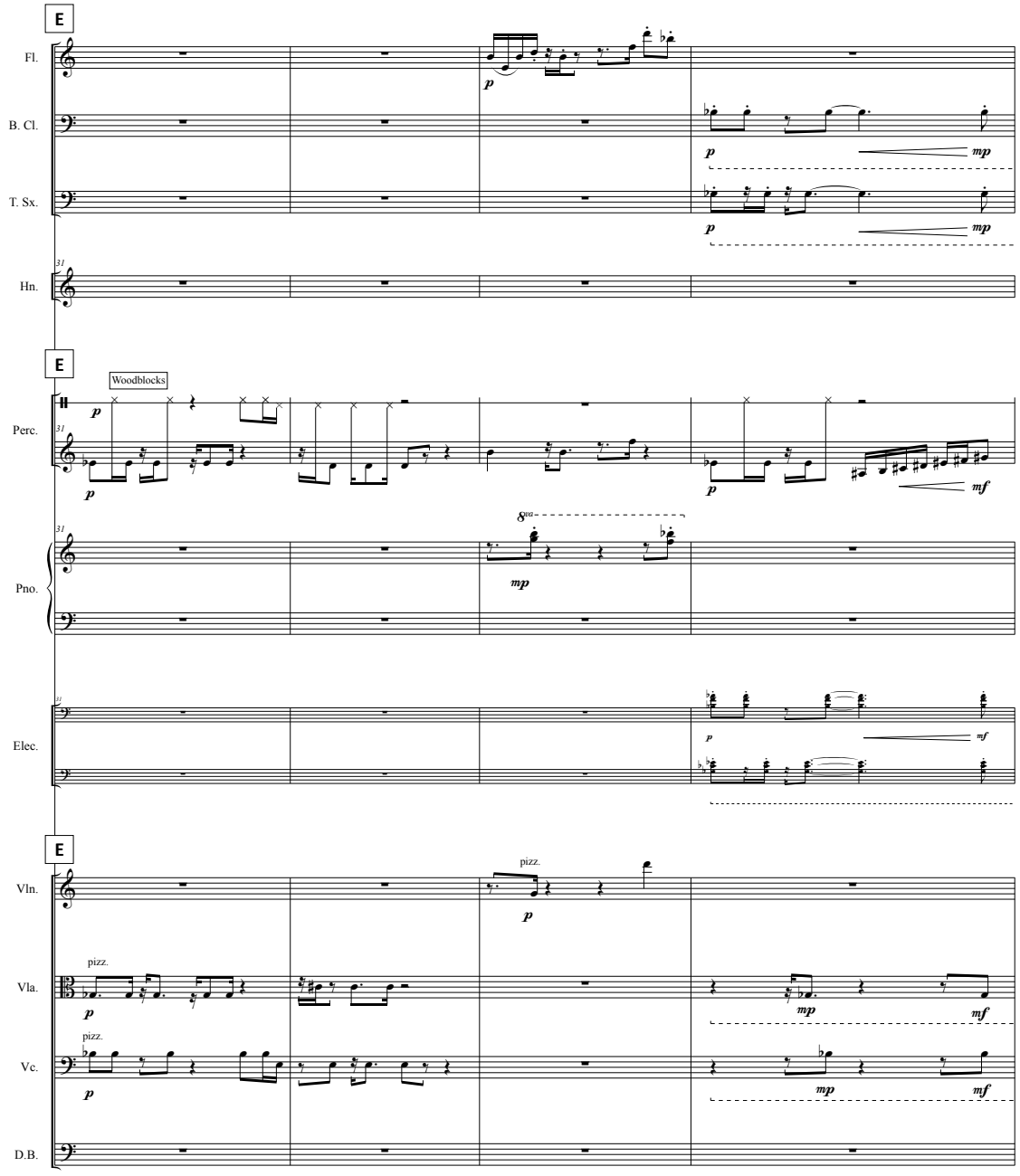
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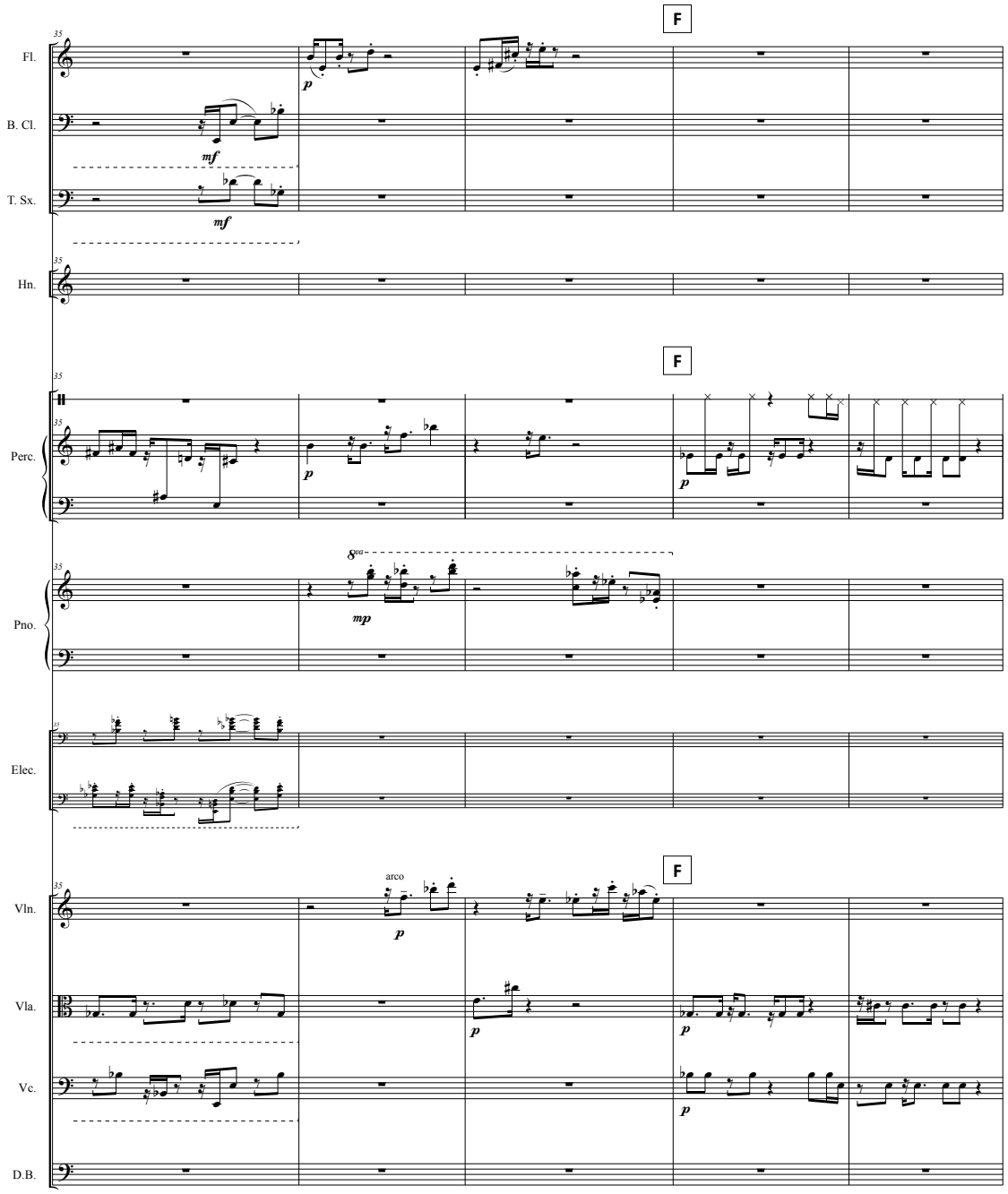
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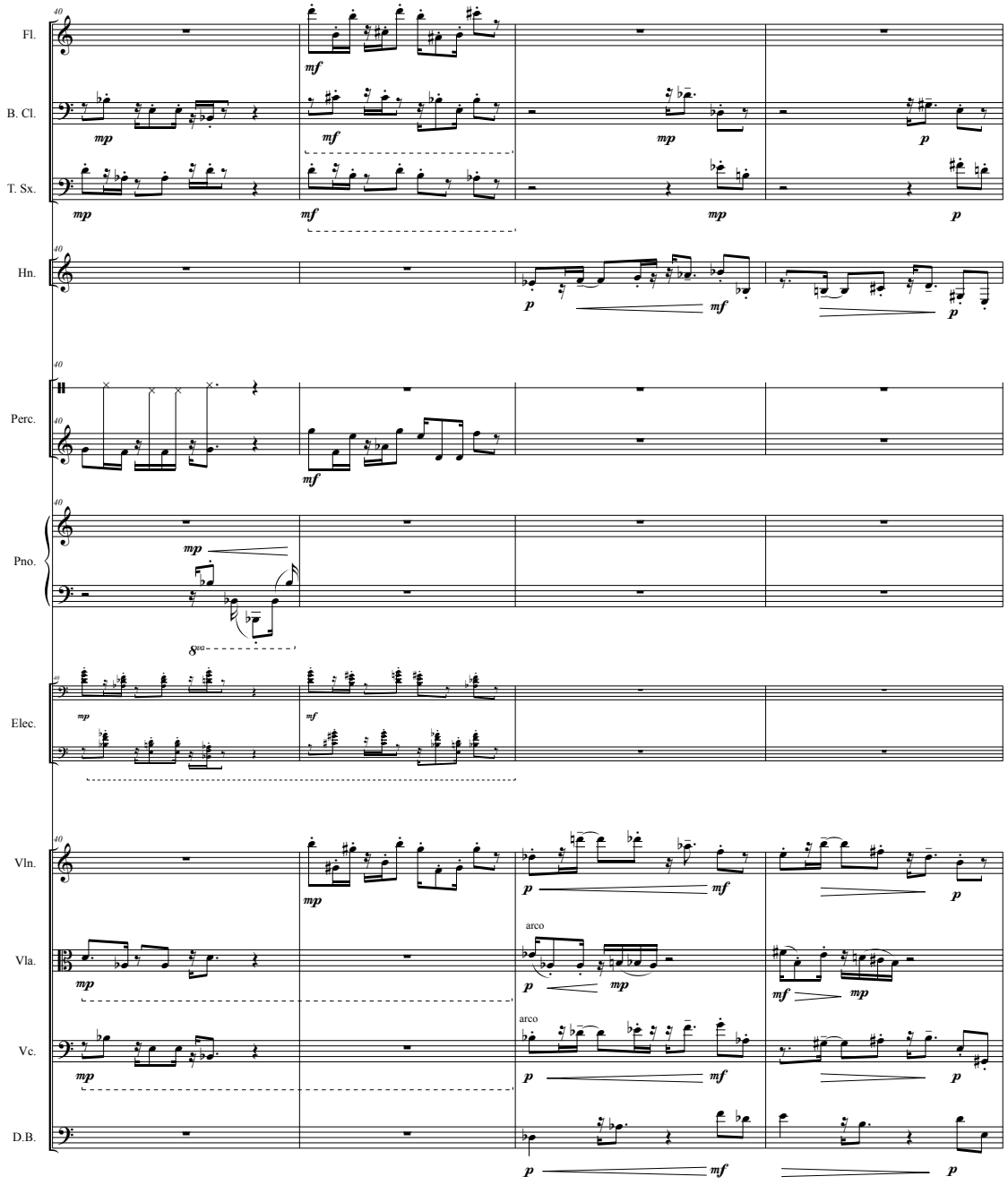
arco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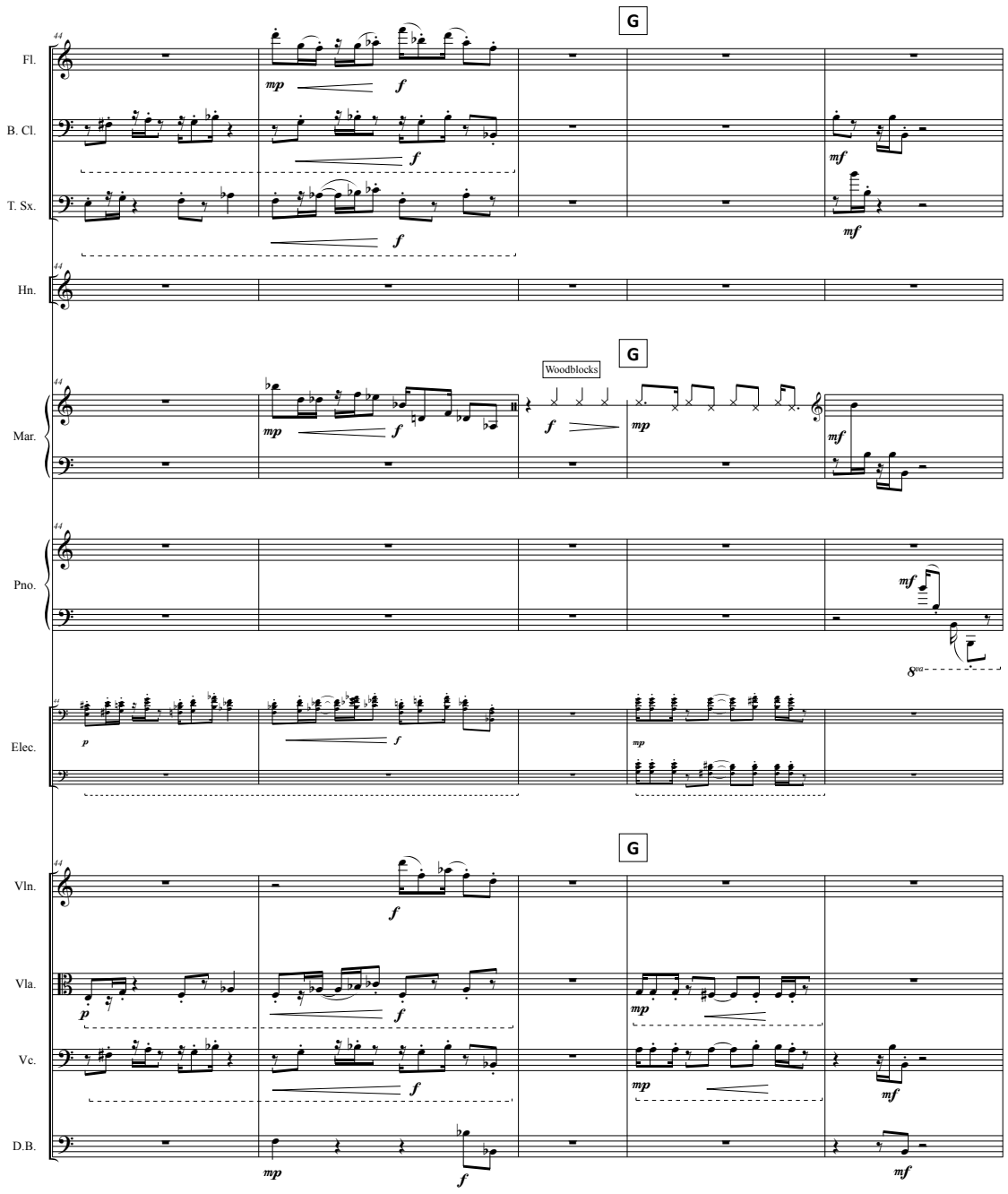
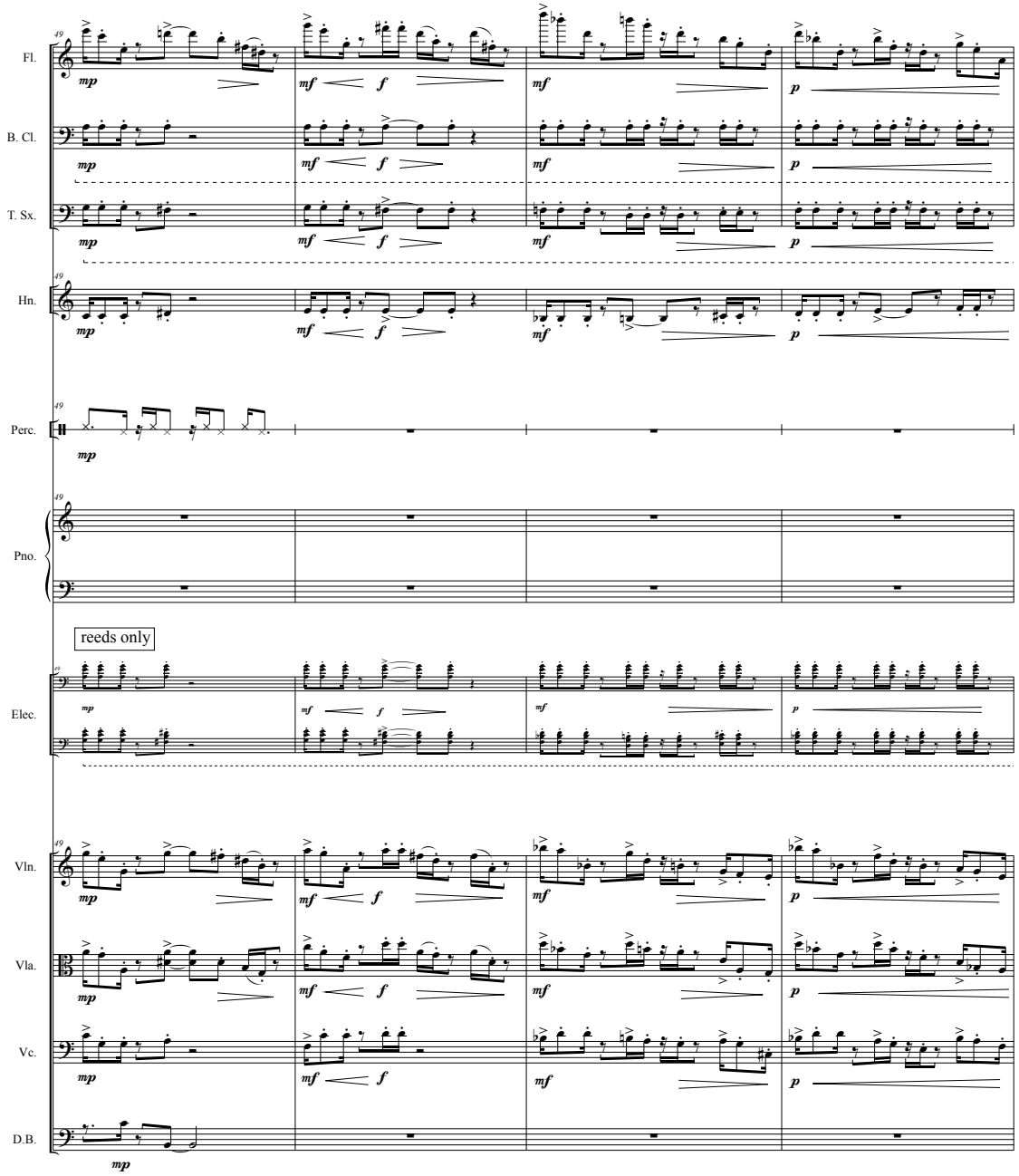
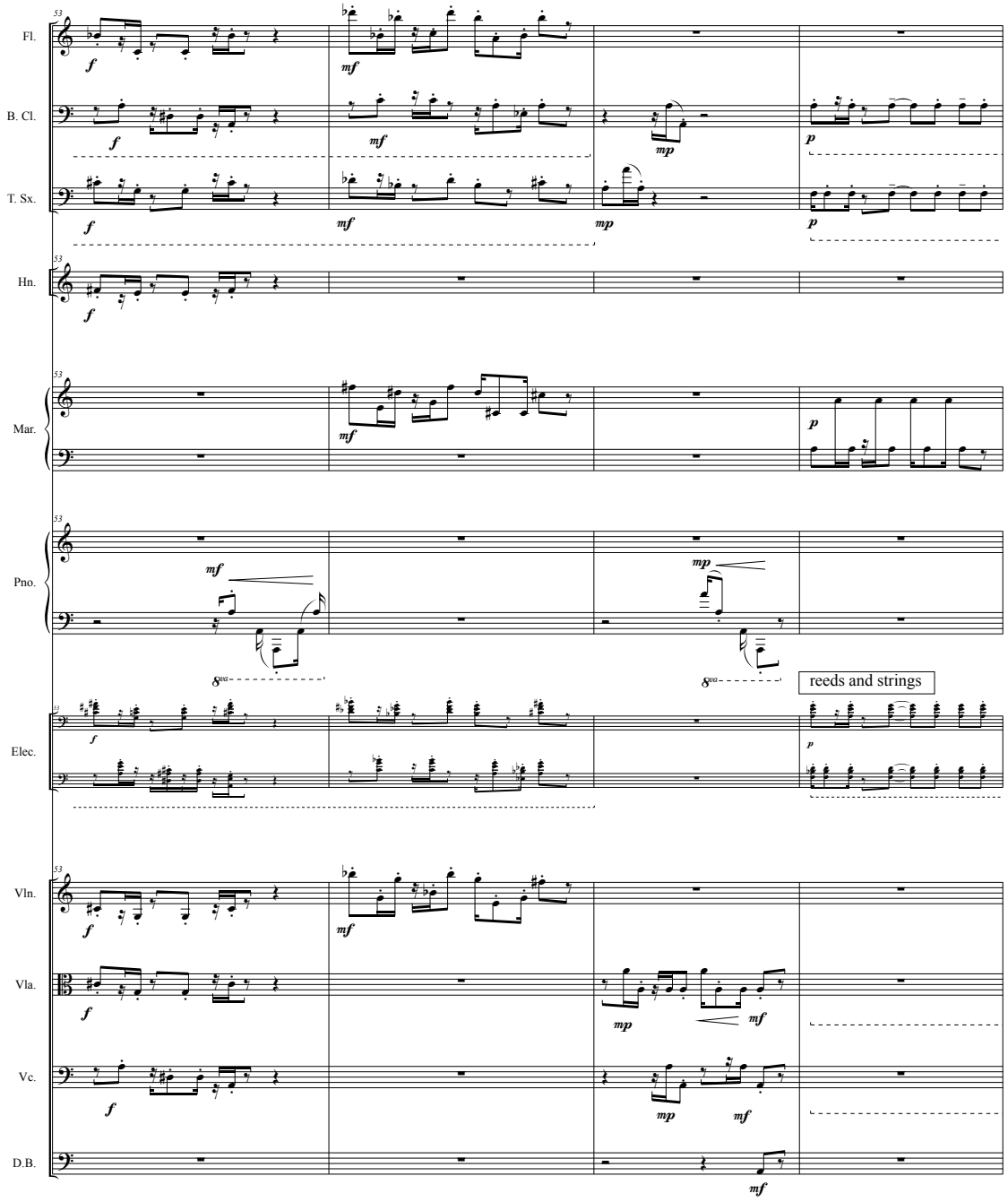
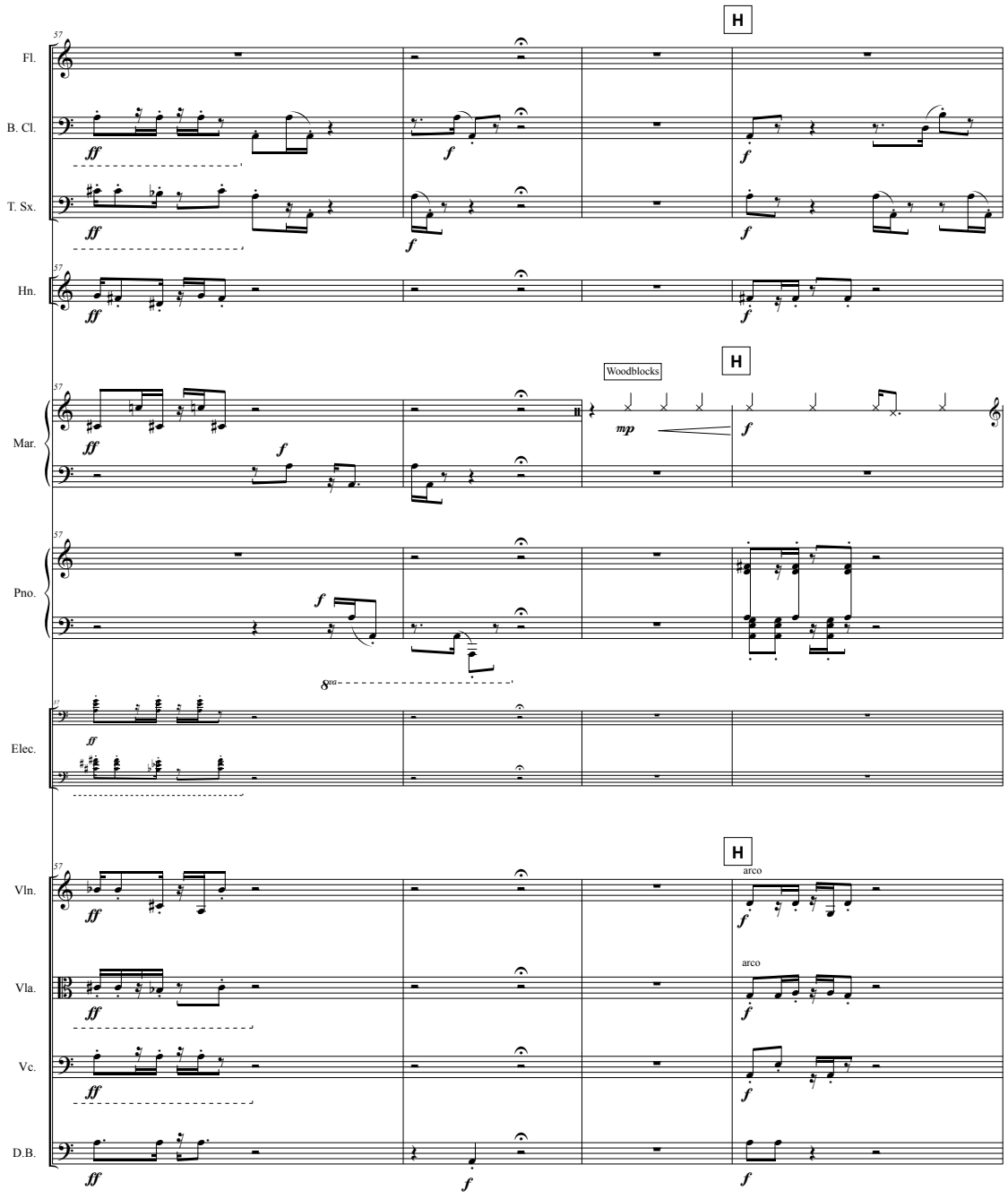
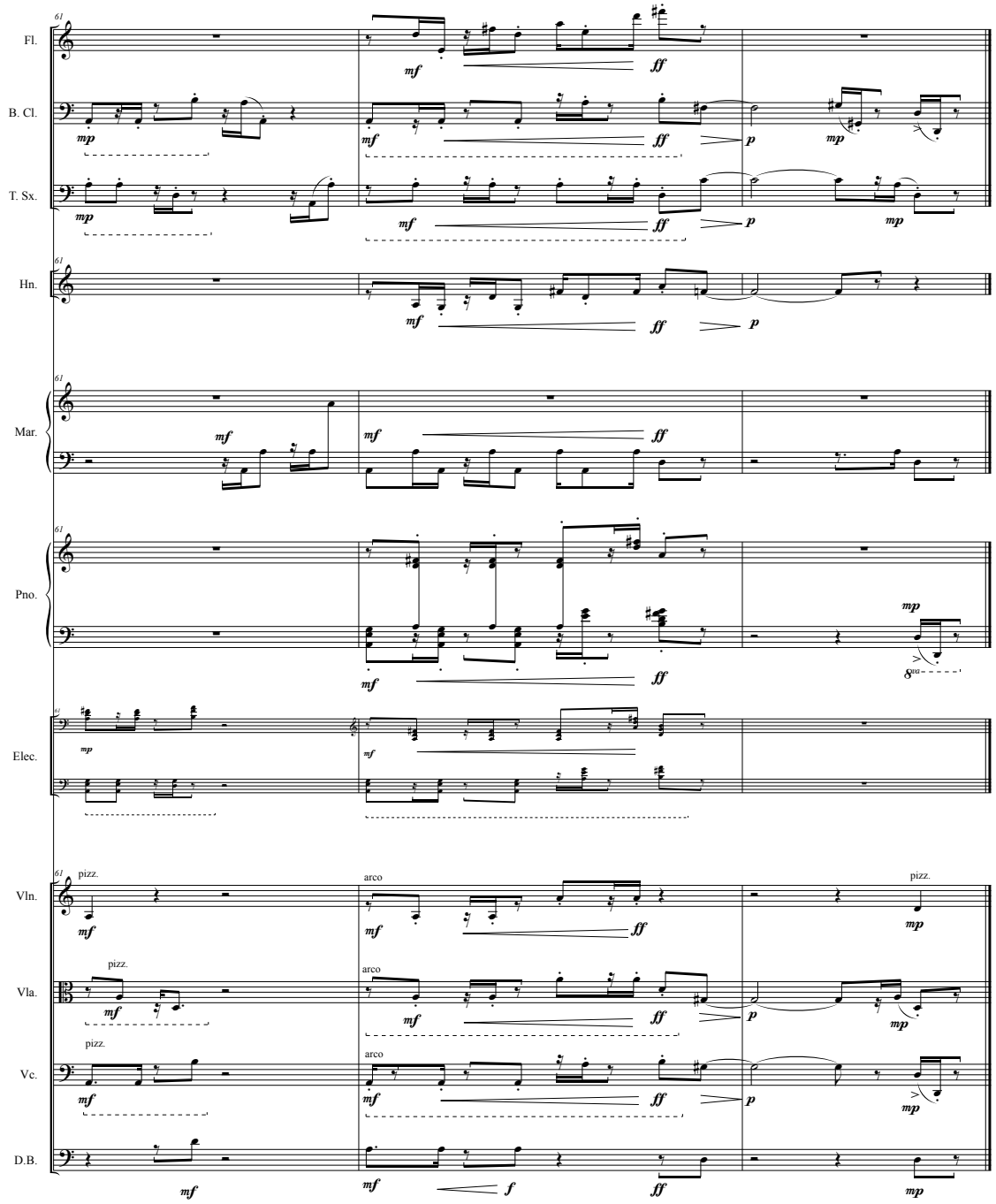
arco


G
Fl.
B. Cl.
T. Sx.
Hn.
G
Woodblocks
Mar.
Pno.
Elec.
G
Vln.
Vla.
Vc.
D.B.


Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Pno.
reeds only
Elec.
Vln.
Vla.
Vc.
D.B.


Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
Elec.
Vln.
Vla.
Vc.
D.B.
reeds and strings

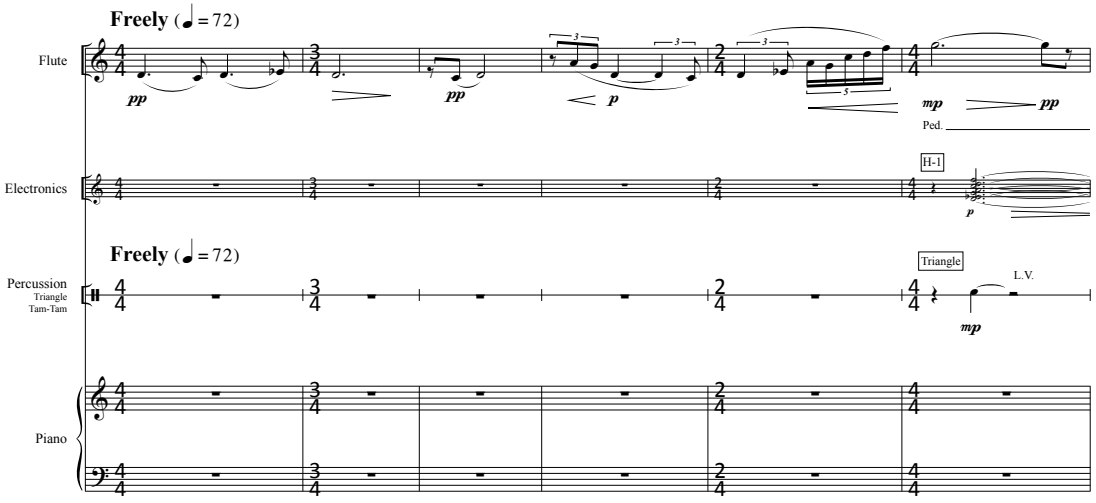

H
Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Woodblocks
Pno.
8va
Elec.
Vln.
arco
Vla.
arco
Vc.
D.B.

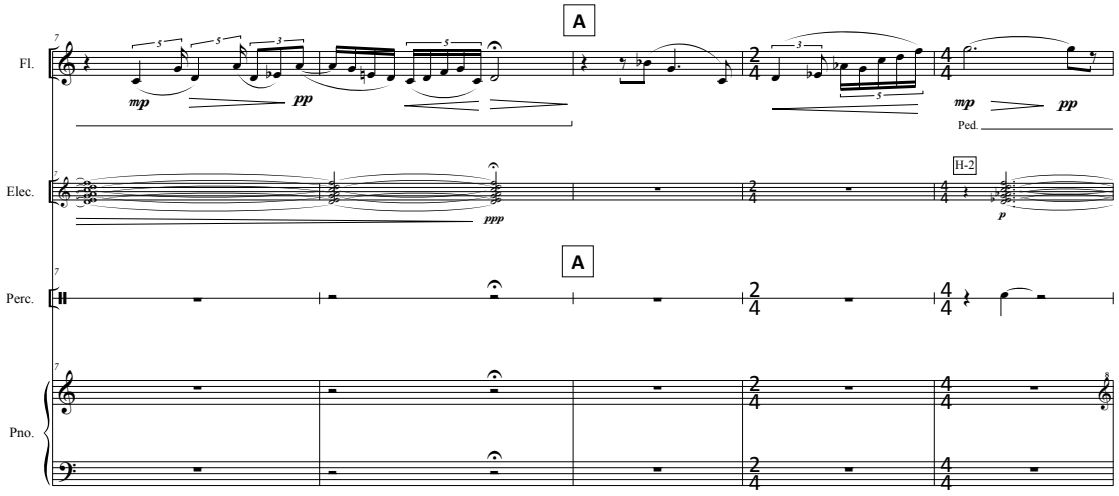

Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
Elec.
Vln.
Vla.
Vc.
D.B.
pizz.
arco
mf
ff
mp
p
f

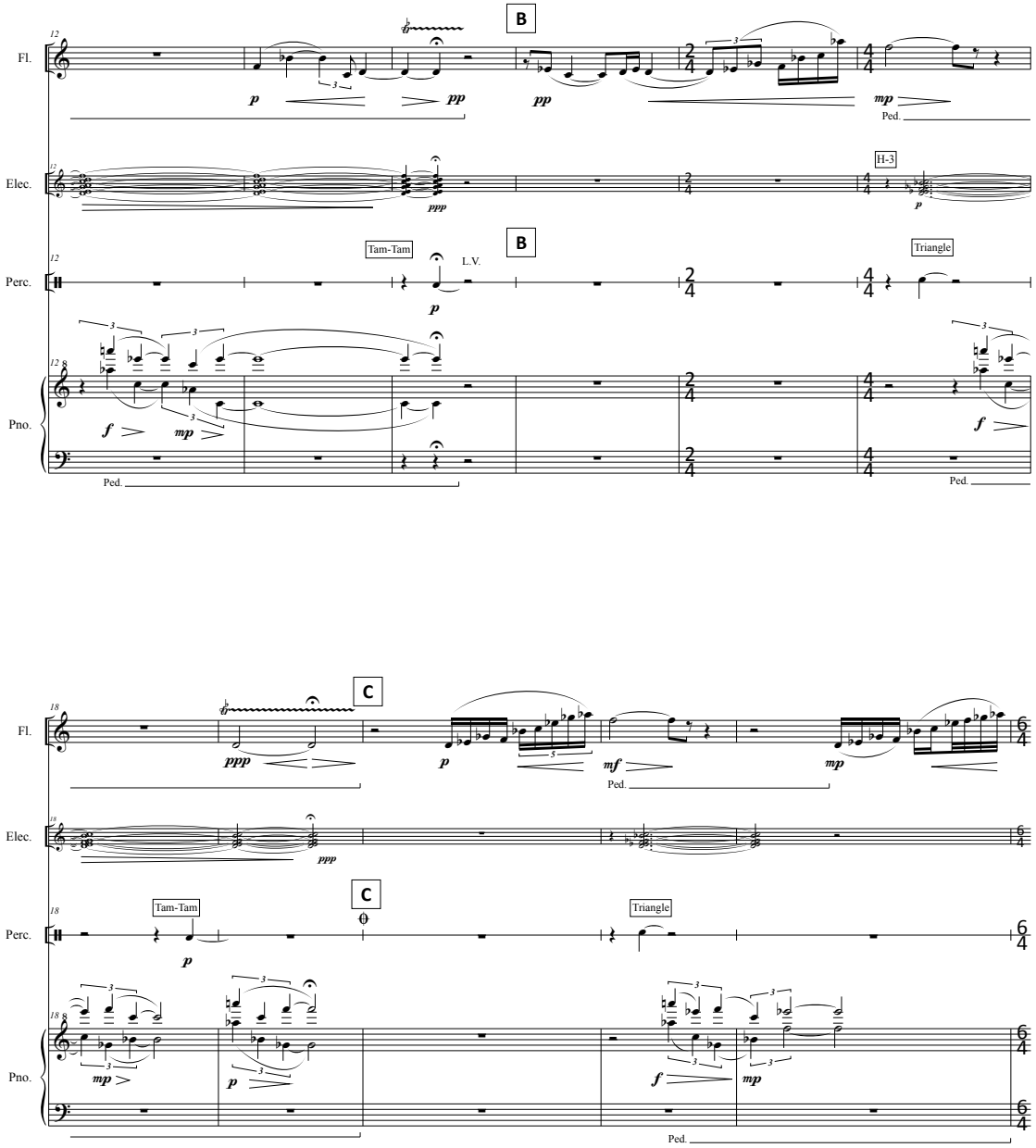
Score in C

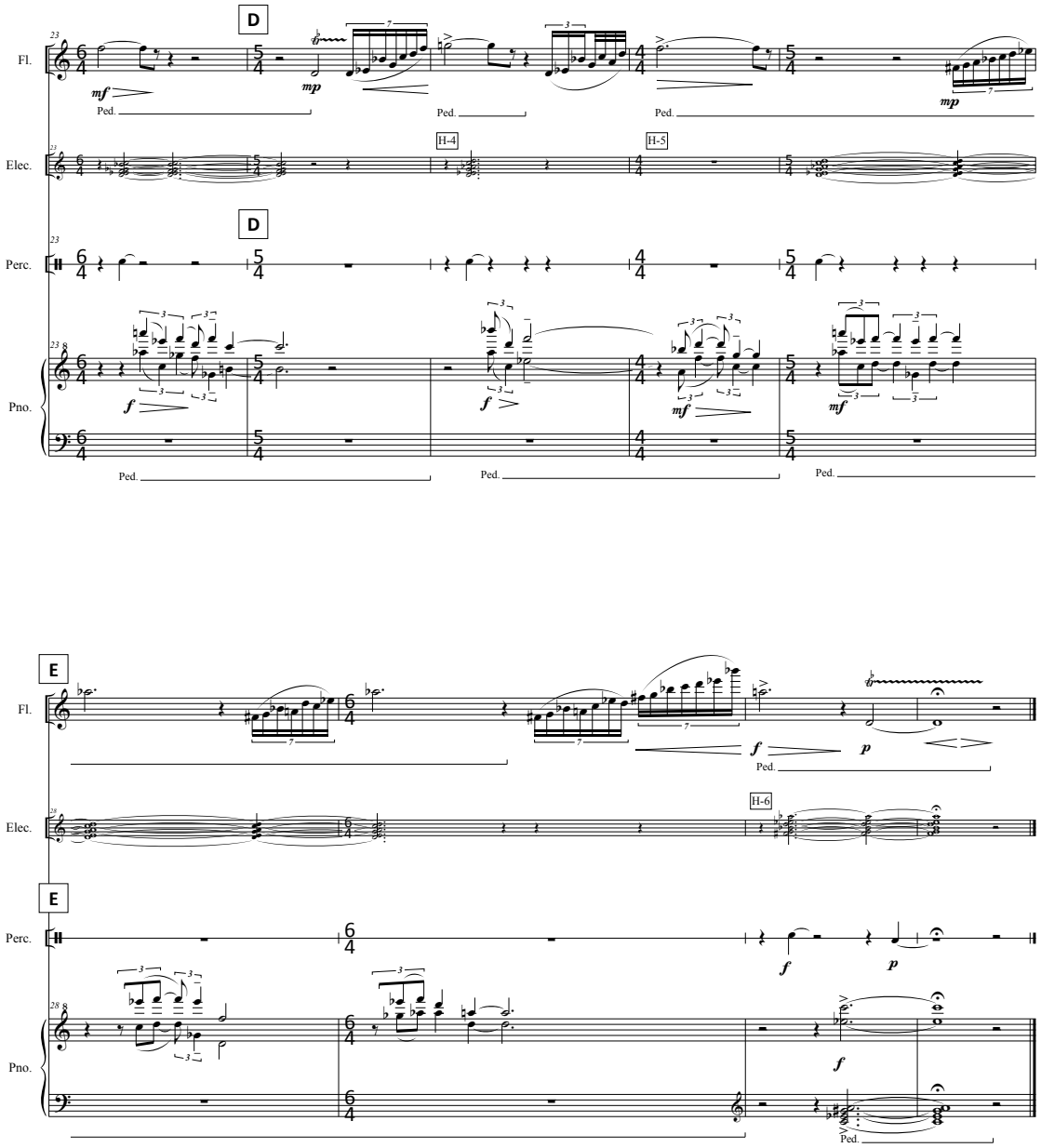
II. Parallel Existence

Jamie Keesecker





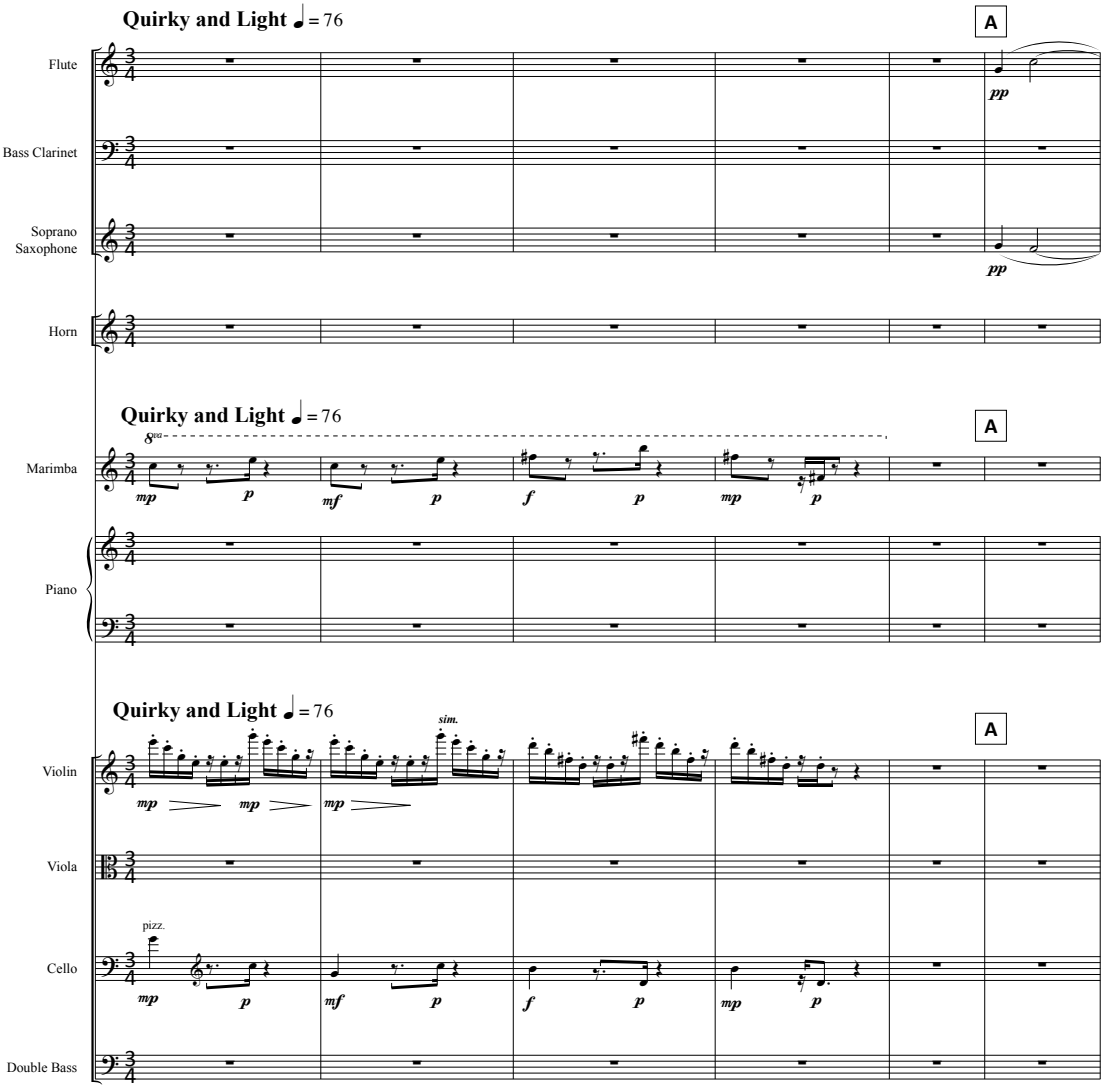

B
Fl.
Elec.
Perc.
Pno.
Tam-Tam
L.V.
Triangle
H-3
Ped.
C

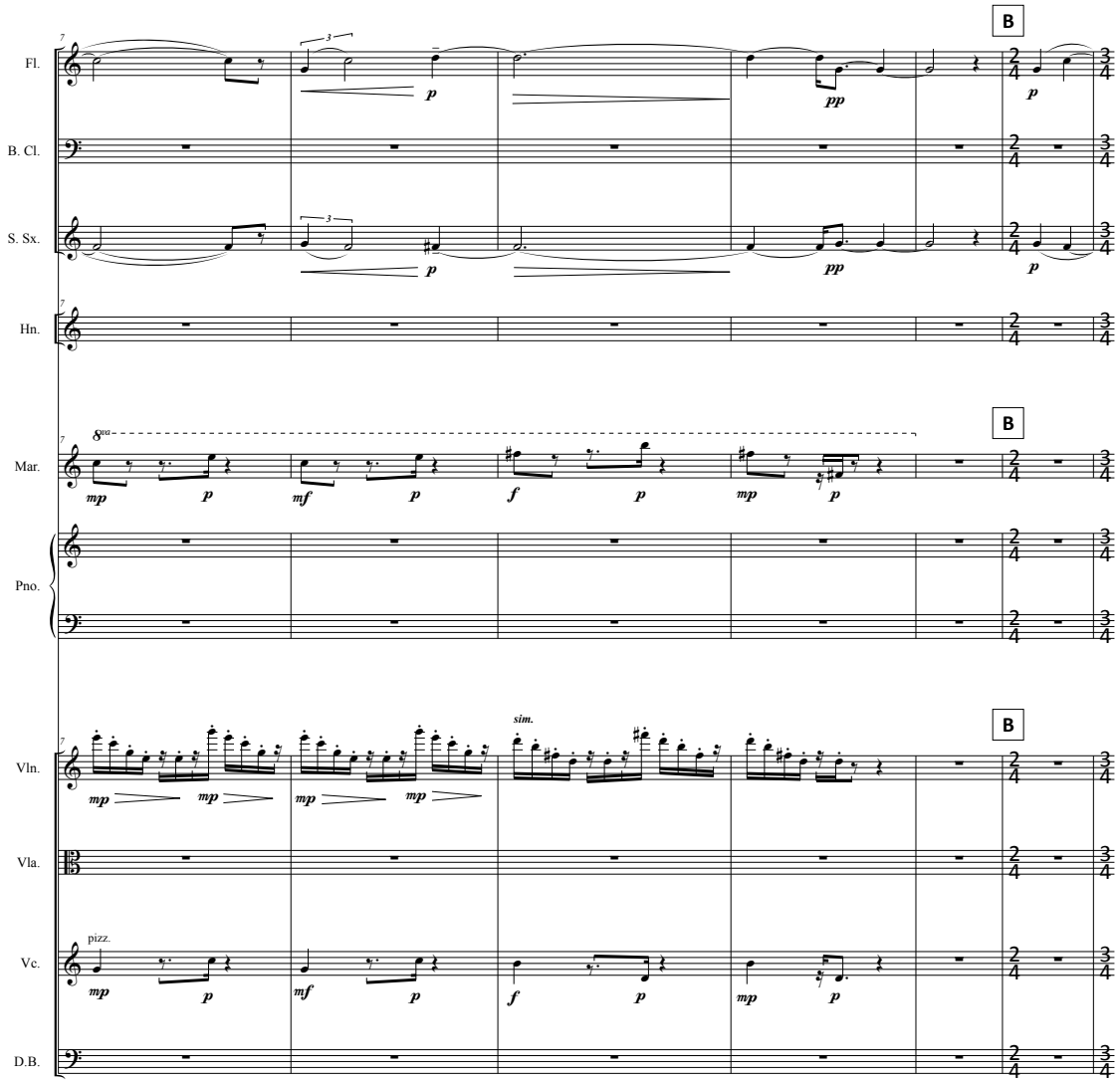

D
Fl.
Elec.
Perc.
Pno.
H-4
H-5
Ped.
E
H-6

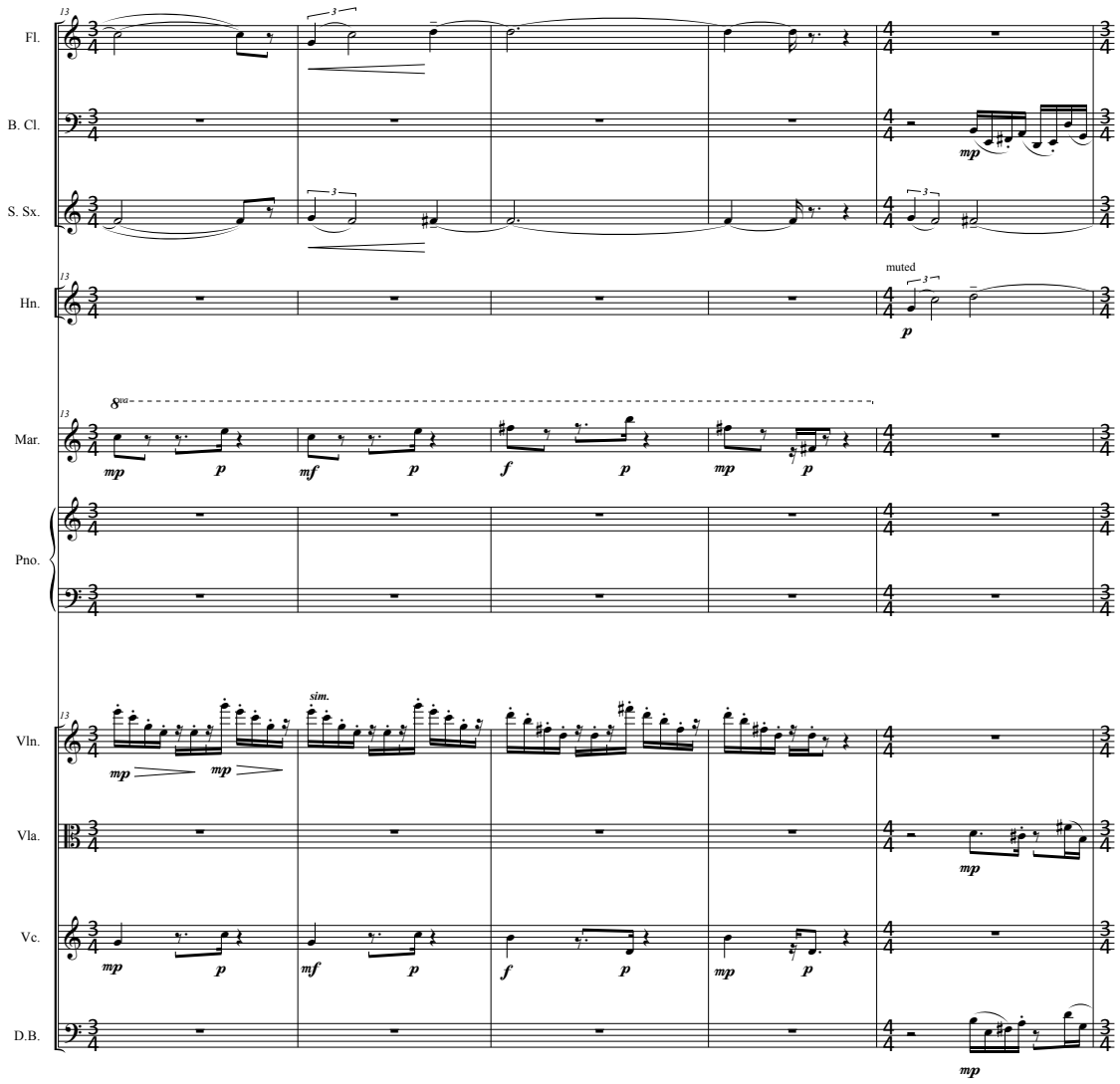
III. Broken Things

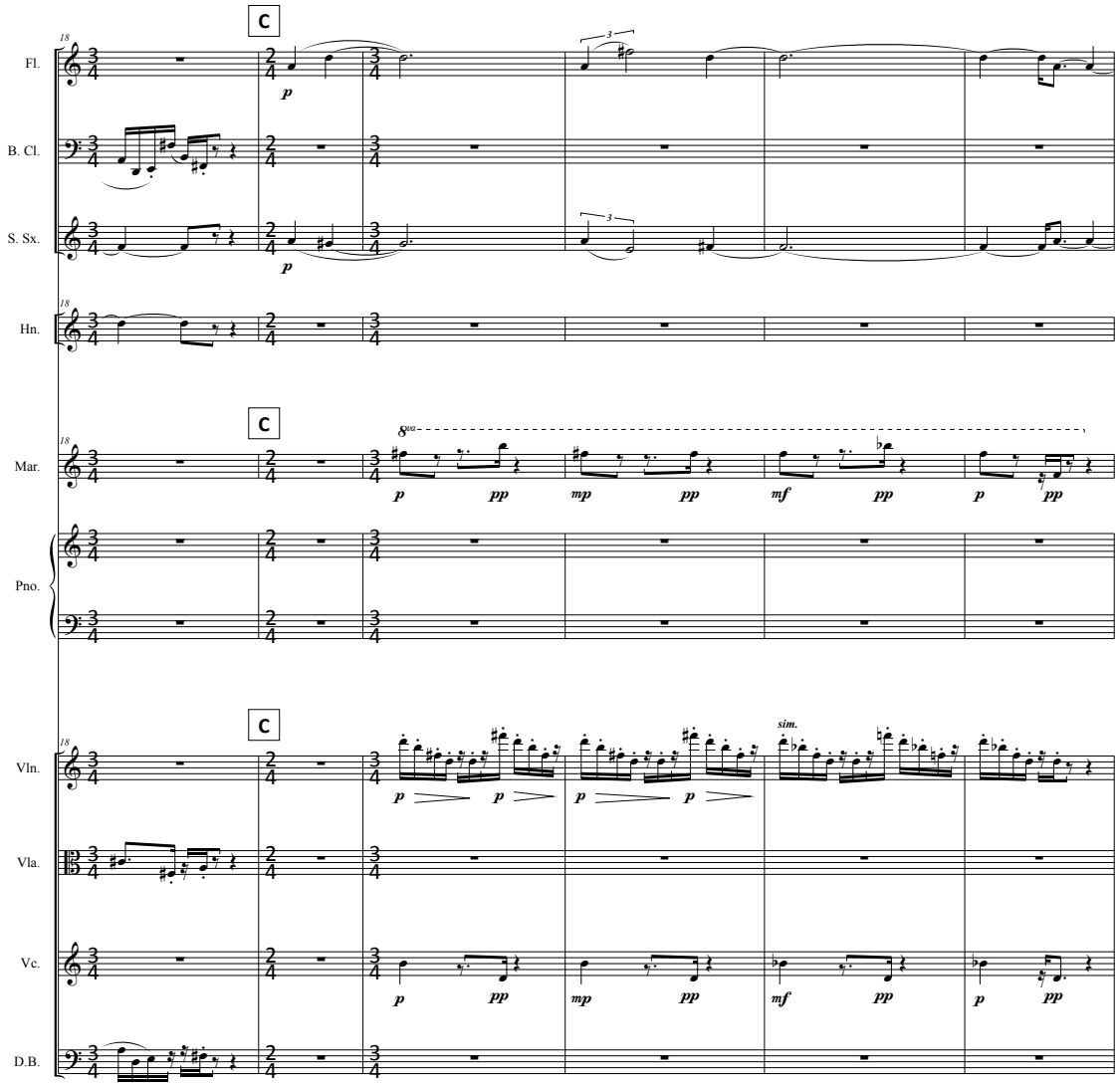
Score in C

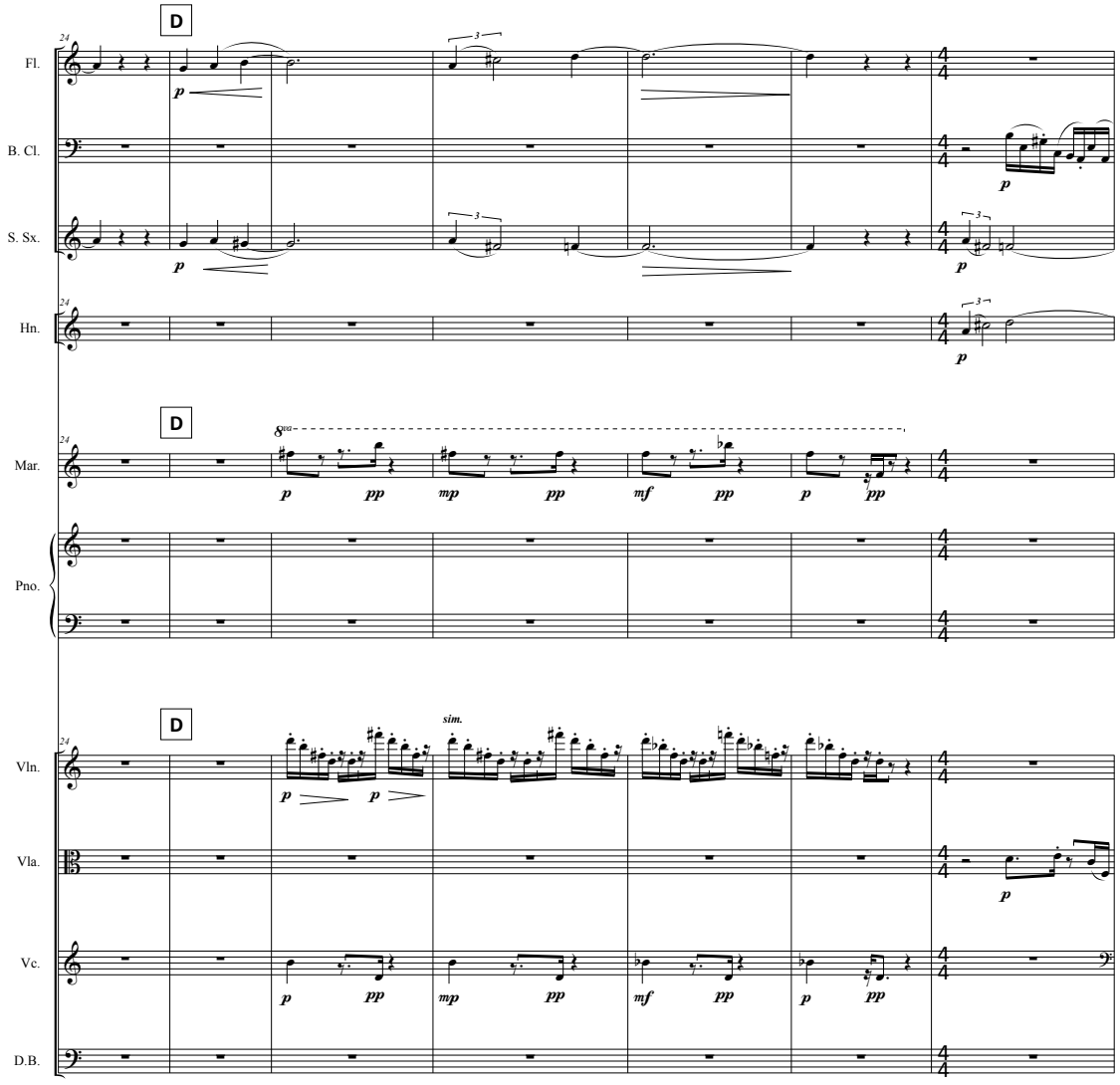
Jamie Keesecker

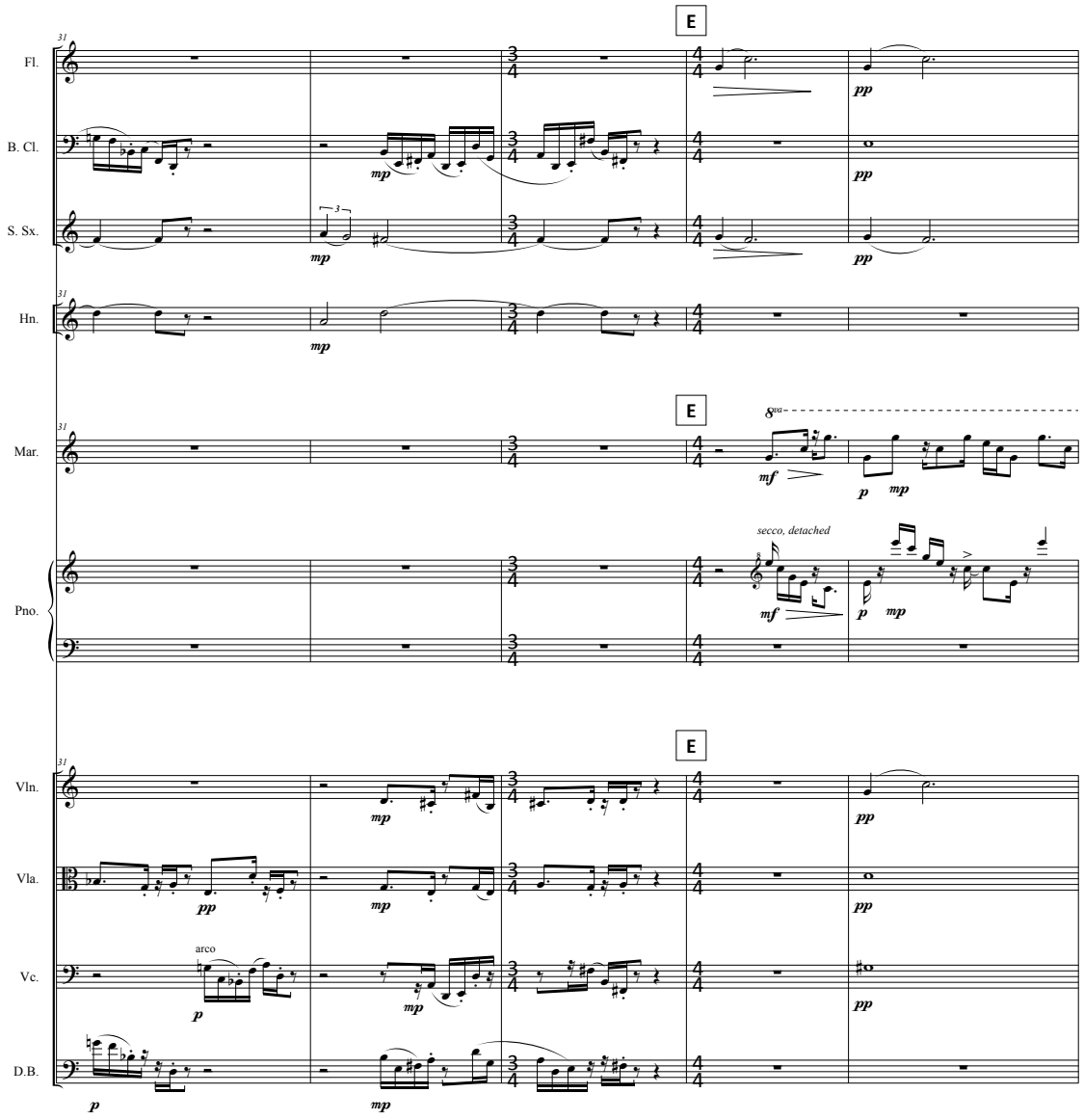


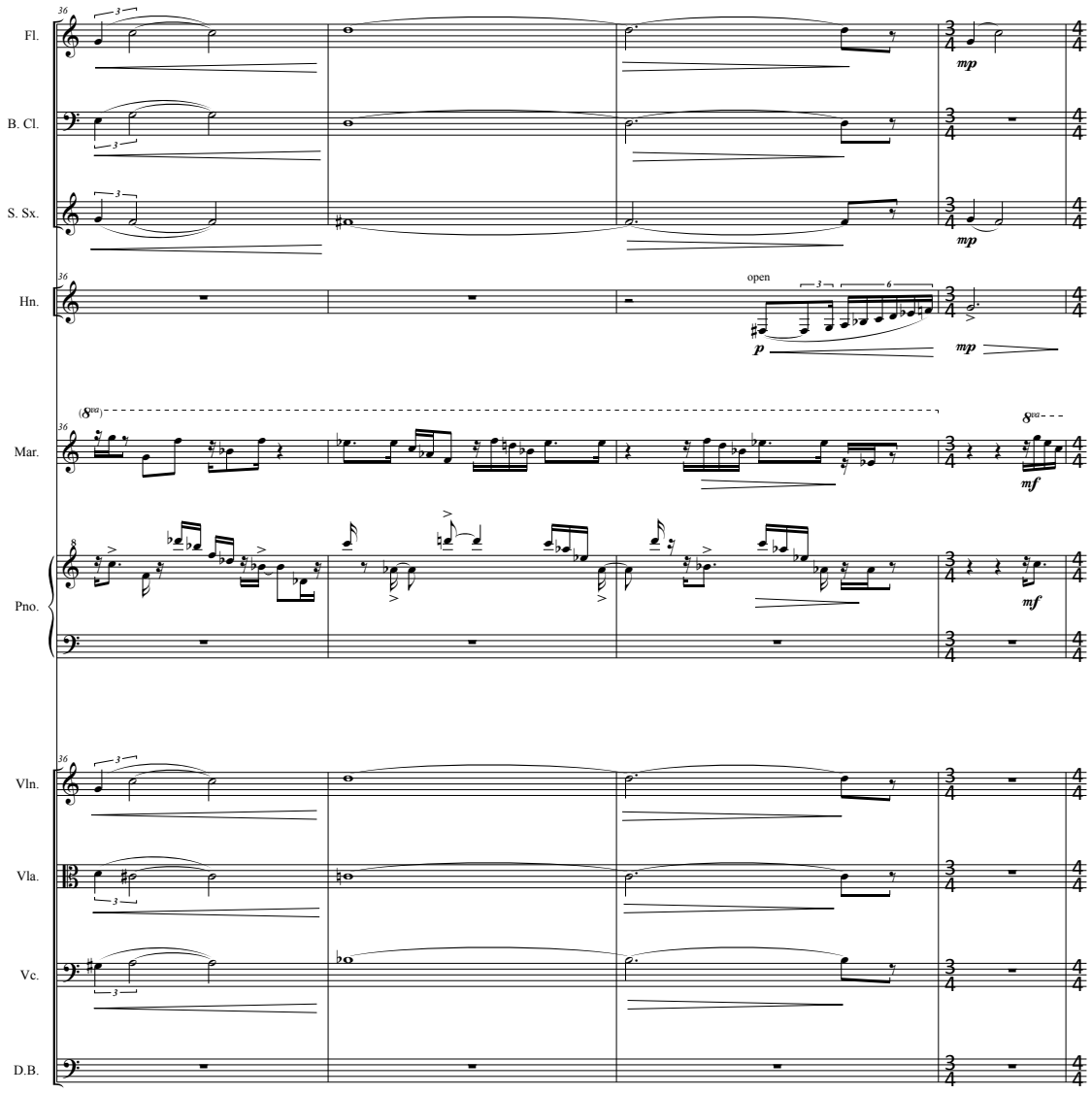

B
Fl.
B. Cl.
S. Sx.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
pizz.
sim.

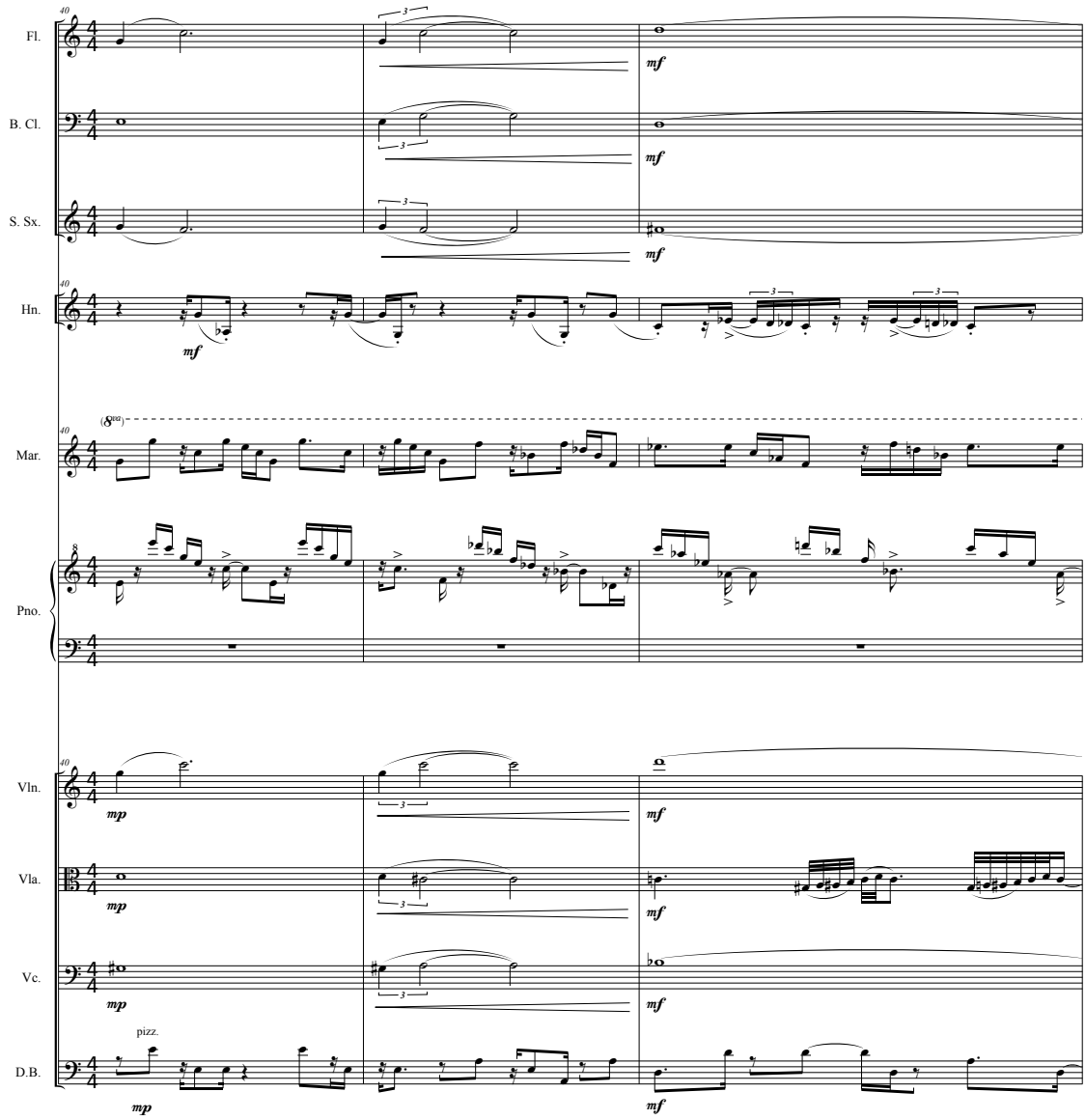

Fl.
B. Cl.
S. Sx.
Hn.
muted
Mar.
Pno.
Vln.
sim.
Vla.
Vc.
D.B.

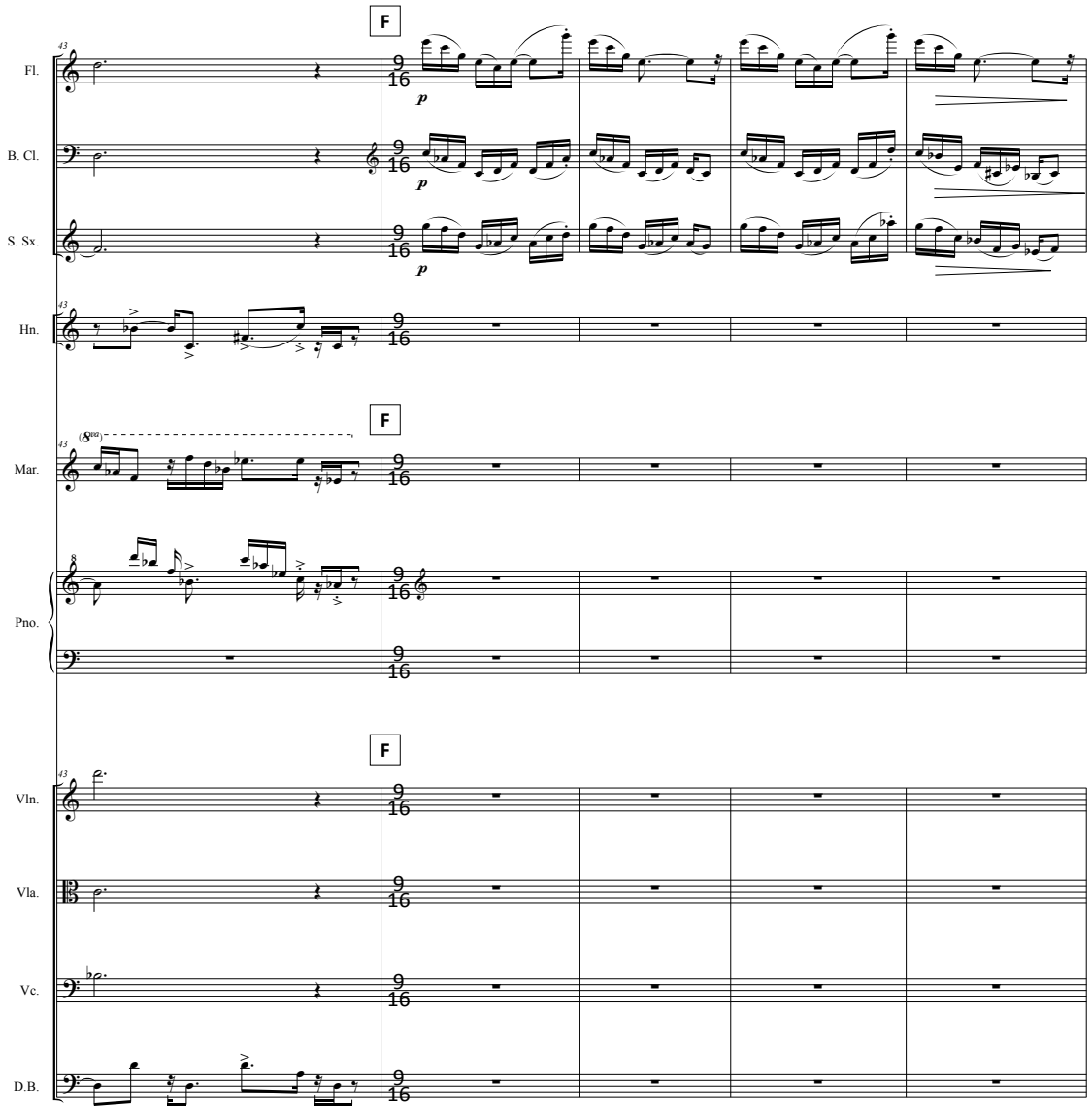

C
Fl.
B. Cl.
S. Sx.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
sim.

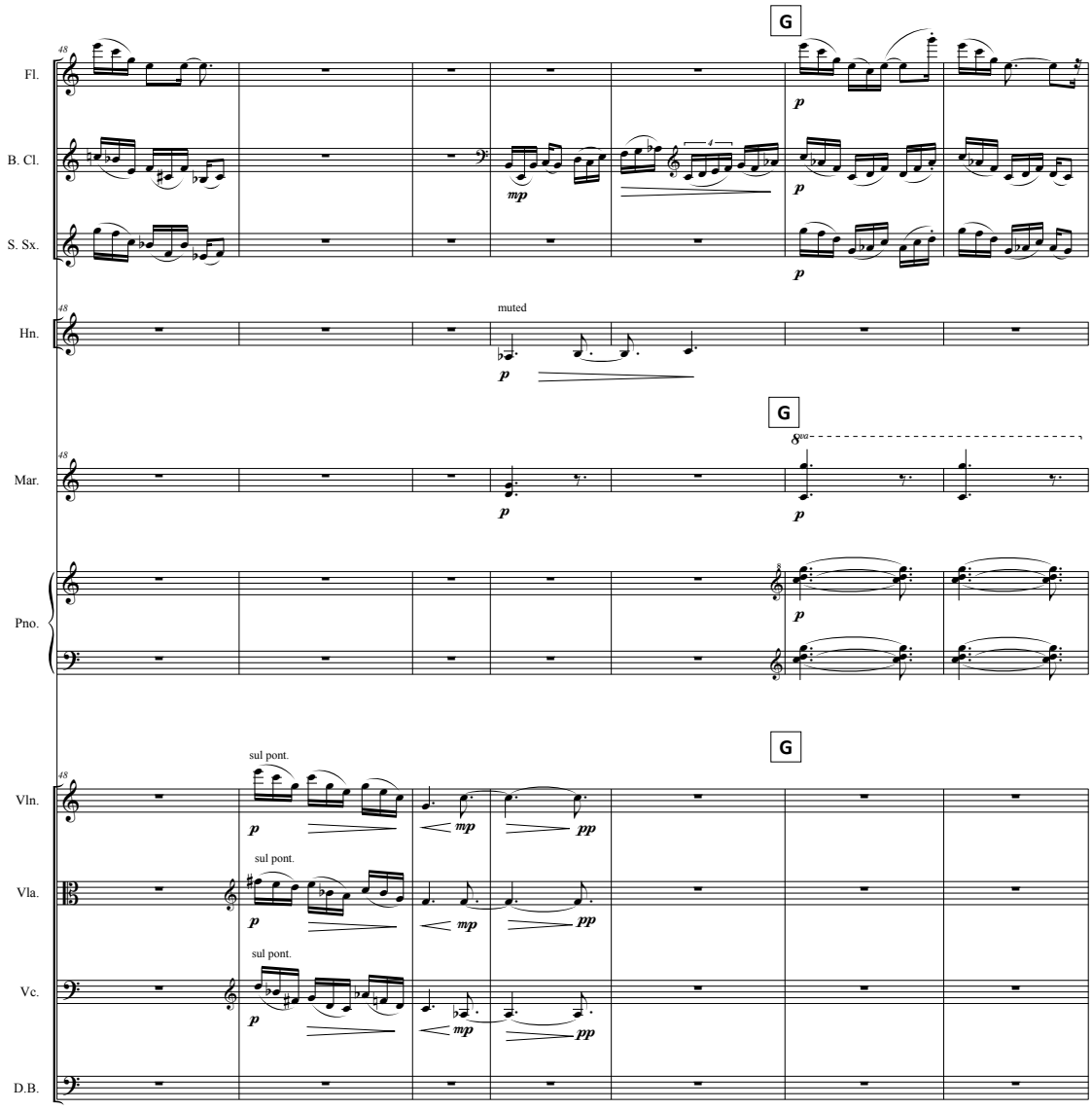

D
Fl.
B. Cl.
S. Sx.
Hn.
D
Mar.
8va
Pno.
D
sim.
Vln.
Vla.
Vc.
D.B.

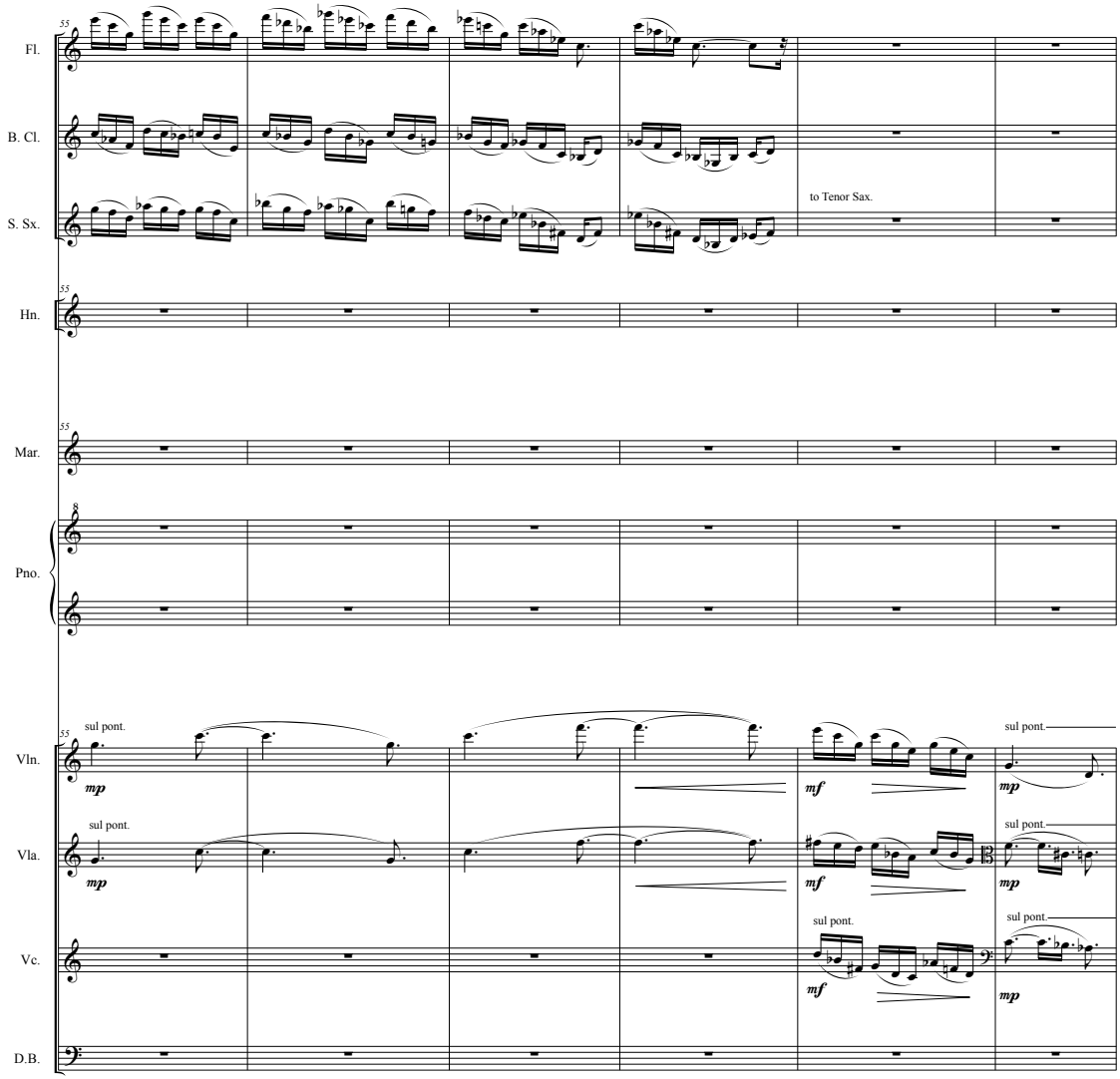

E
Fl.
B. Cl.
S. Sx.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
8va
secco, detached
arco
pp
mp
mf
p

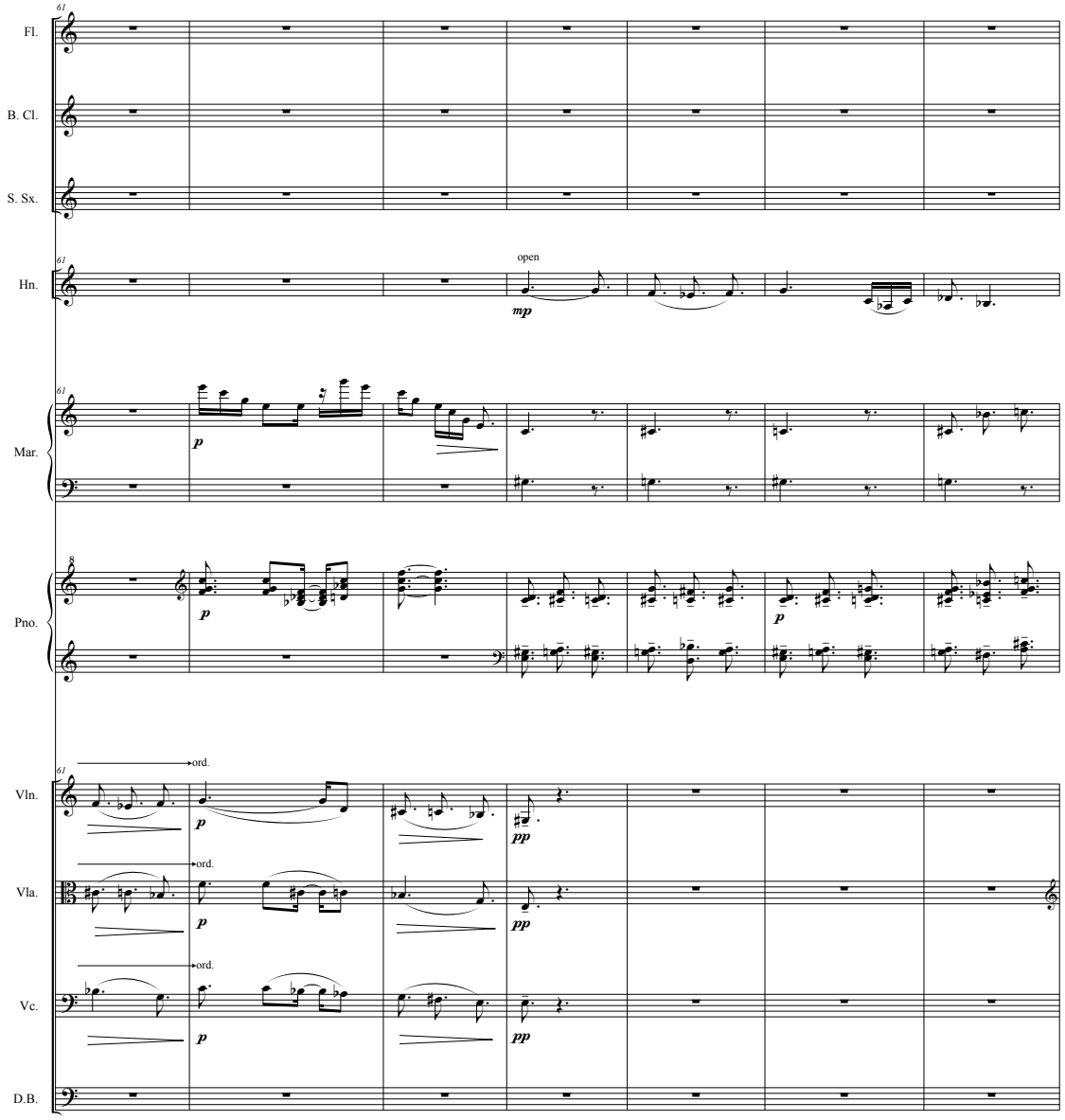

Fl.
B. Cl.
S. Sx.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
36
mp
open
p
8va
mf

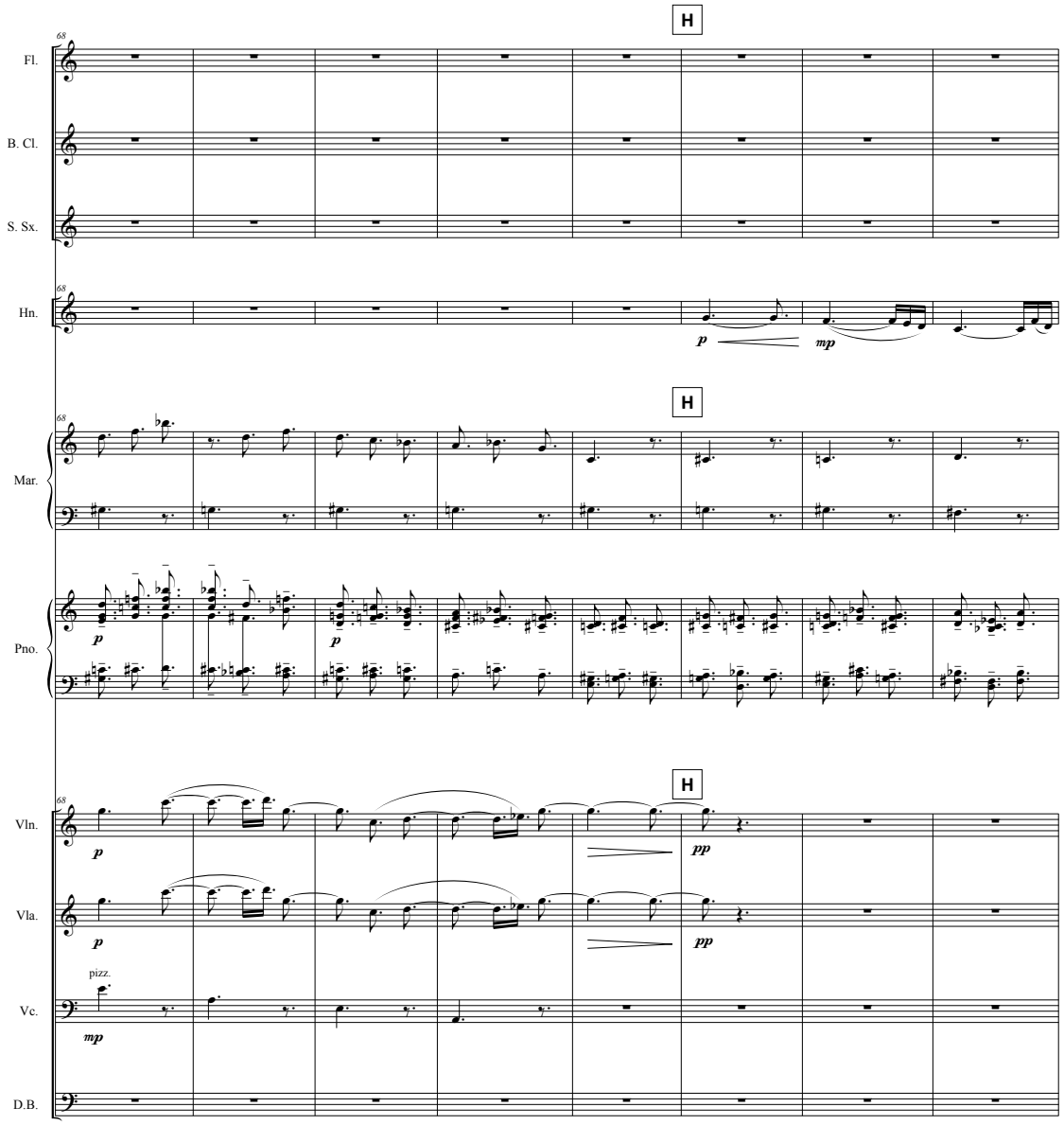

Fl.
B. Cl.
S. Sx.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
mf
mp
pizz.

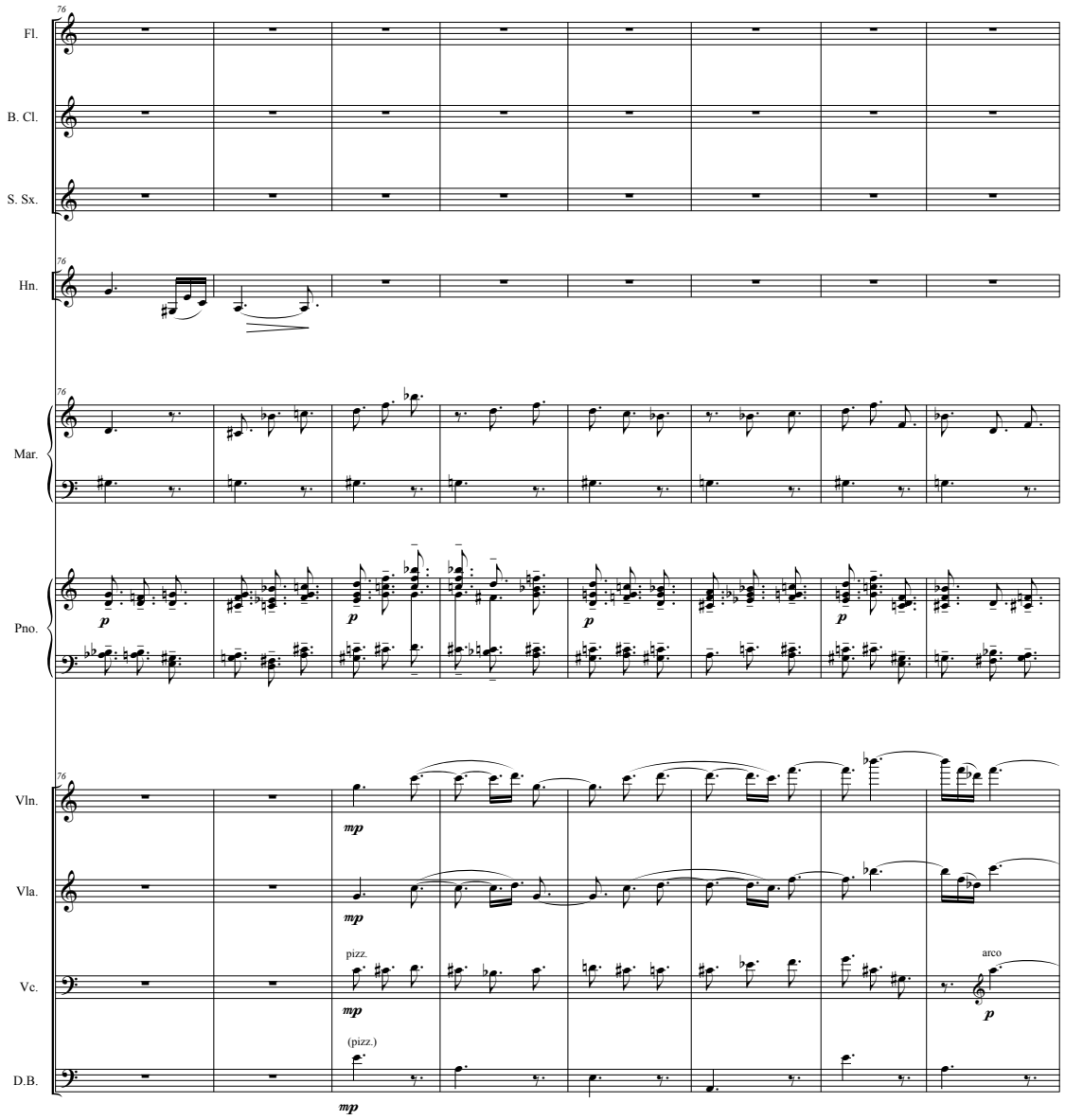

F
Fl.
B. Cl.
S. Sx.
Hn.
F
Mar.
Pno.
F
Vln.
Vla.
Vc.
D.B.
9
16
p

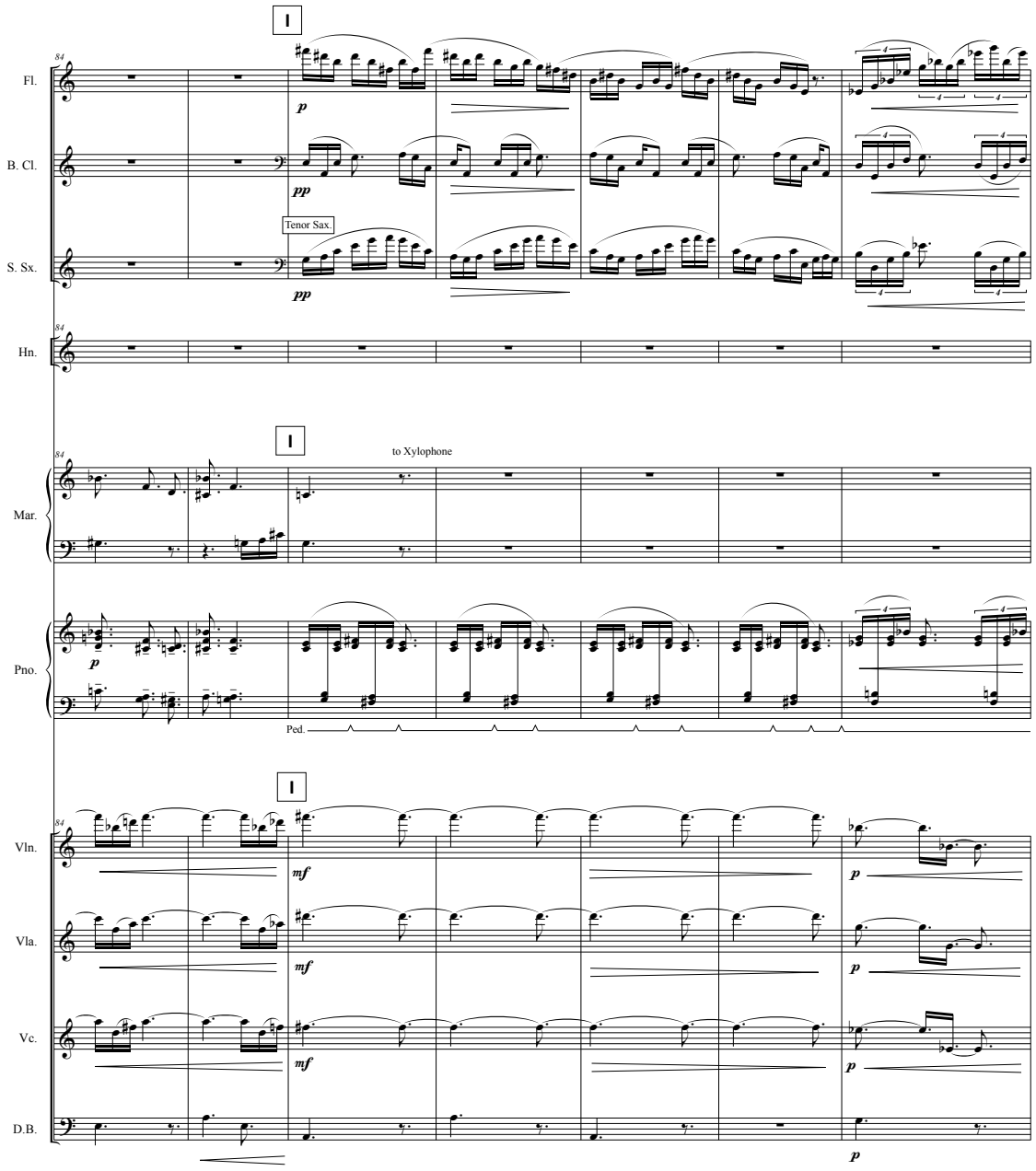

G
Fl.
B. Cl.
S. Sx.
Hn.
muted
G
Mar.
8va
Pno.
G
sul pont.
Vln.
sul pont.
Vla.
sul pont.
Vc.
D.B.

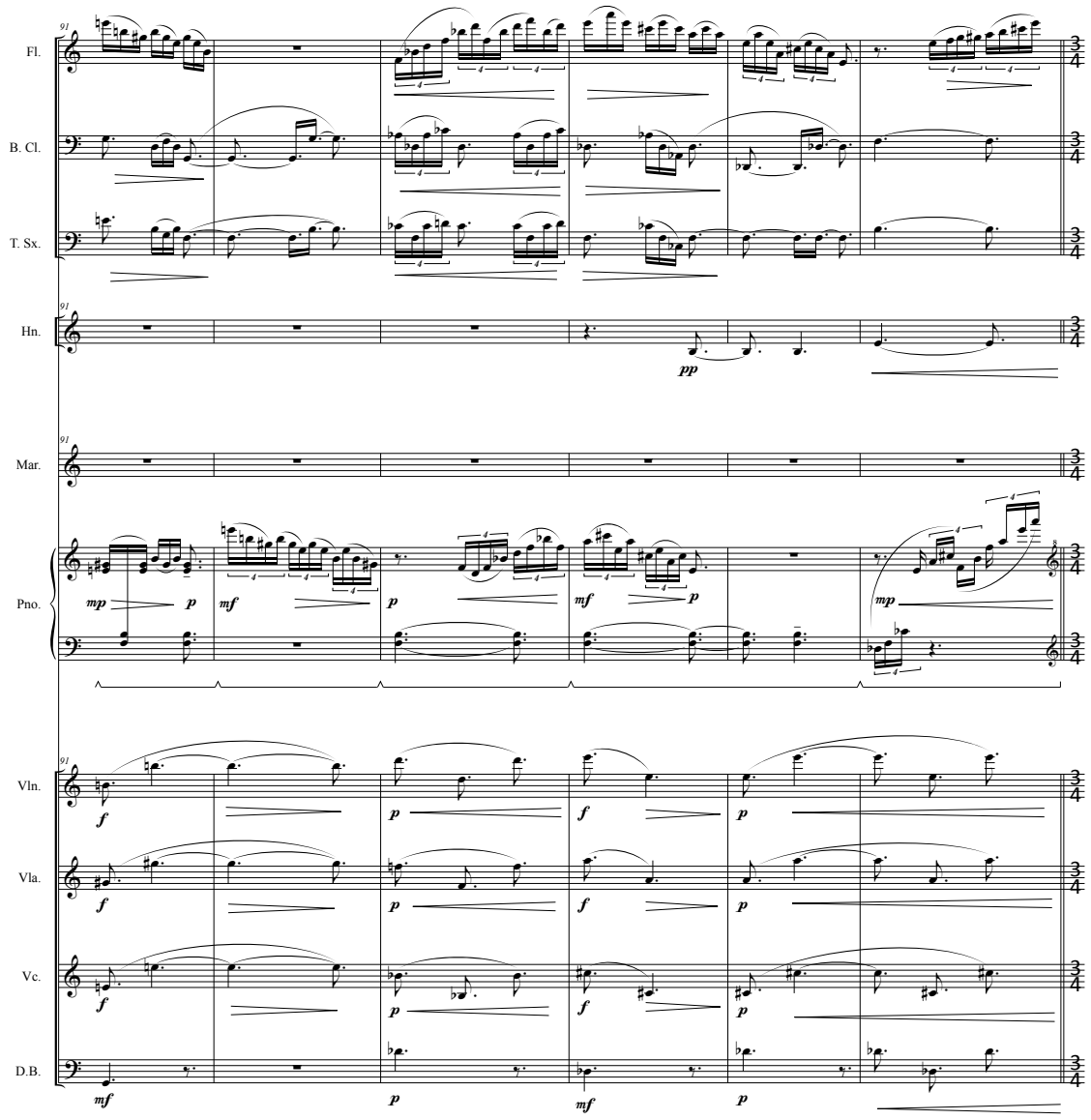

Fl.
B. Cl.
S. Sx.
to Tenor Sax.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
sul pont.
mp
mf

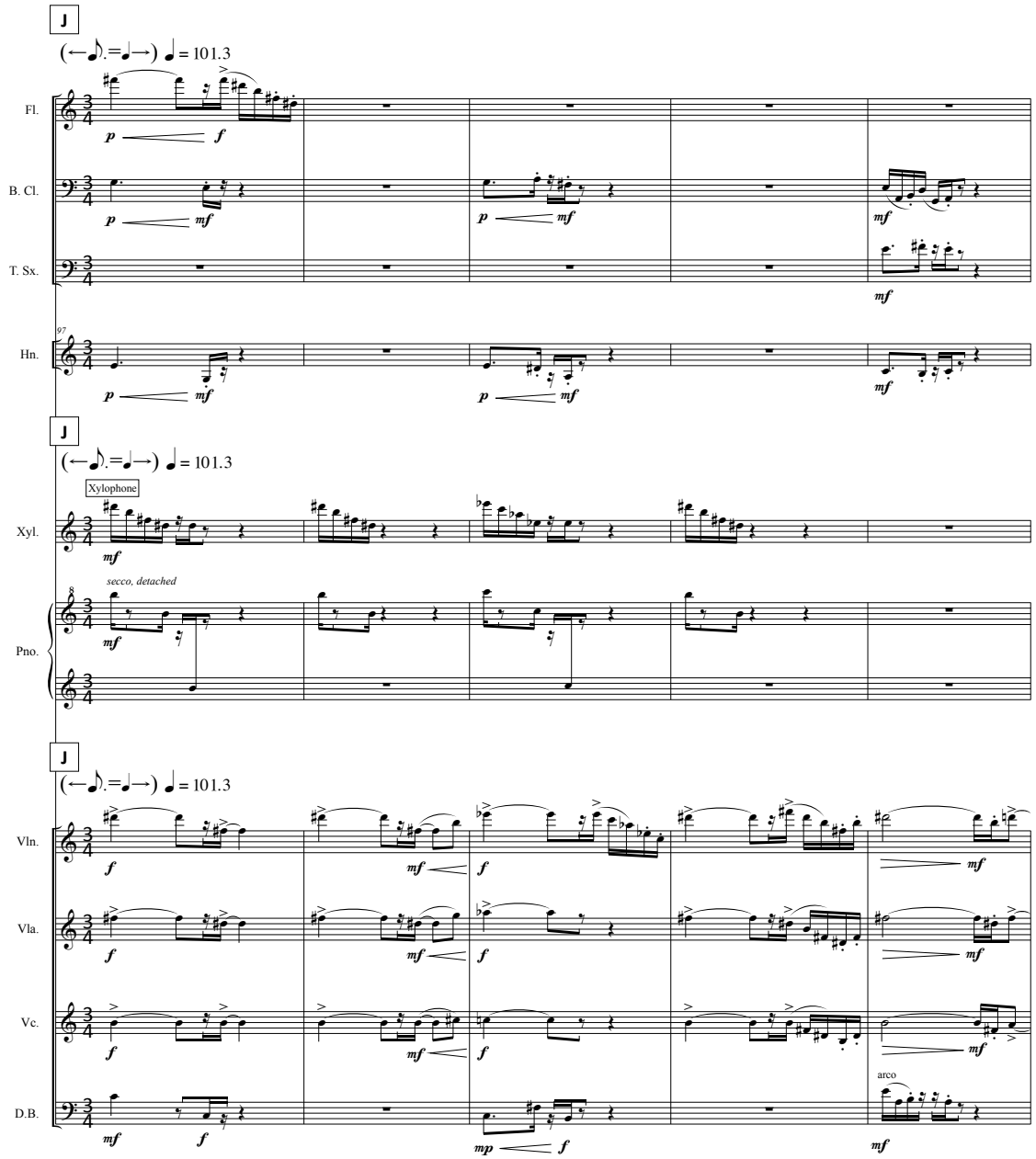

61
Fl.
B. Cl.
S. Sx.
Hn.
open
mp
Mar.
p
Pno.
p
p
Vln.
ord.
p
pp
Vla.
ord.
p
pp
Vc.
ord.
p
pp
D.B.

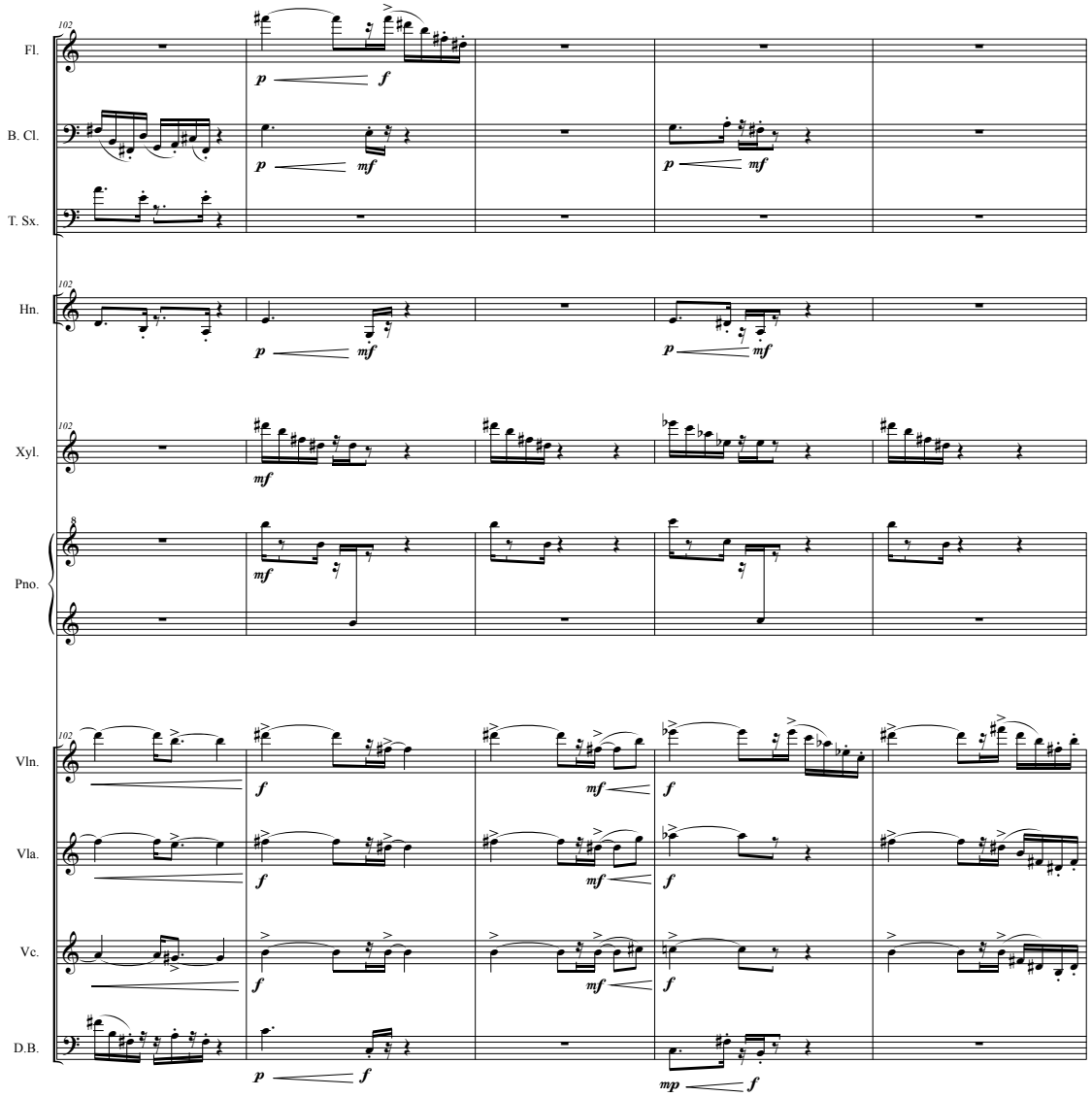

H
68
Fl.
B. Cl.
S. Sx.
Hn.
p
mp
H
68
Mar.
Pno.
p
p
H
68
Vln.
p
pp
Vla.
p
pp
pizz.
Vc.
mp
D.B.

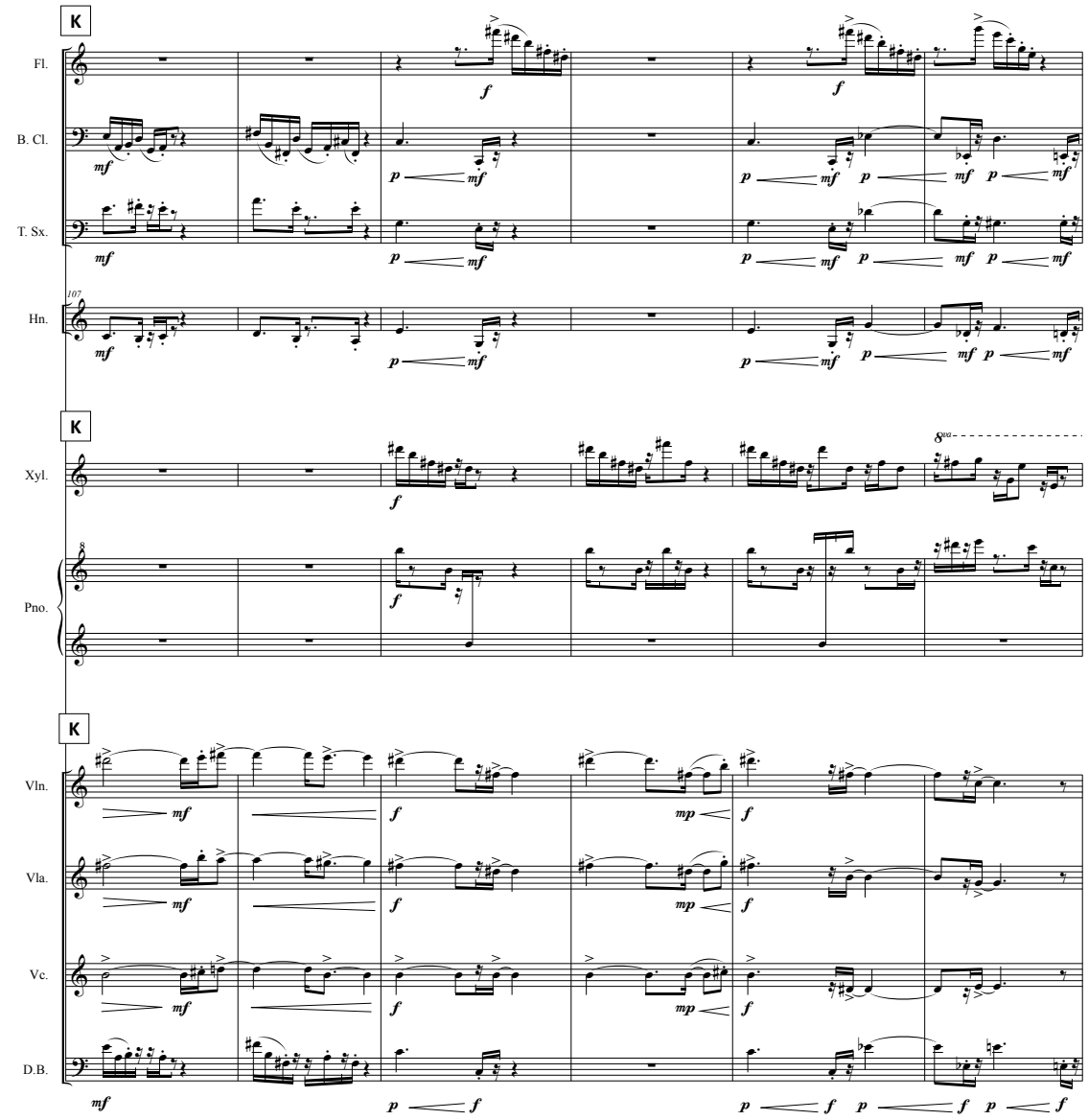

76
Fl.
B. Cl.
S. Sx.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
p
mp
pizz.
(pizz.)
arco

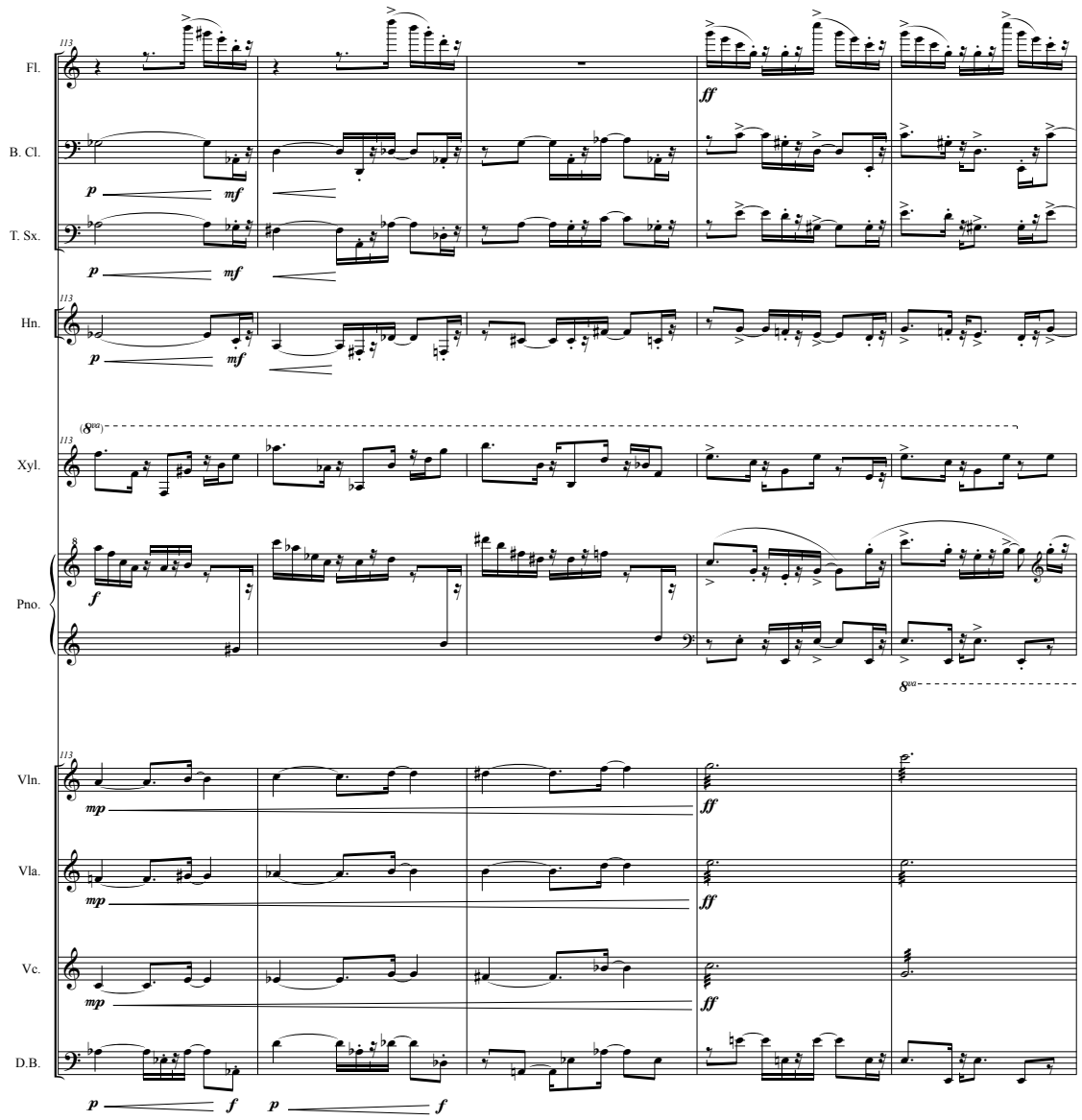

I
Fl.
B. Cl.
Tenor Sax.
S. Sx.
Hn.
I
to Xylophone
Mar.
Pno.
Ped.
I
Vln.
Vla.
Vc.
D.B.

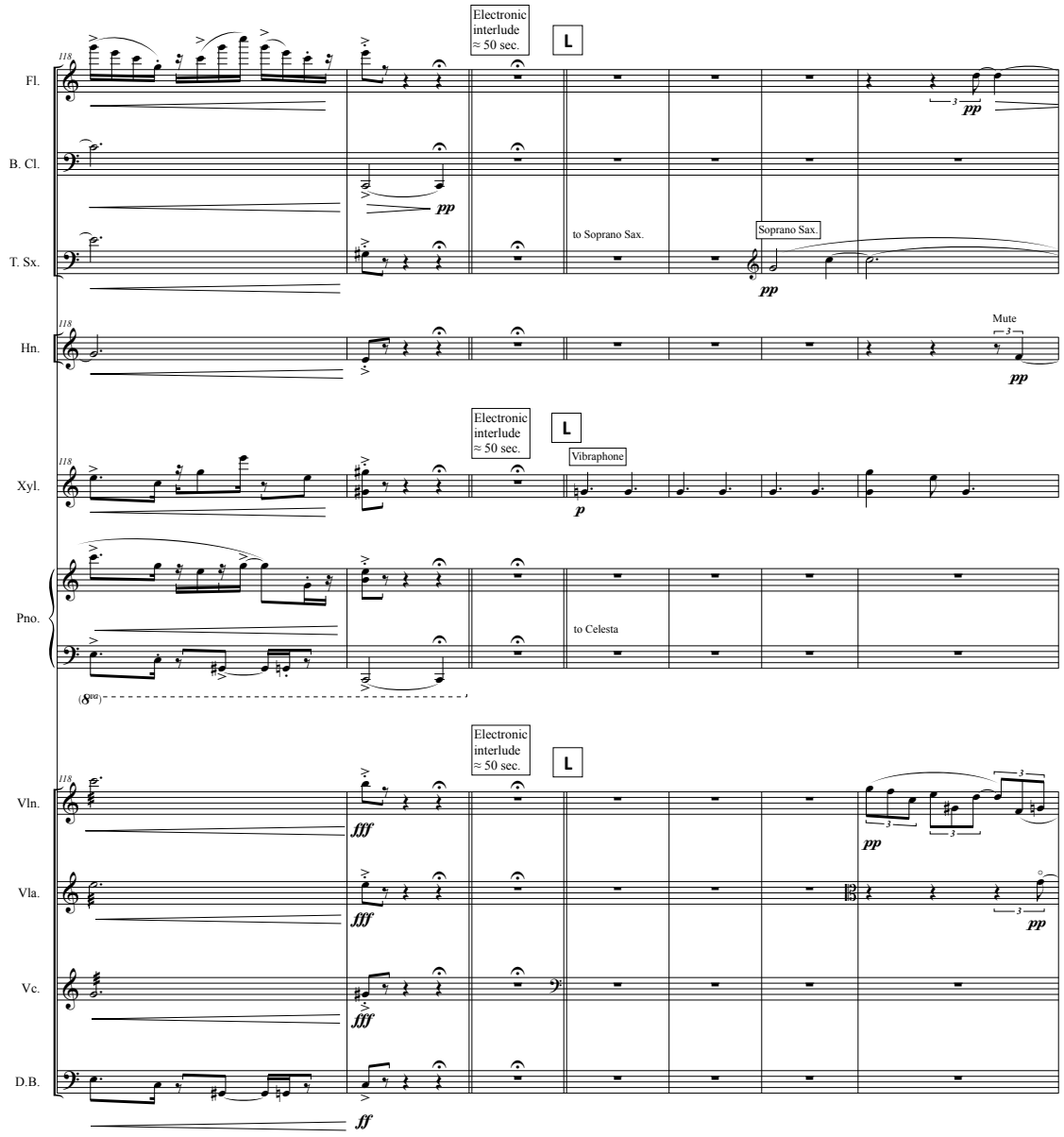

Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
Vln.
Vla.
Vc.
D.B.
91
pp
mp
p
mf
f

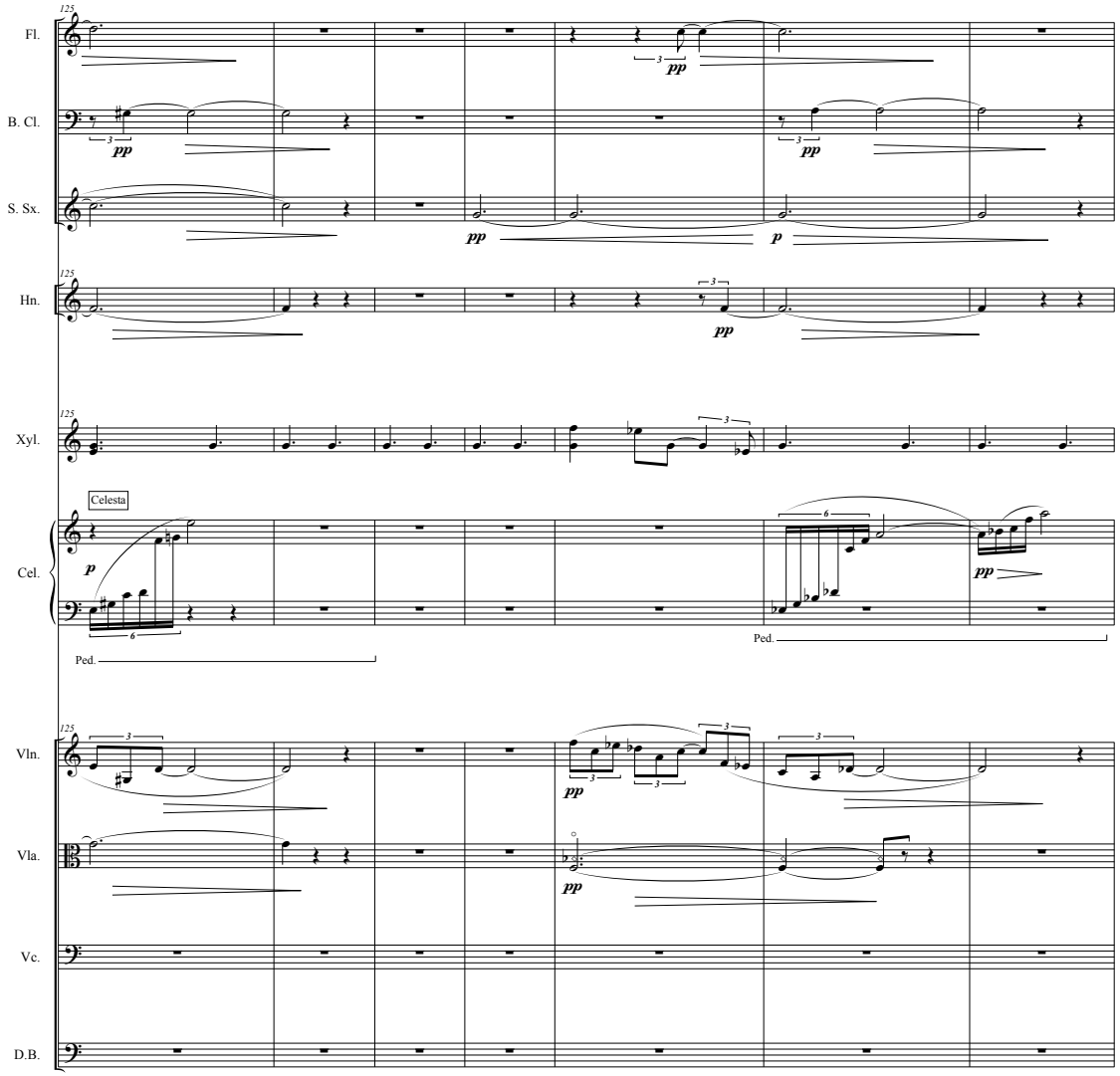

J
(←♪.=♩→) ♩= 101.3
Fl.
B. Cl.
T. Sx.
97
Hn.
J
(←♪.=♩→) ♩= 101.3
Xylophone
Xyl.
secco, detached
Pno.
J
(←♪.=♩→) ♩= 101.3
Vln.
Vla.
Vc.
arco
D.B.

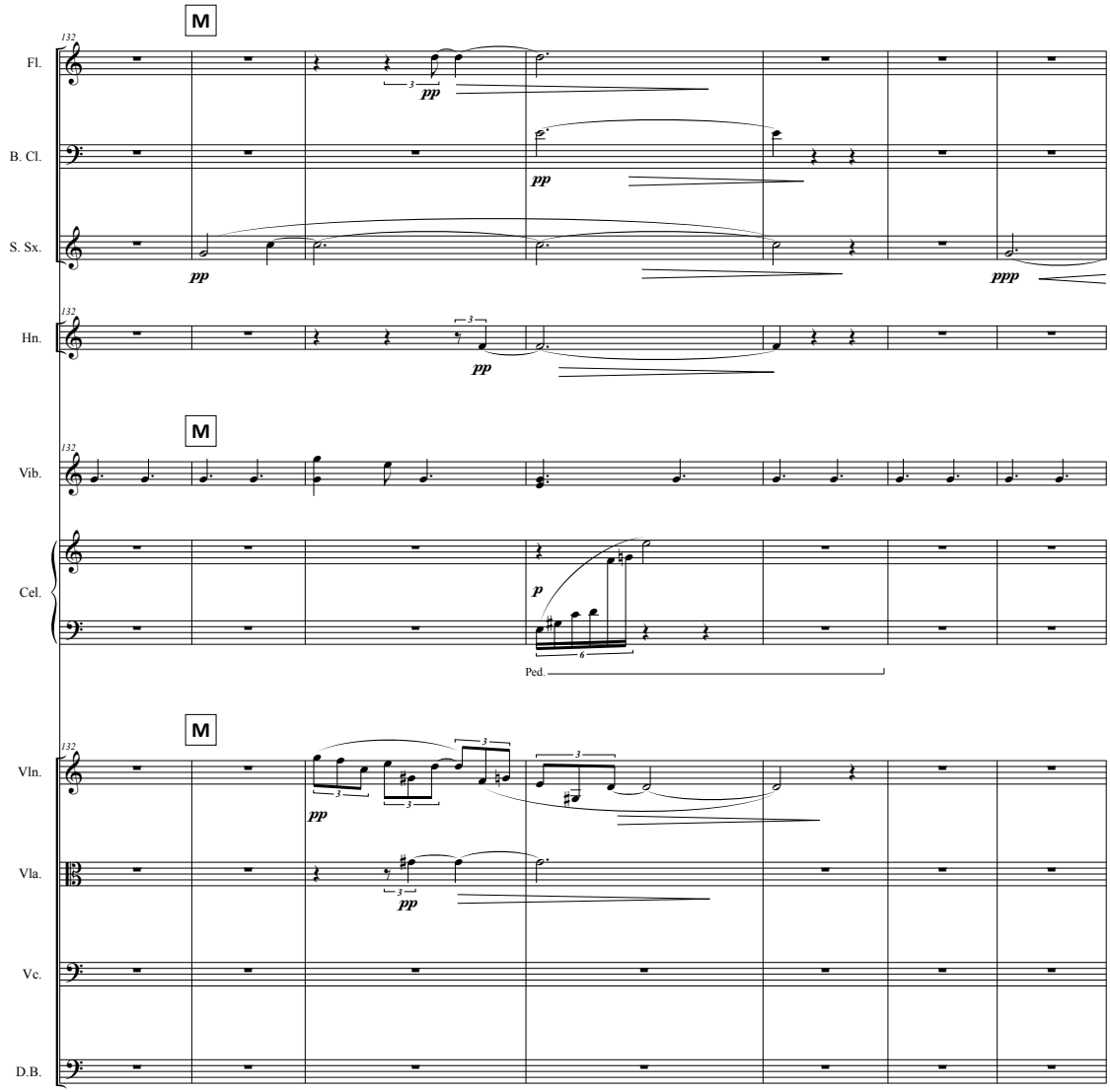

Fl.
B. Cl.
T. Sx.
Hn.
Xyl.
Pno.
Vln.
Vla.
Vc.
D.B.
102
8
p
f
mf
mp

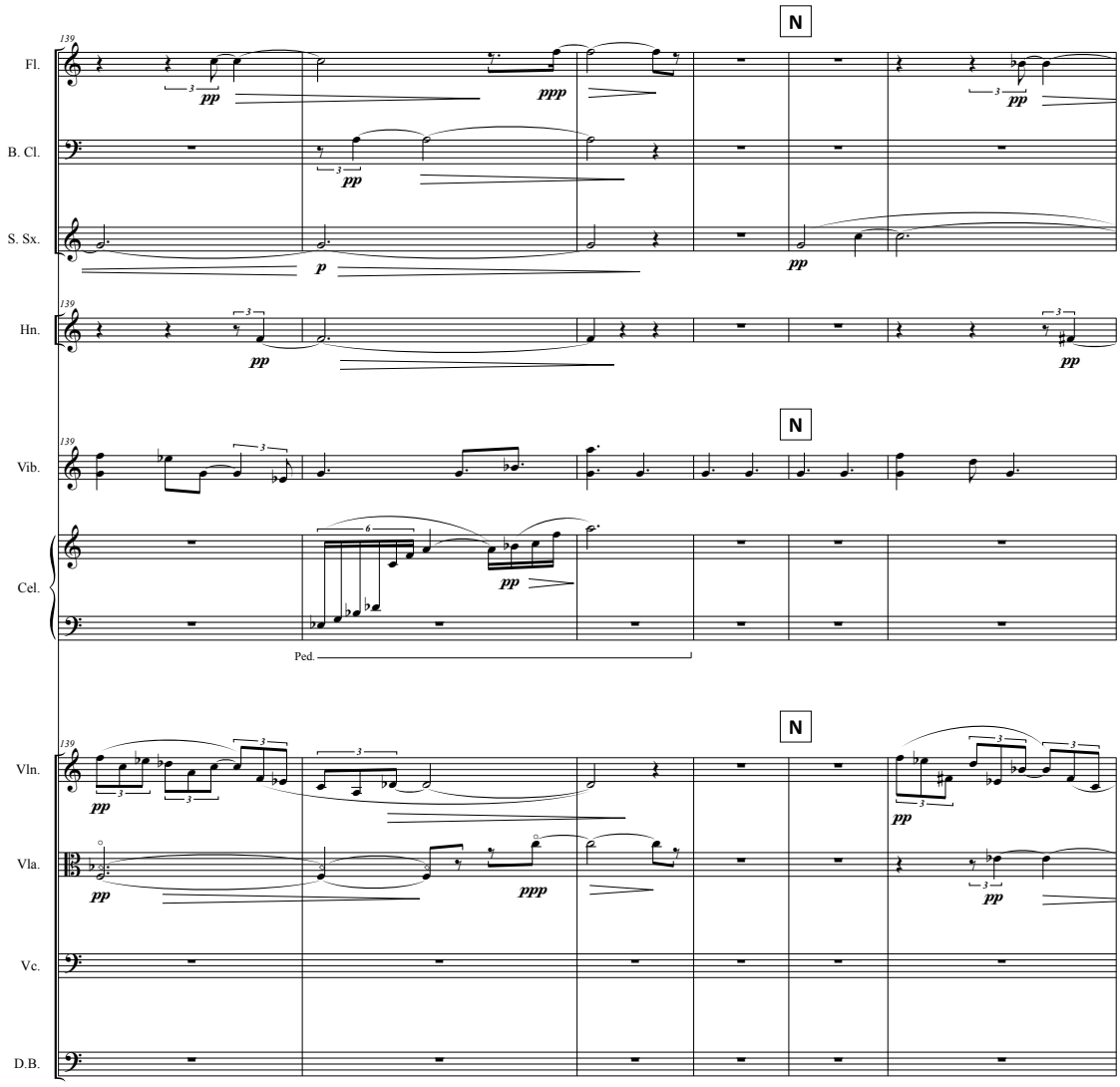

K
Fl.
B. Cl.
T. Sx.
107
Hn.
K
Xyl.
Pno.
K
Vln.
Vla.
Vc.
D.B.

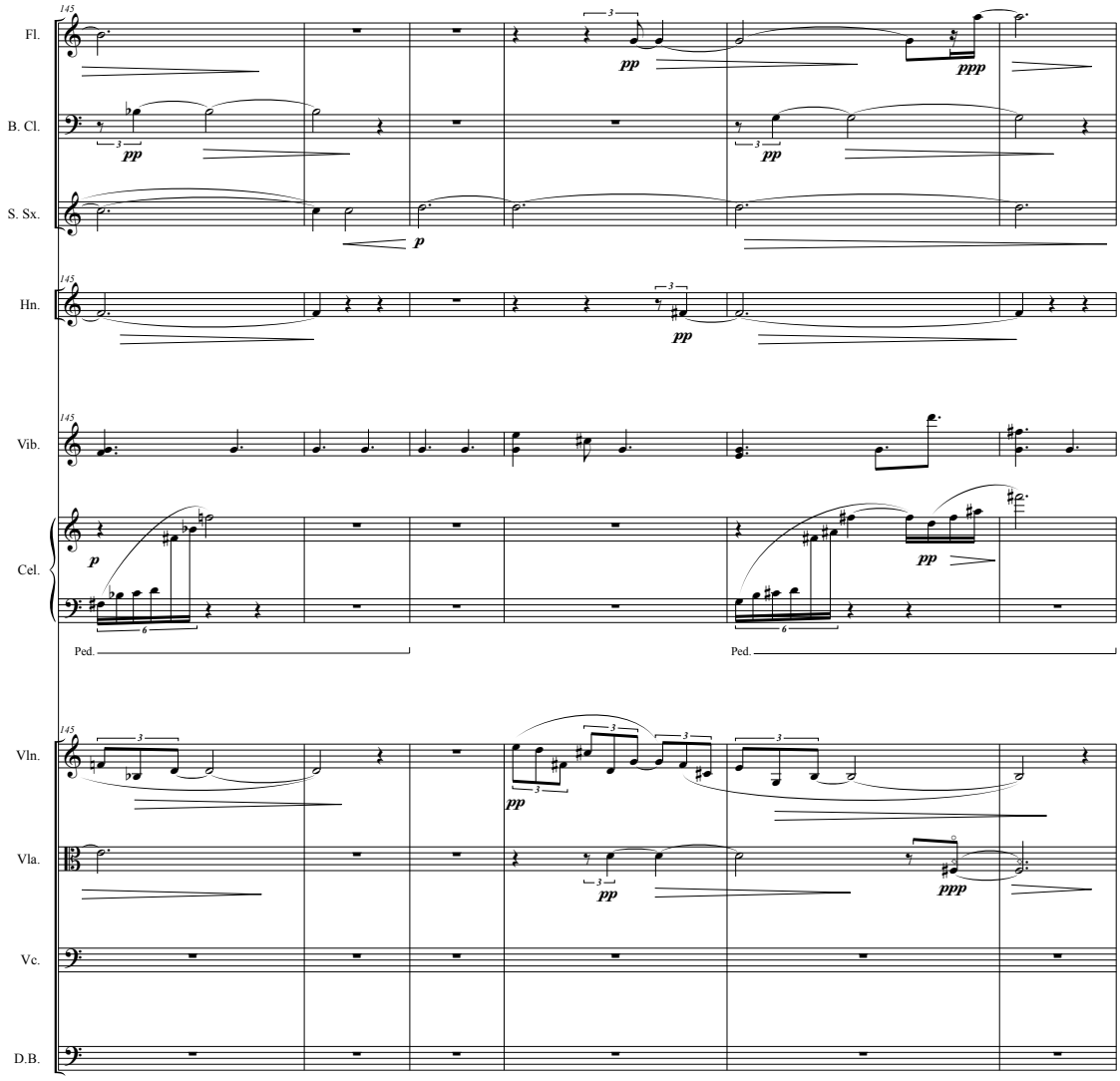

Fl.
B. Cl.
T. Sx.
Hn.
Xyl.
Pno.
Vln.
Vla.
Vc.
D.B.
113
ff
p
mf
f
mp

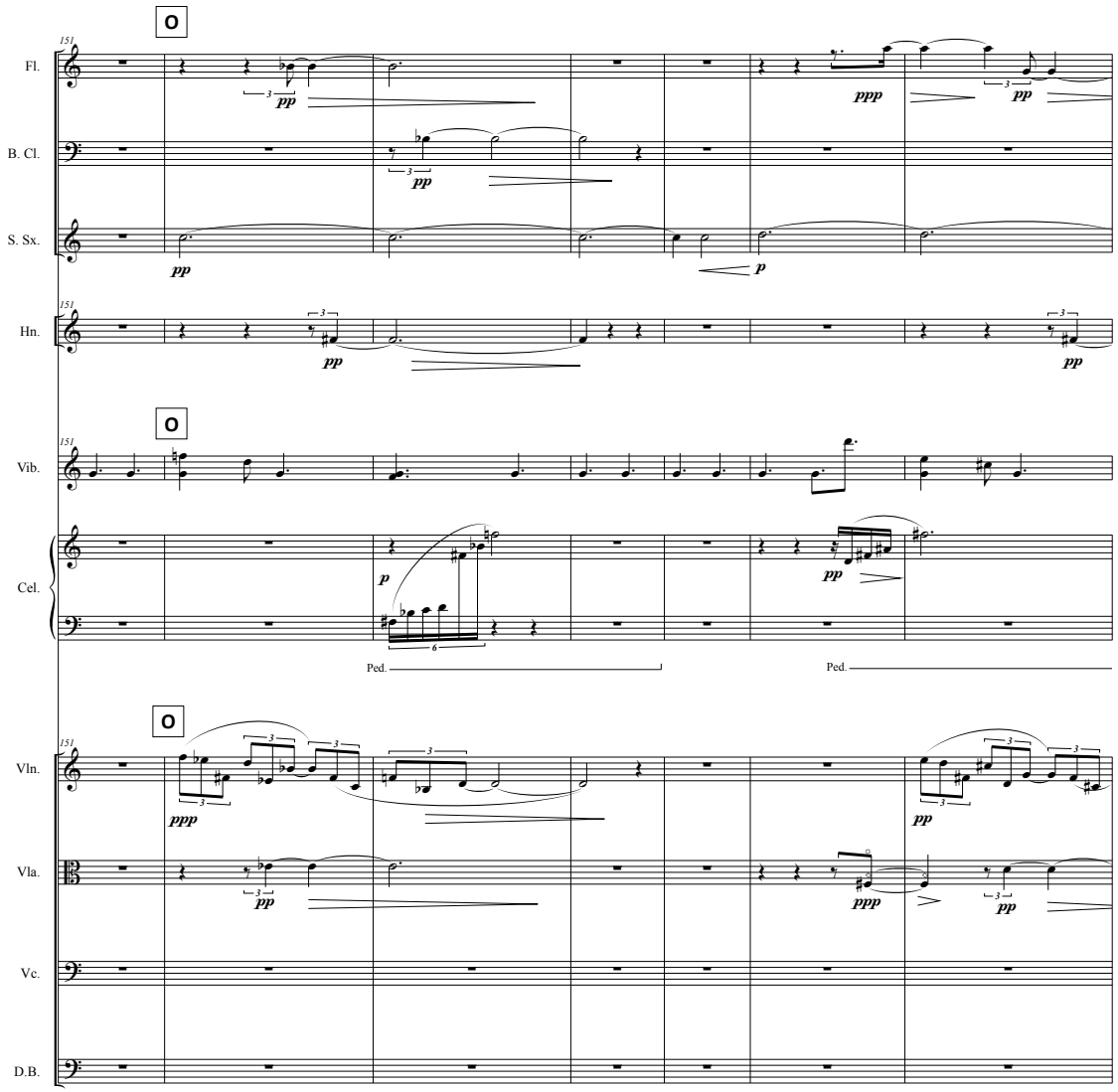

Electronic interlude ≈ 50 sec.
L
Fl.
B. Cl.
T. Sx.
to Soprano Sax.
Soprano Sax.
Hn.
Mute
Xyl.
Vibraphone
Pno.
to Celesta
Vln.
Vla.
Vc.
D.B.

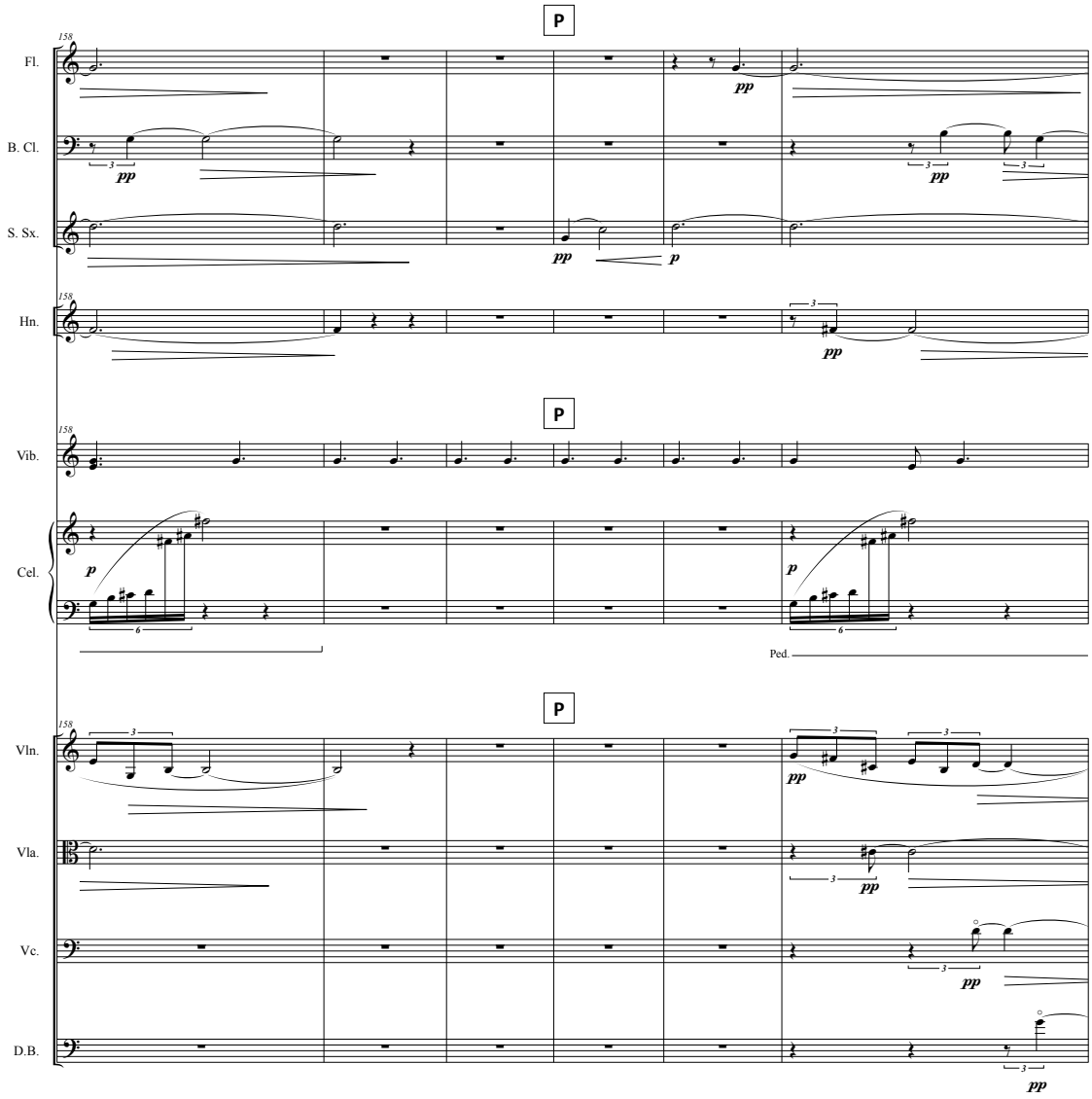

Fl.
B. Cl.
S. Sx.
Hn.
Xyl.
Celesta
Cel.
Ped.
Ped.
Vln.
Vla.
Vc.
D.B.
pp
p

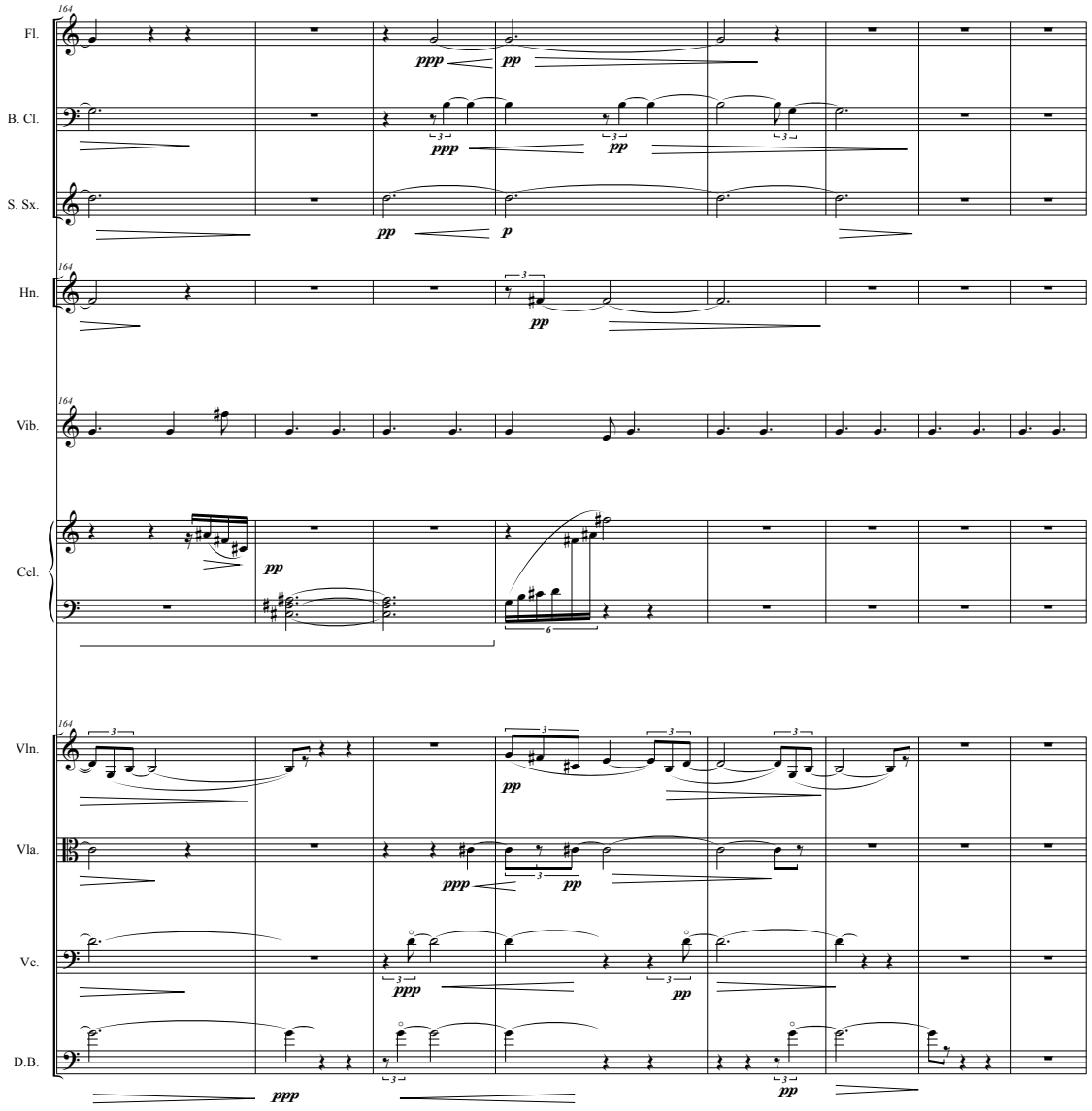

M
132
Fl.
B. Cl.
S. Sx.
Hn.
pp
ppp
M
Vib.
Cel.
p
Ped.
M
Vln.
Vla.
Vc.
D.B.

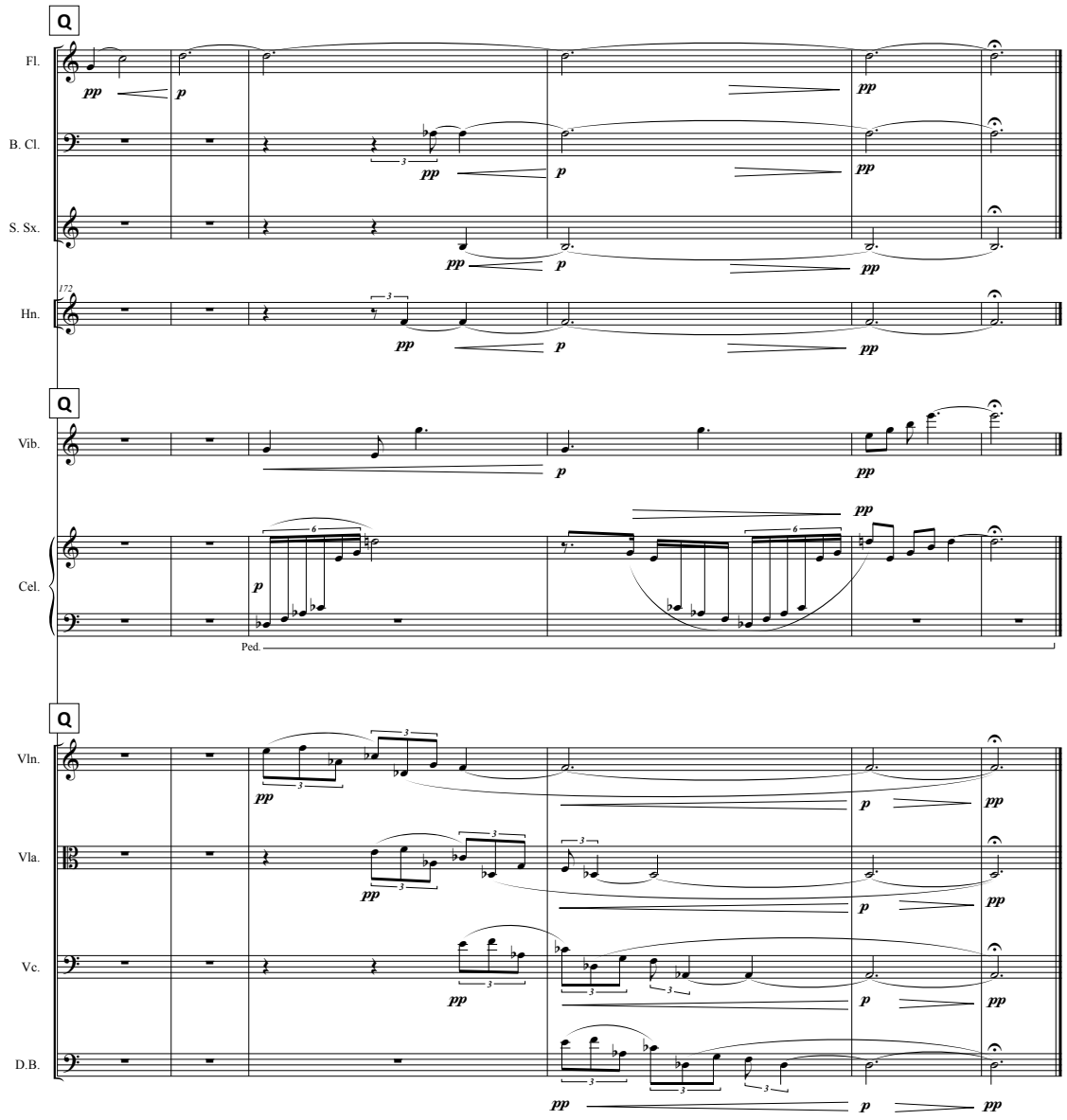

N
139
Fl.
B. Cl.
S. Sx.
Hn.
Vib.
Cel.
Ped.
Vln.
Vla.
Vc.
D.B.
pp
ppp
p


145
Fl.
B. Cl.
S. Sx.
Hn.
Vib.
Cel.
Ped.
Ped.
Vln.
Vla.
Vc.
D.B.
pp
ppp
p


O
151
Fl.
B. Cl.
S. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
ppp
pp
p
Ped.


P
158
Fl.
B. Cl.
S. Sx.
Hn.
Vib.
Cel.
Ped.
Vln.
Vla.
Vc.
D.B.
pp
p

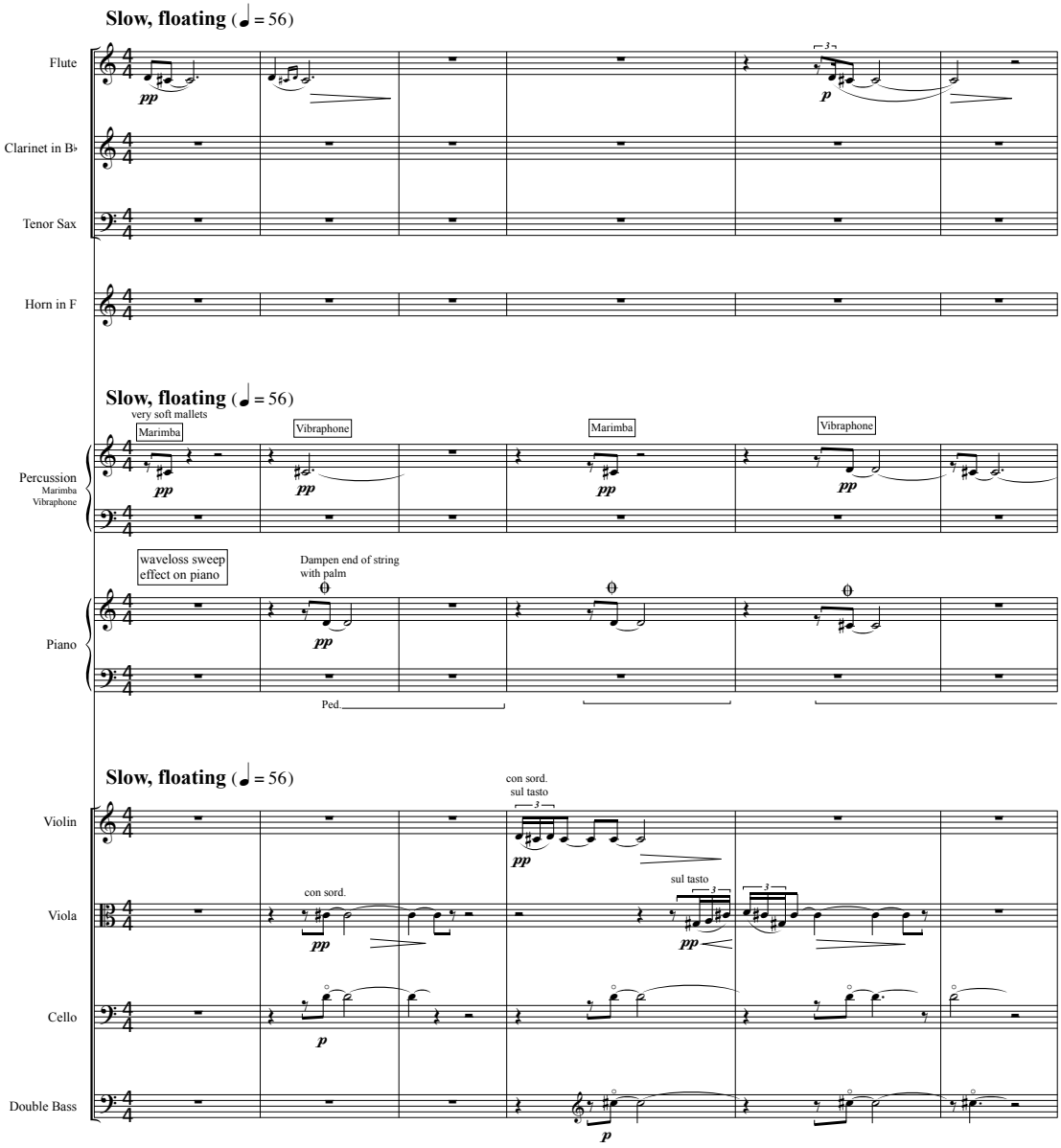

164
Fl.
B. Cl.
S. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
ppp
pp
p

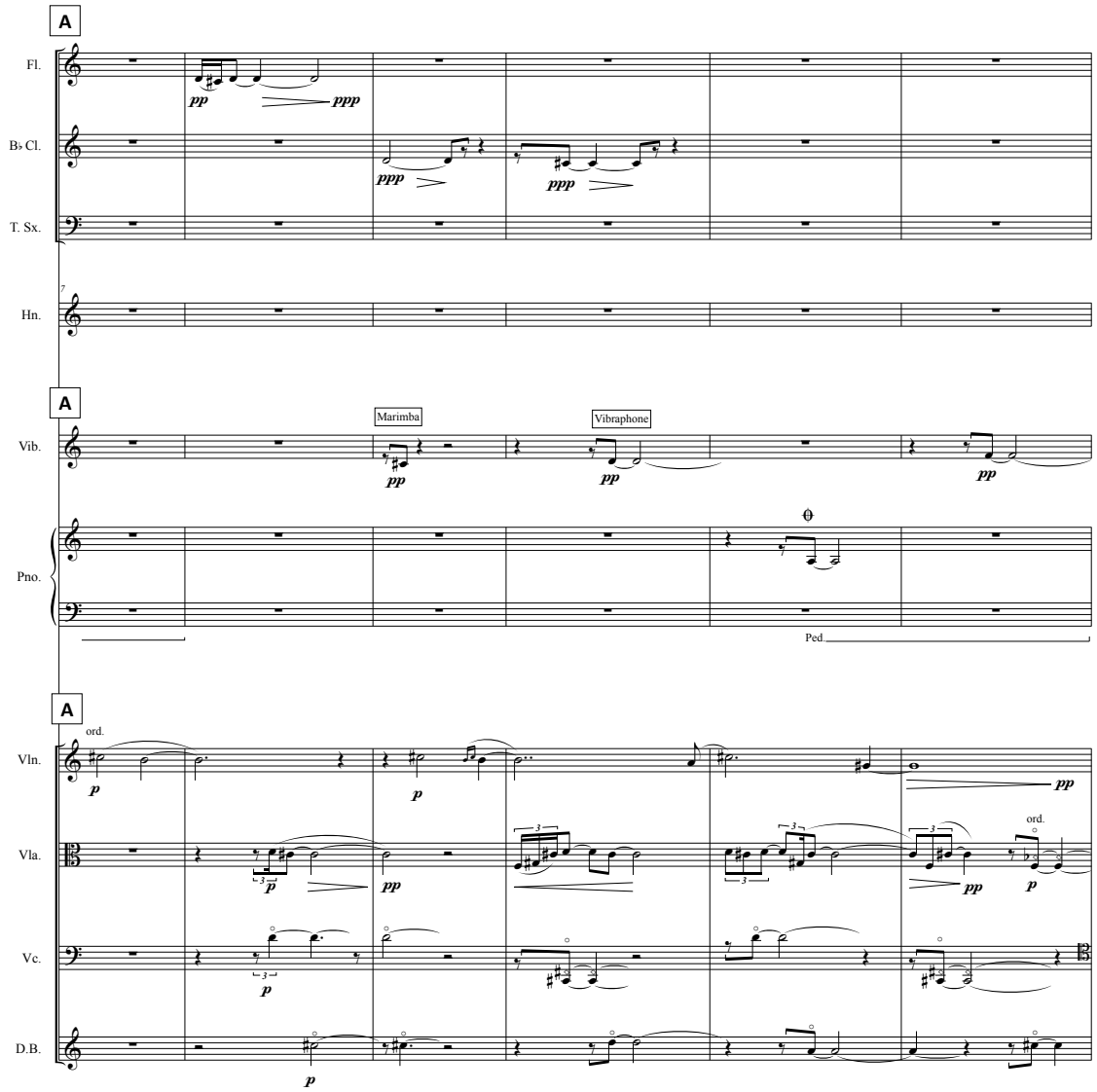

Q
Fl.
B. Cl.
S. Sx.
172
Hn.
Q
Vib.
Cel.
Ped.
Q
Vln.
Vla.
Vc.
D.B.

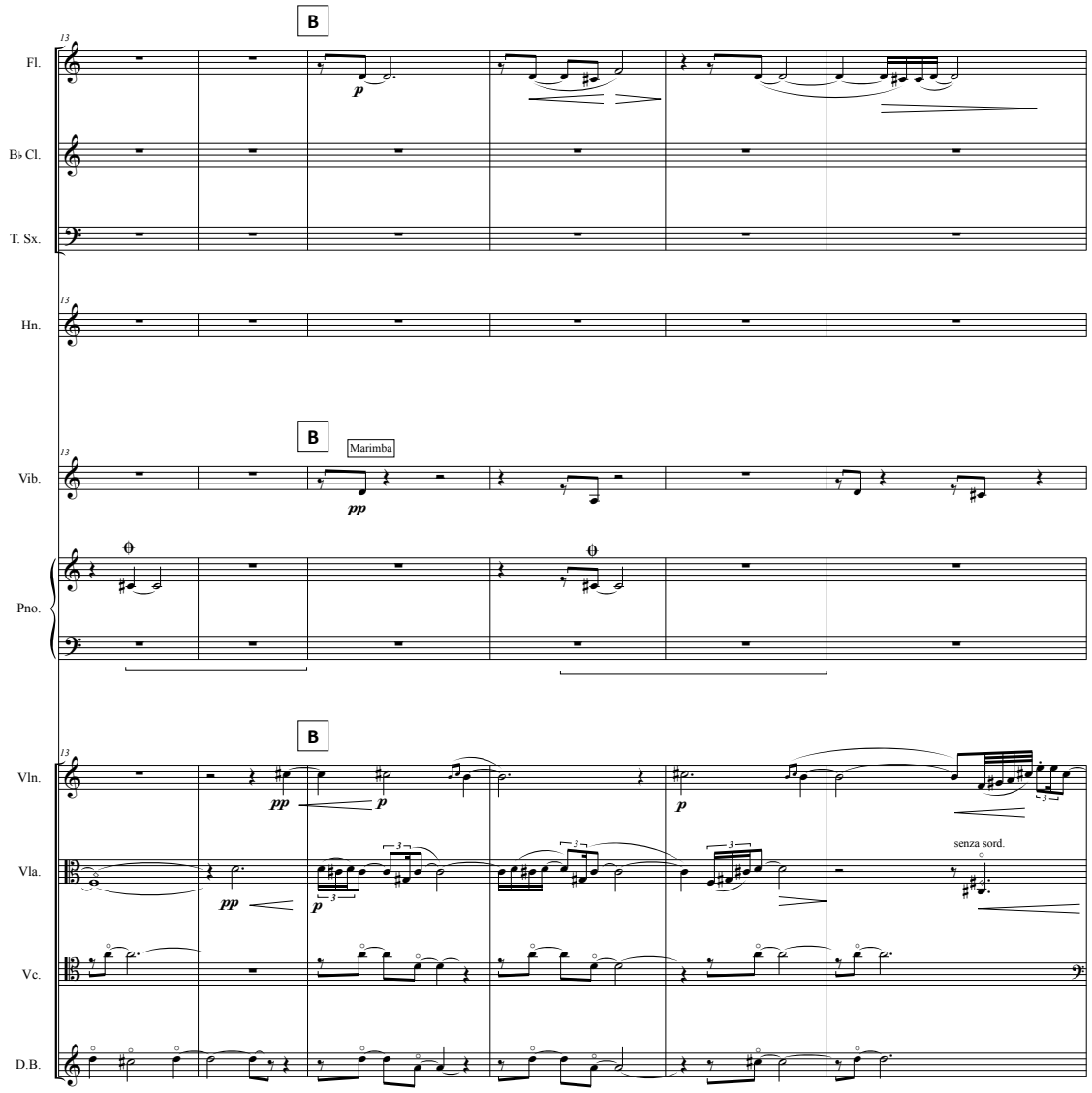
IV. Divergence

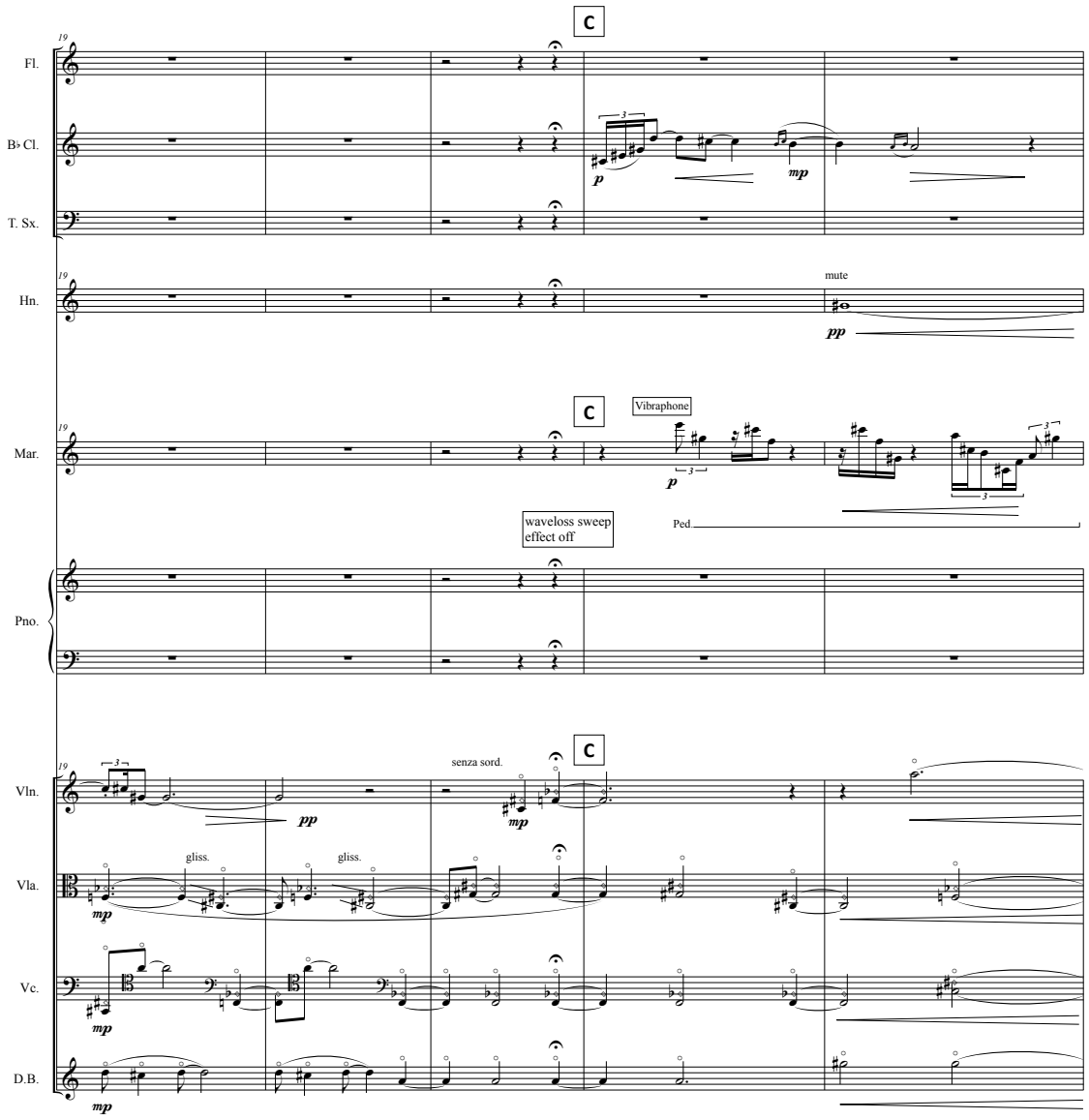
Score in C

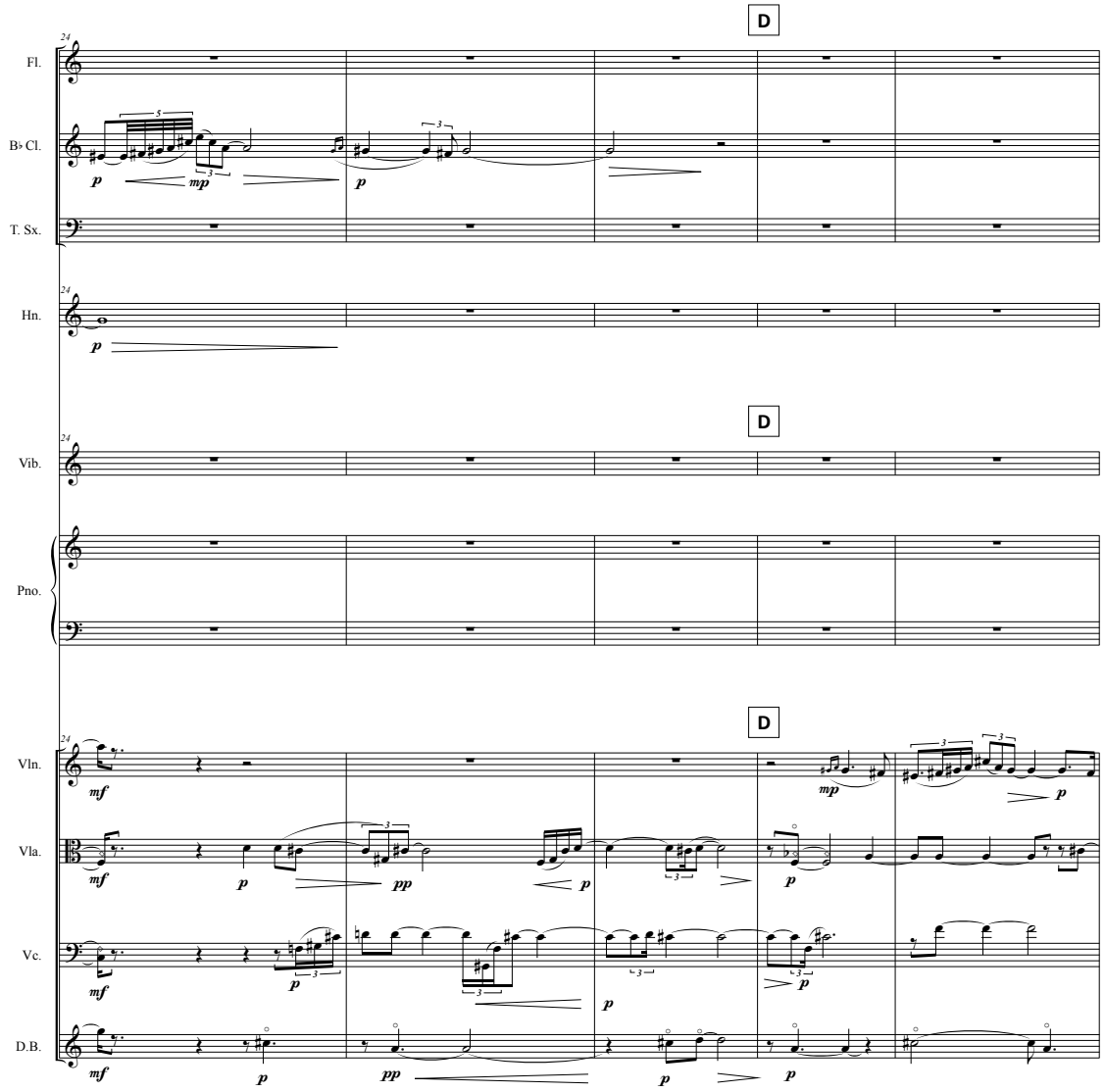
Jamie Keesecker

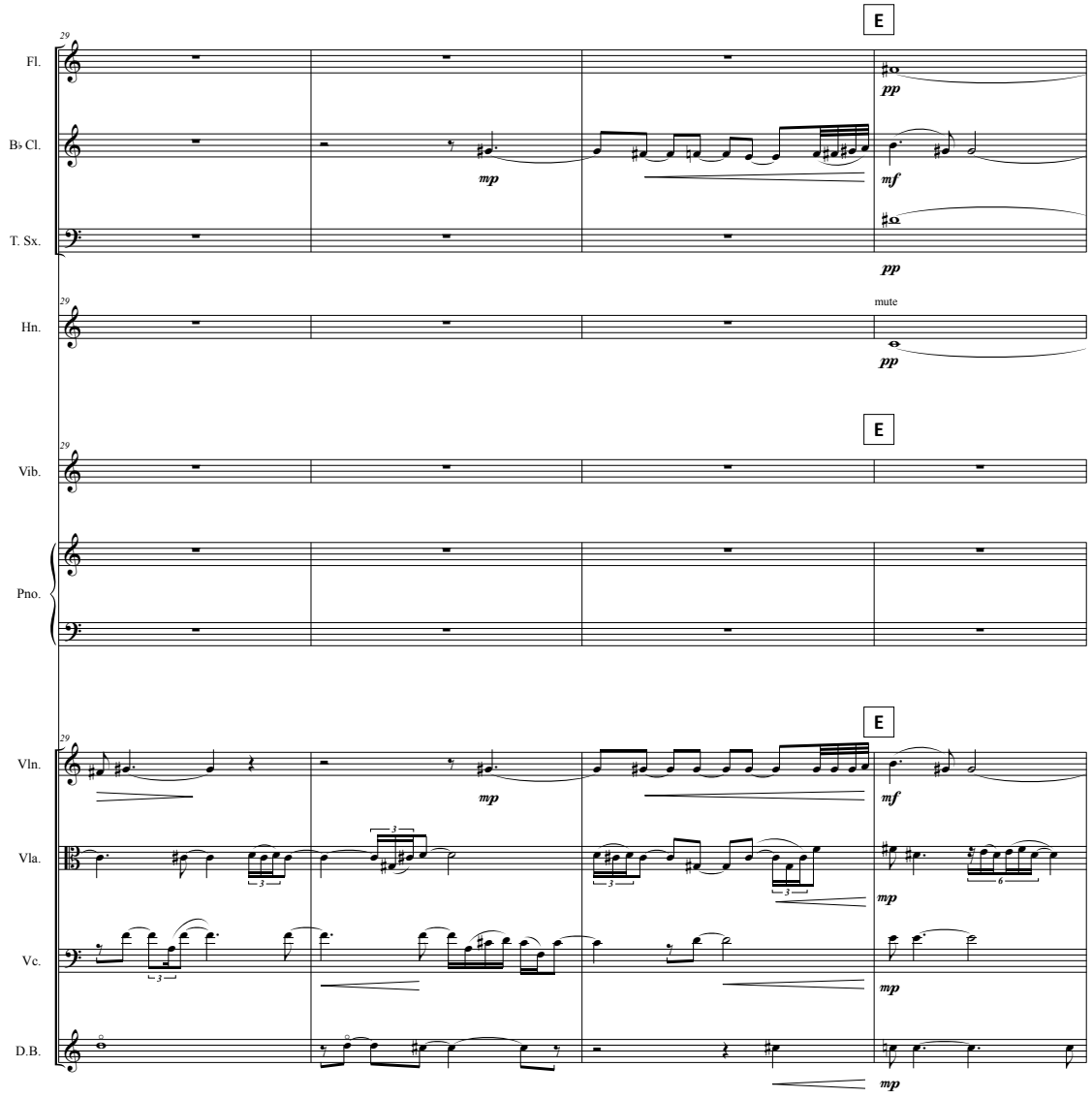


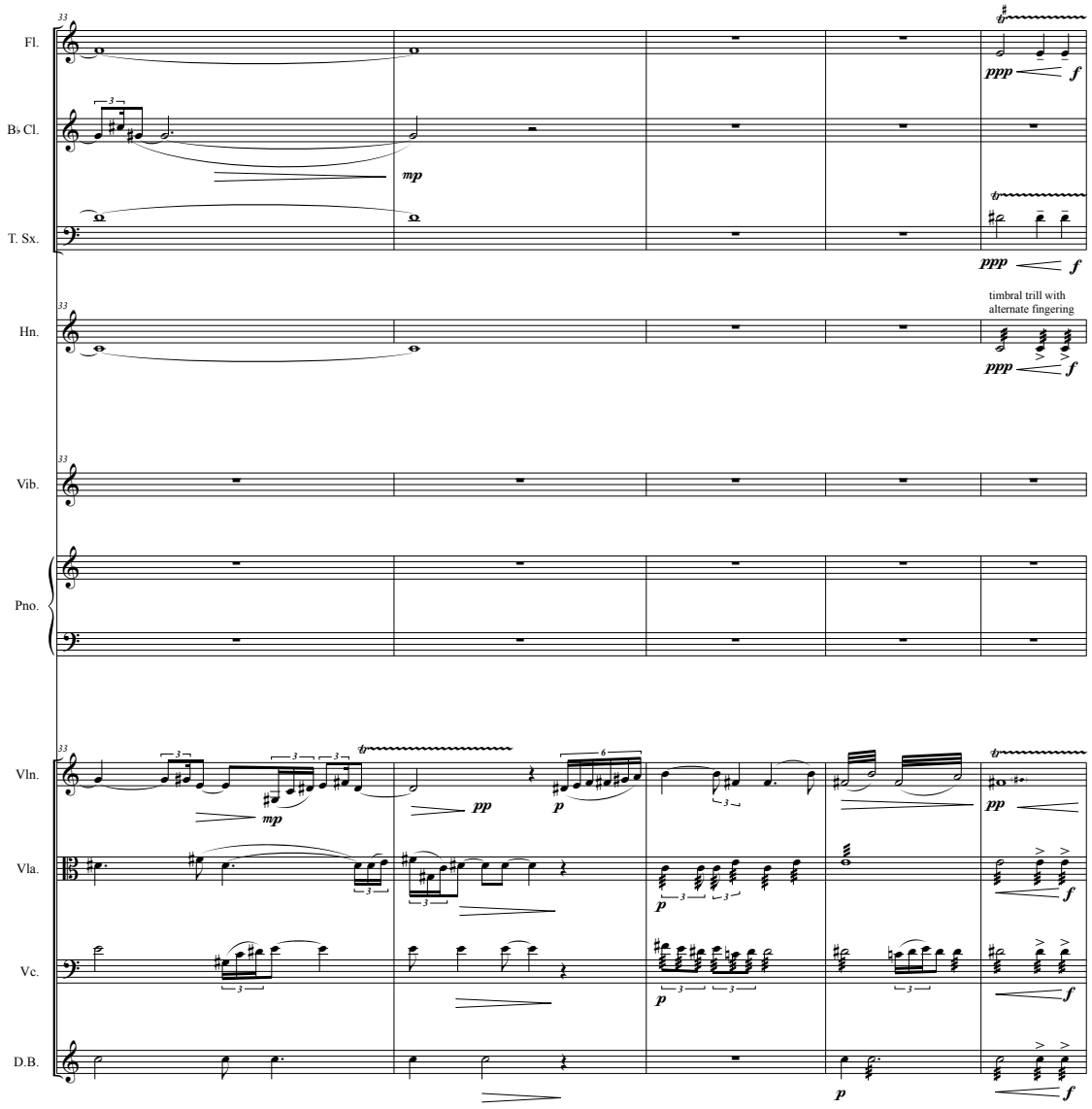

A
Fl.
pp
ppp
B♭ Cl.
ppp
ppp
T. Sx.
Hn.
A
Marimba
Vibraphone
Vib.
pp
pp
pp
Pno.
Ped.
A
ord.
Vln.
p
p
pp
Vla.
p
pp
pp
ord.
p
Vc.
p
D.B.
p

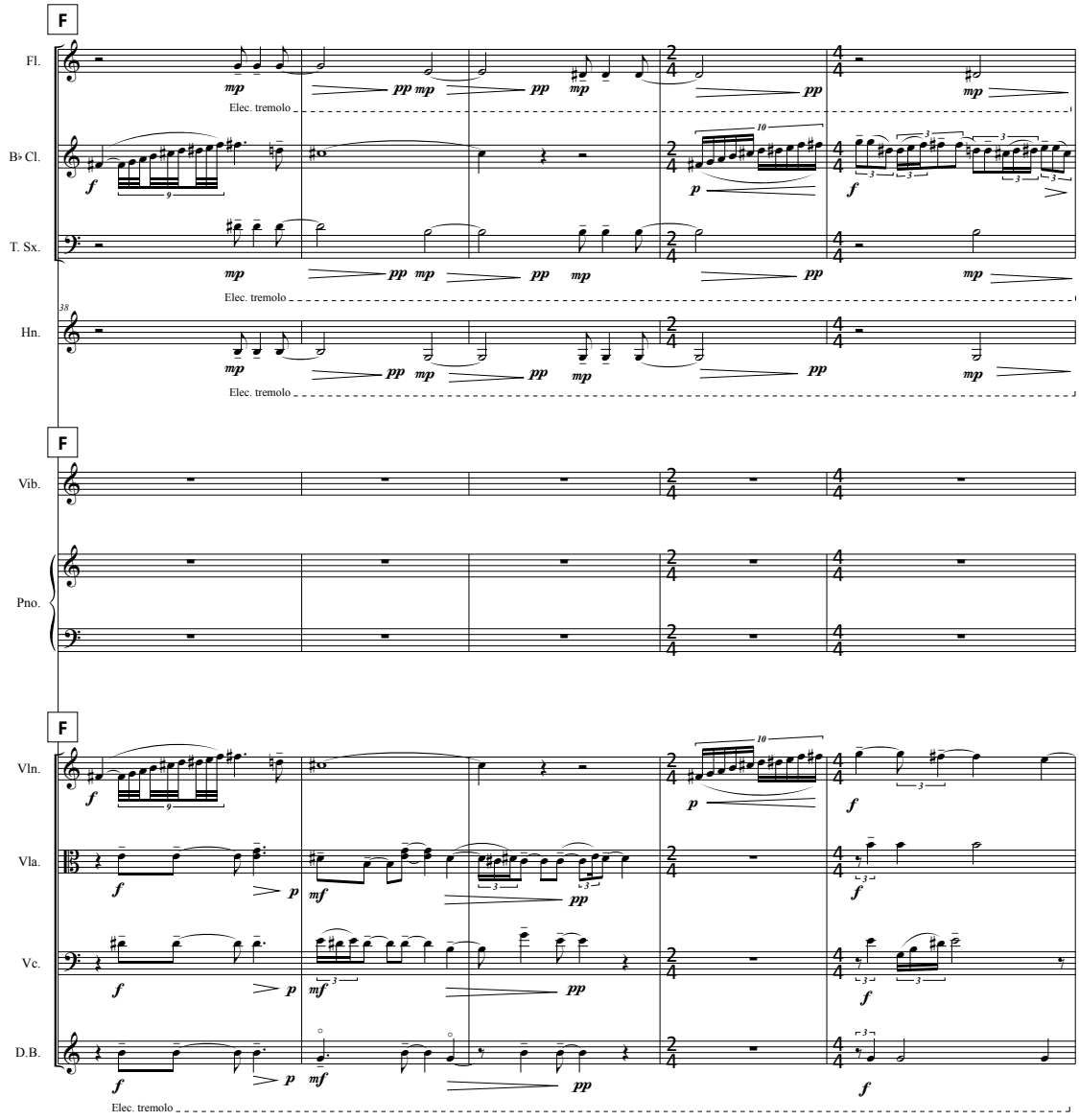

B
Fl.
B♭ Cl.
T. Sx.
Hn.
B
Marimba
Vib.
Pno.
B
Vln.
Vla.
senza sord.
Vc.
D.B.

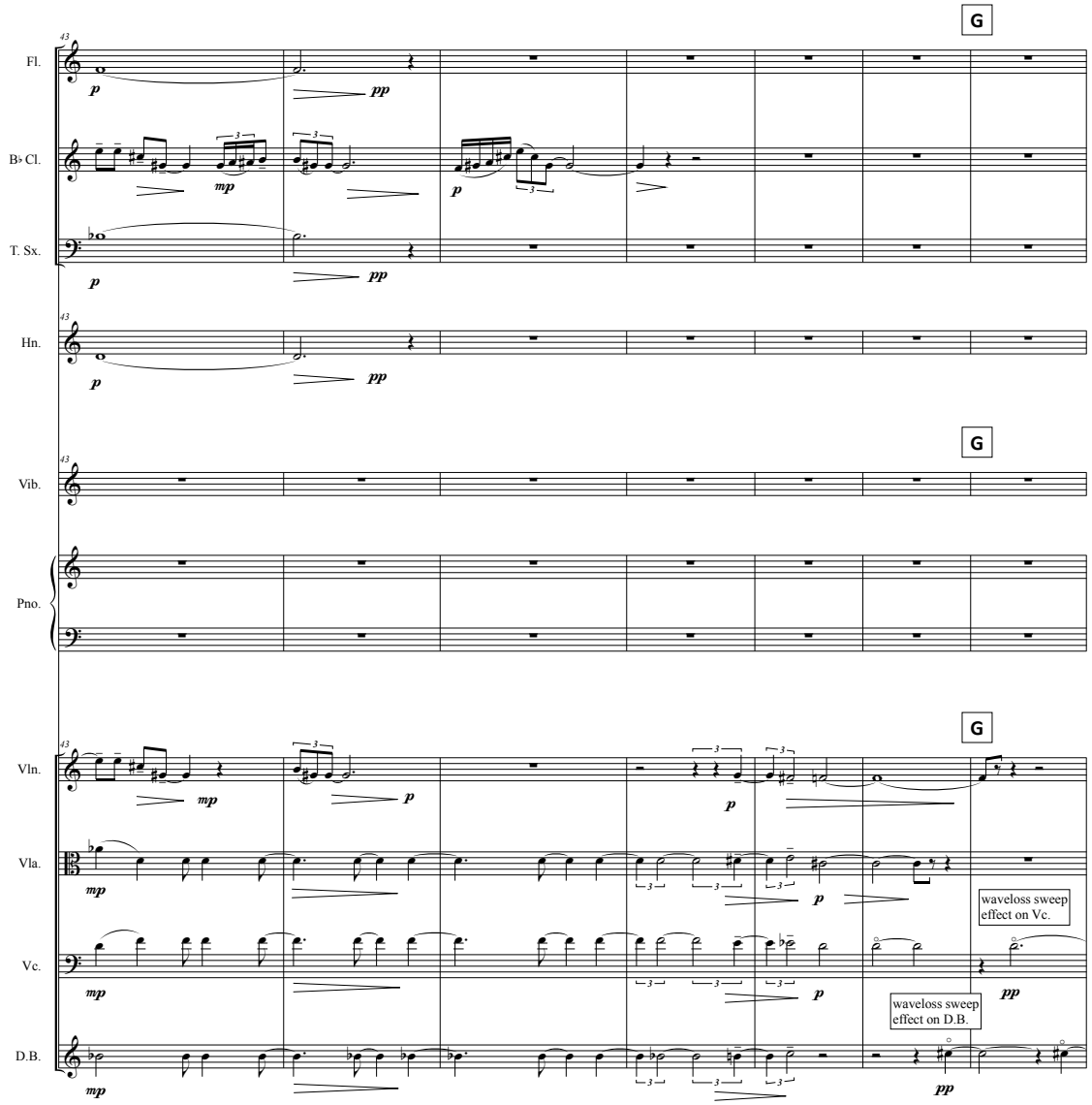

C
19
Fl.
B♭ Cl.
T. Sx.
Hn.
mute
pp
Mar.
Vibraphone
p
Ped
waveloss sweep effect off
Pno.
Vln.
senza sord.
mp
Vla.
gliss.
Vc.
D.B.

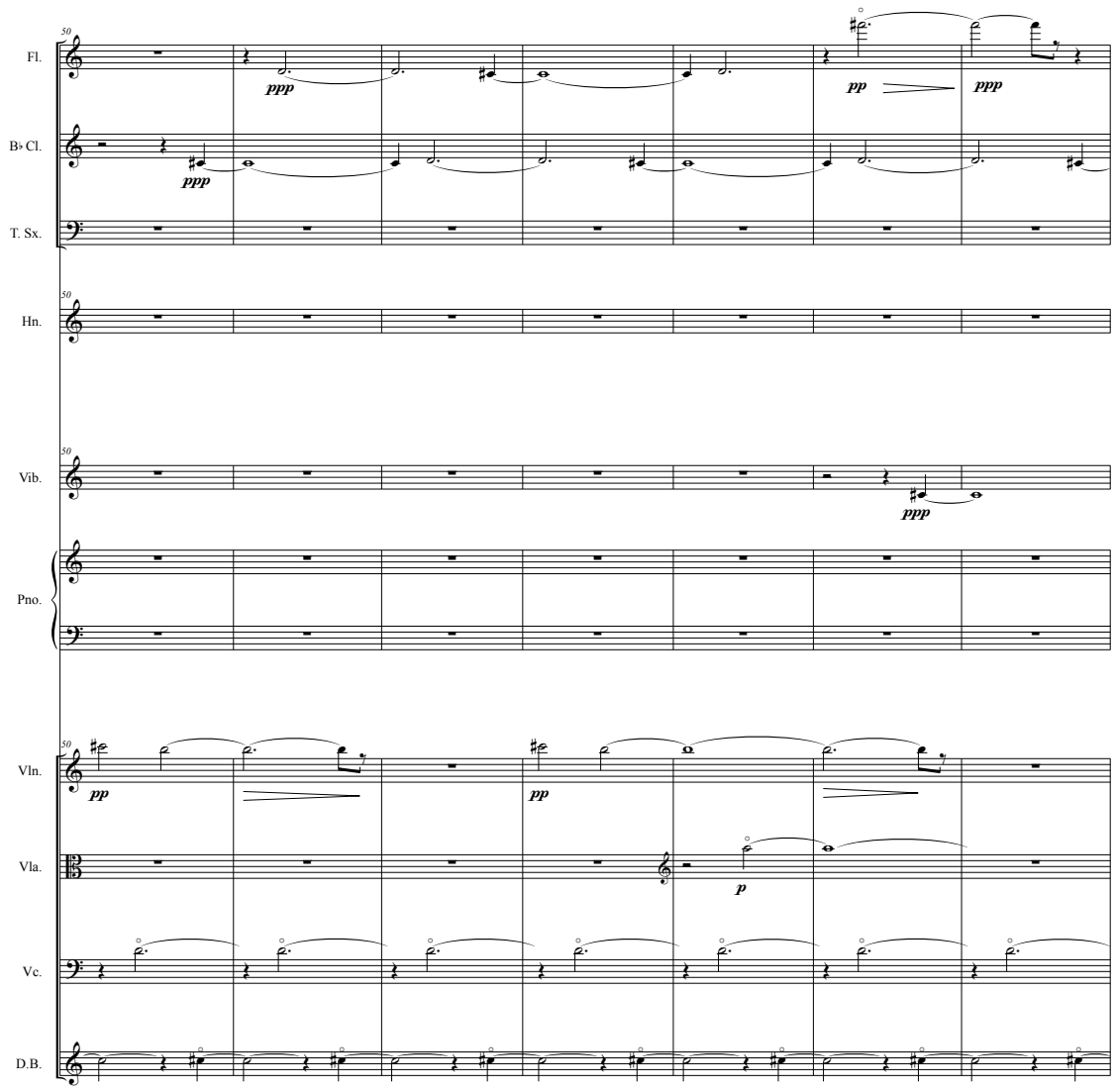

D
Fl.
B♭ Cl.
T. Sx.
Hn.
D
Vib.
Pno.
D
Vln.
Vla.
Vc.
D.B.

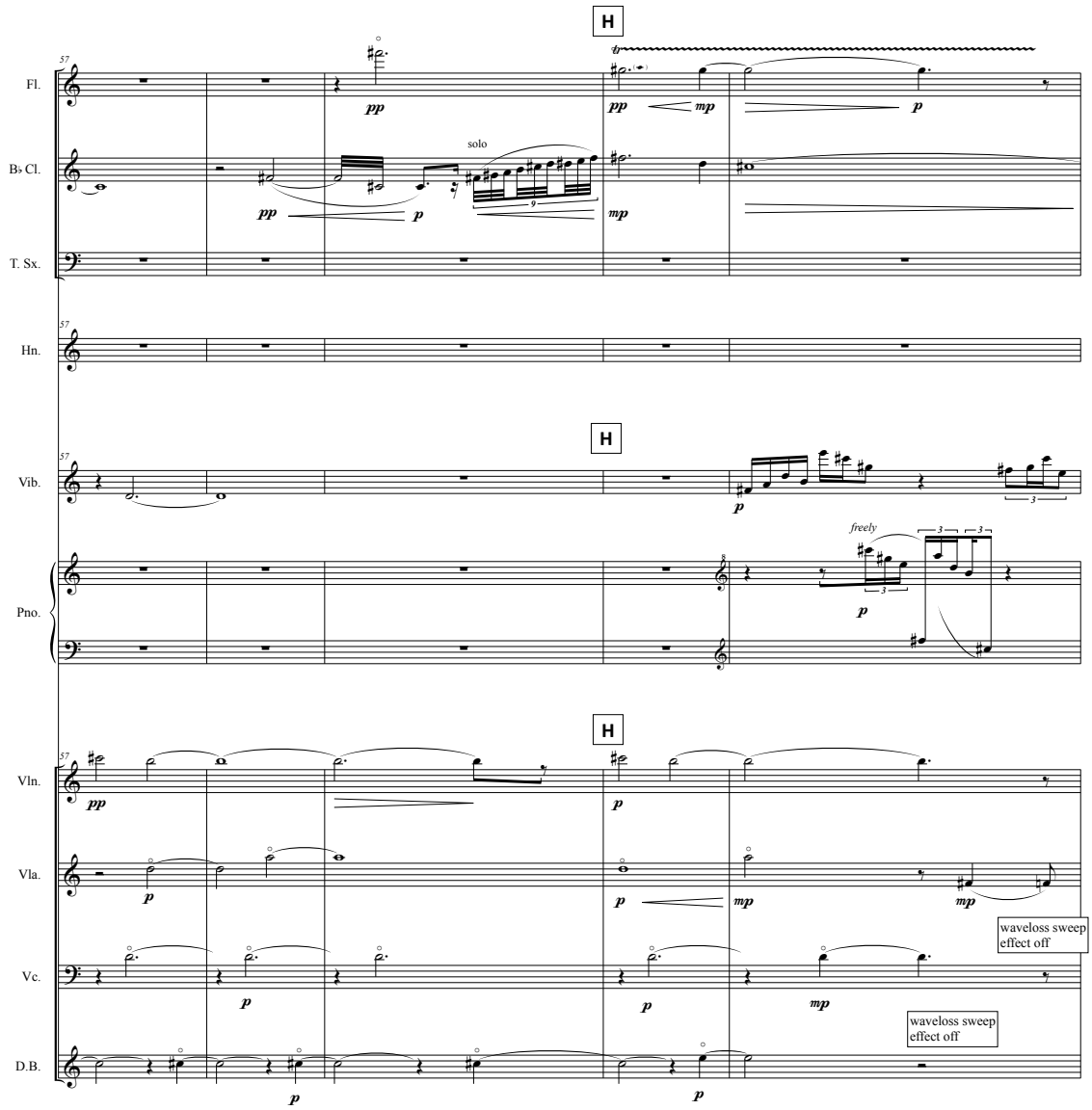

E
29
Fl.
pp
B♭ Cl.
mp
mf
T. Sx.
pp
Hn.
mute
pp
E
Vib.
Pno.
E
Vln.
mp
mf
Vla.
mp
Vc.
mp
D.B.
mp

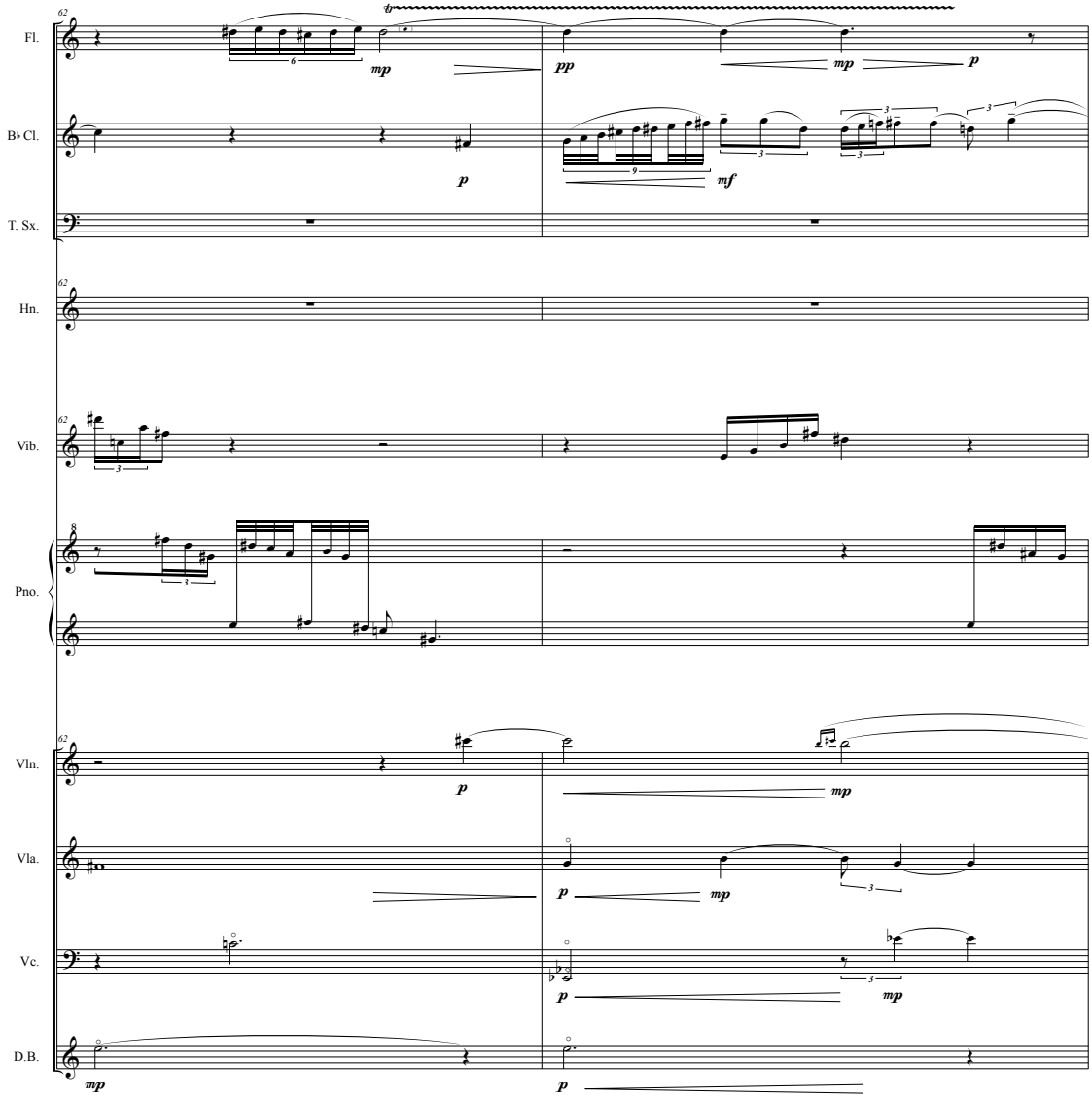

Fl.
B♭ Cl.
T. Sx.
Hn.
timbral trill with
alternate fingering
Vib.
Pno.
Vln.
Vla.
Vc.
D.B.

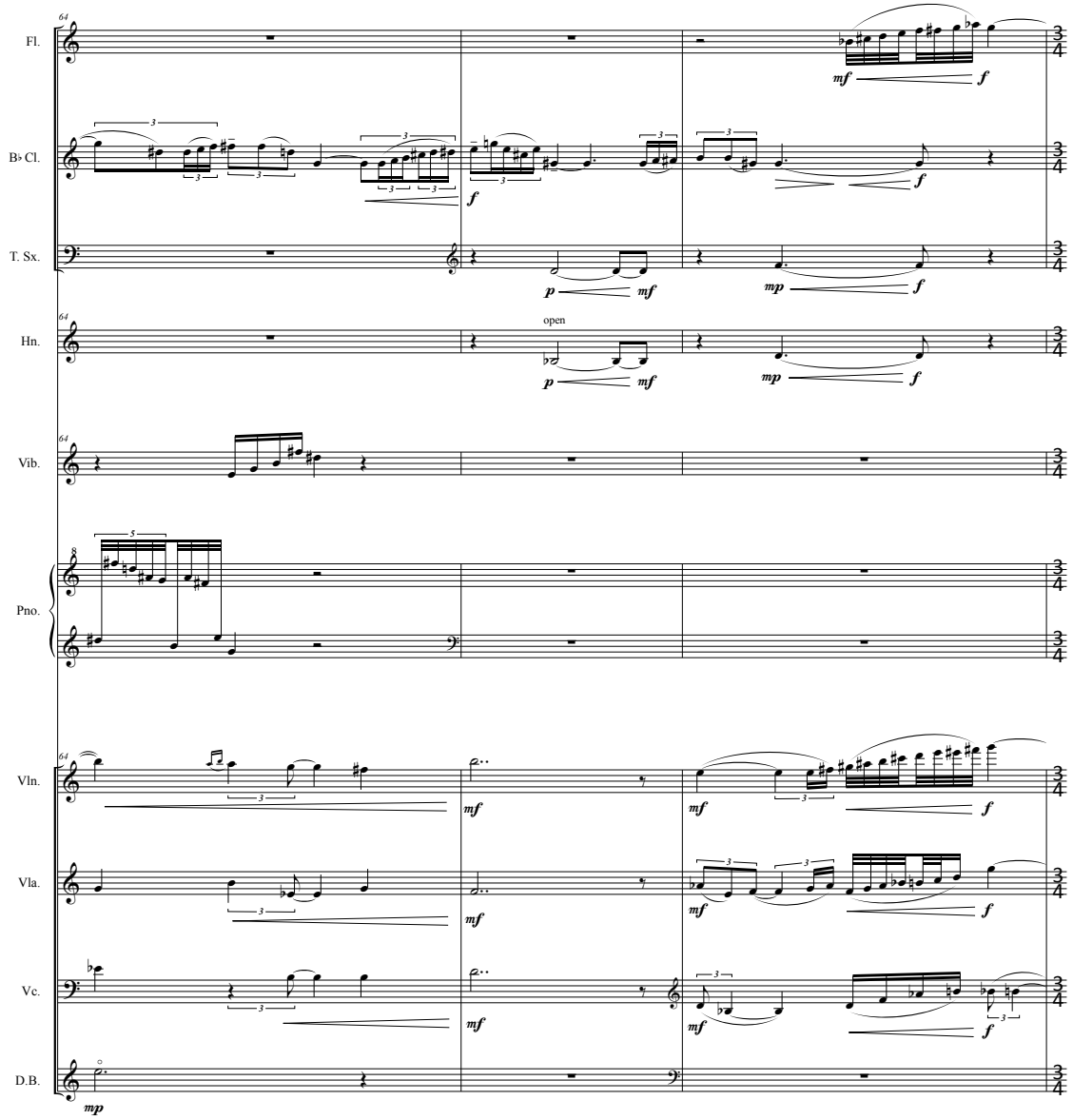

F
Fl.
B♭ Cl.
T. Sx.
Hn.
Elec. tremolo
F
Vib.
Pno.
F
Vln.
Vla.
Vc.
D.B.
Elec. tremolo

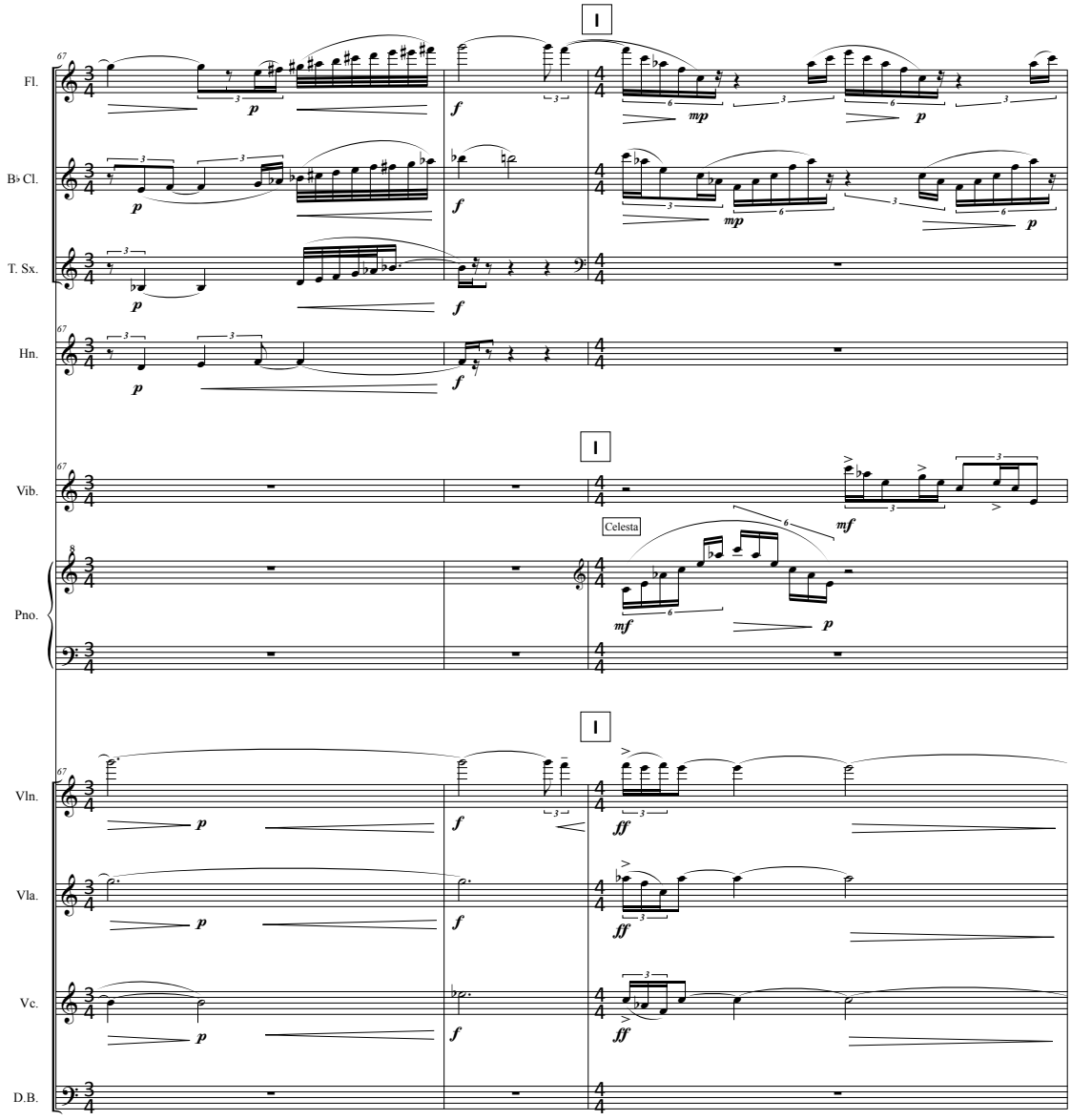

G
Fl.
B♭ Cl.
T. Sx.
Hn.
G
Vib.
Pno.
G
Vln.
Vla.
Vc.
D.B.
waveloss sweep effect on Vc.
waveloss sweep effect on D.B.

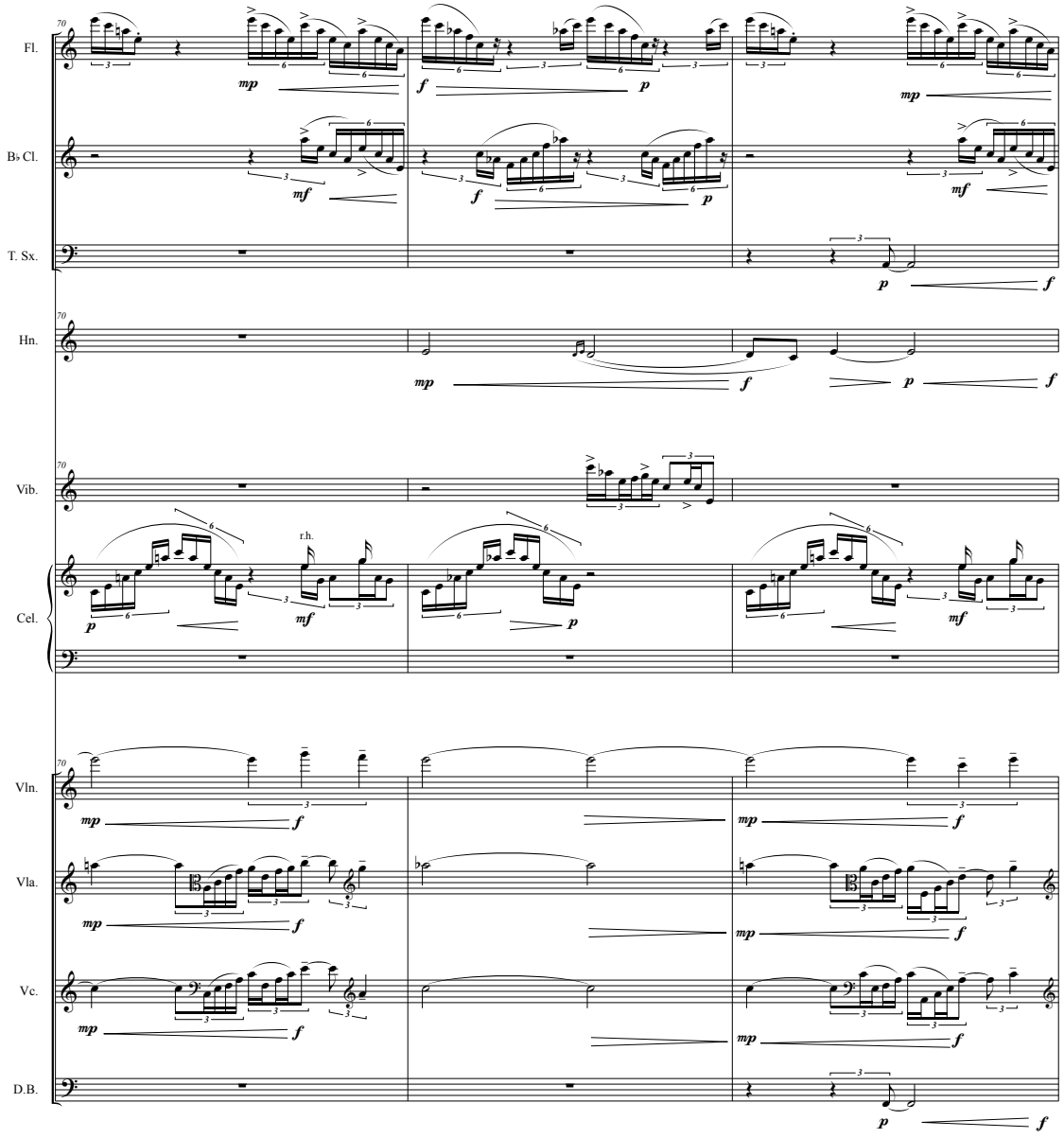

50
Fl.
ppp
pp
ppp
B♭ Cl.
ppp
T. Sx.
50
Hn.
50
Vib.
ppp
Pno.
50
Vln.
pp
pp
Vla.
p
Vc.
D.B.

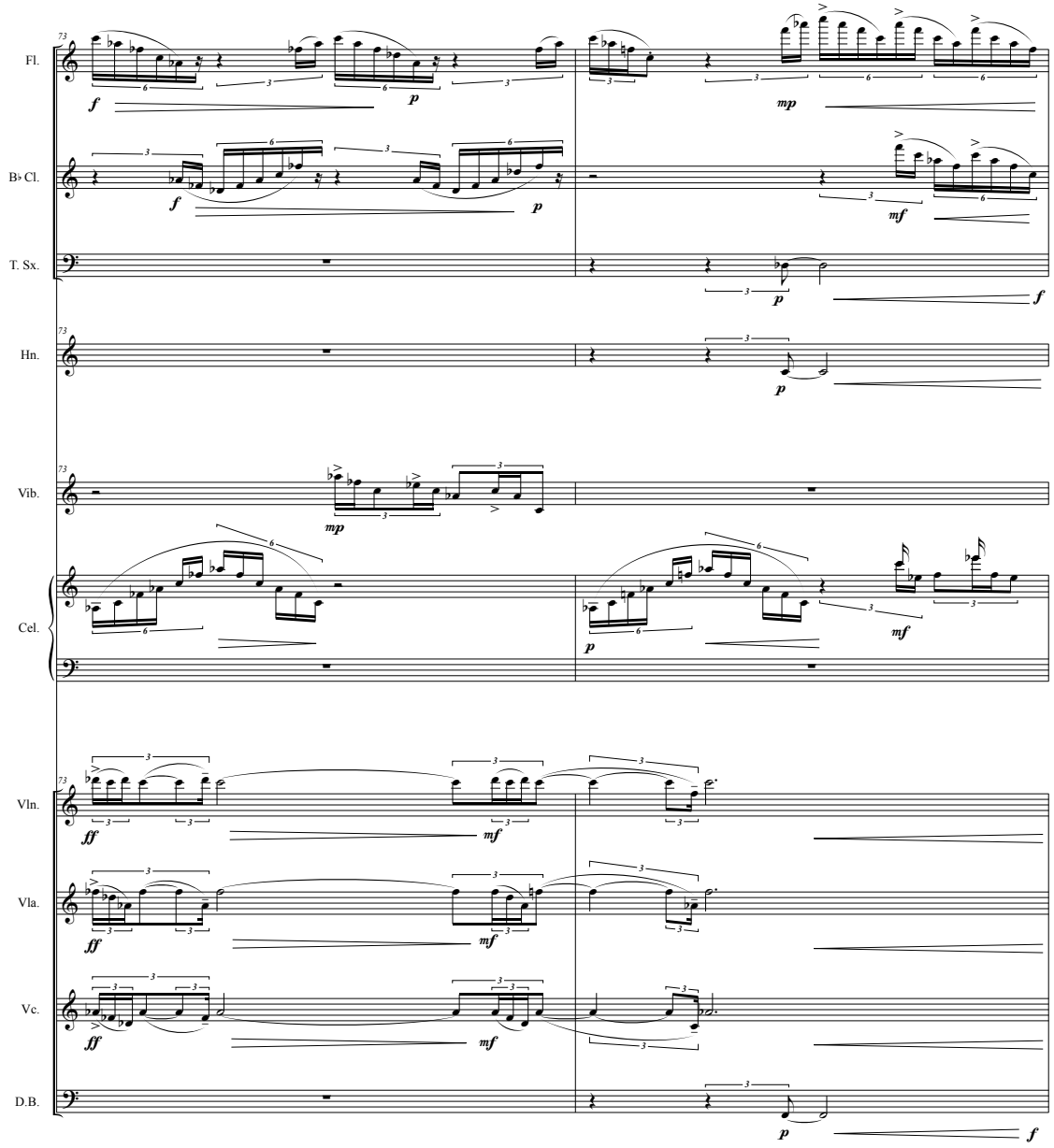

H
Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Pno.
Vln.
Vla.
Vc.
D.B.
solo
freely
waveloss sweep
effect off
waveloss sweep
effect off

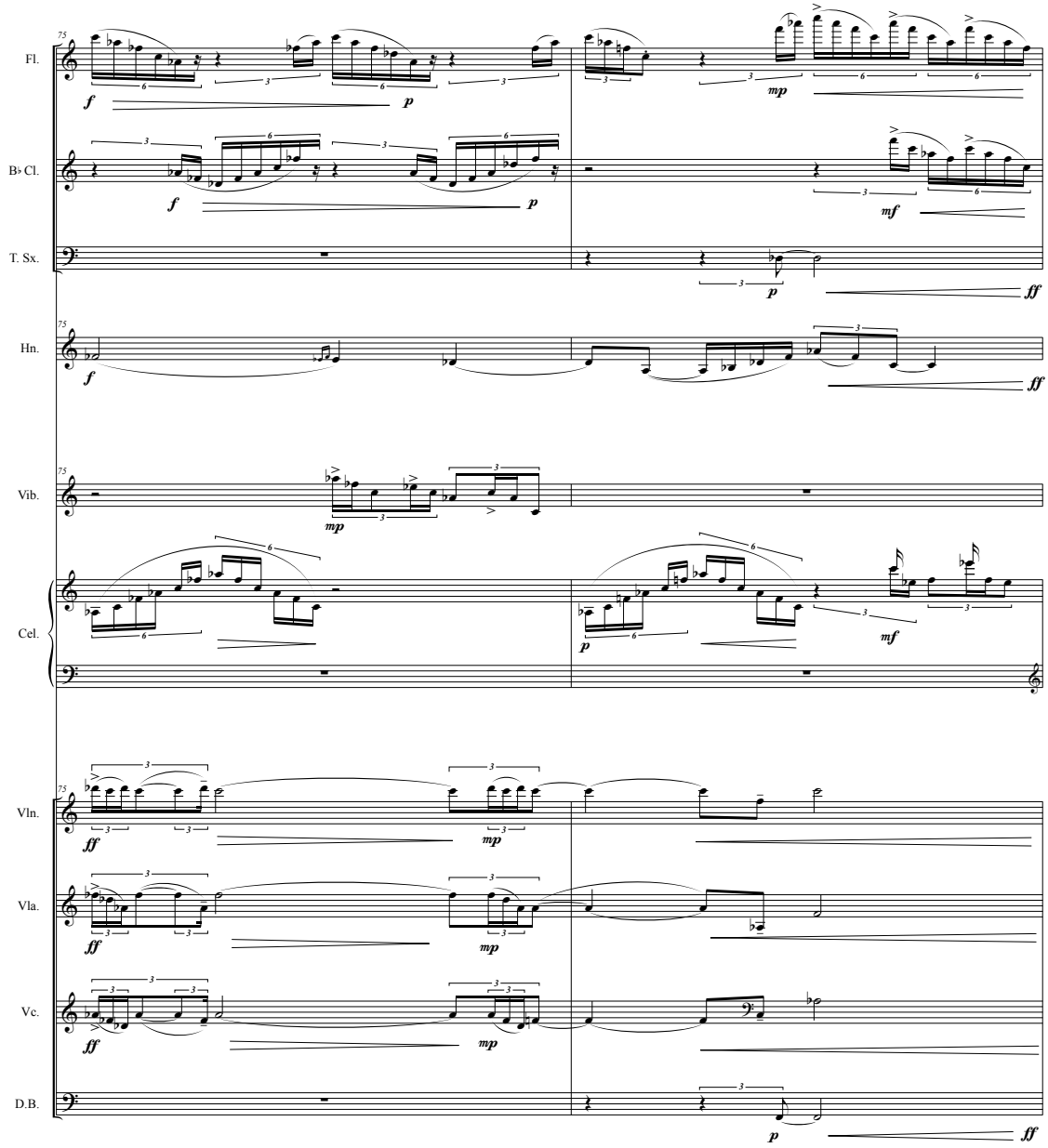

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Pno.
Vln.
Vla.
Vc.
D.B.
mp
pp
mf
p

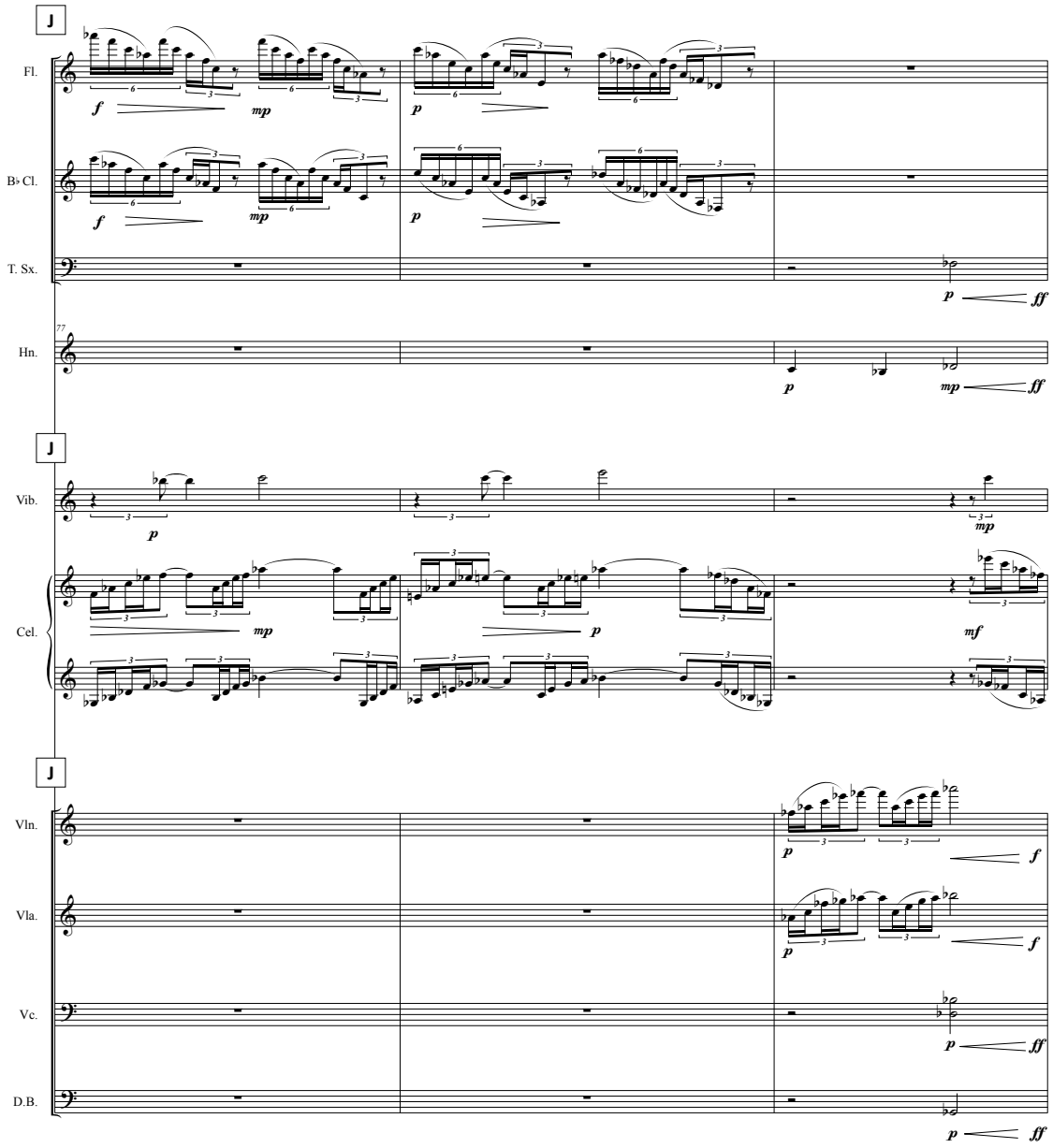

Fl.
B♭ Cl.
T. Sx.
Hn.
open
Vib.
Pno.
Vln.
Vla.
Vc.
D.B.

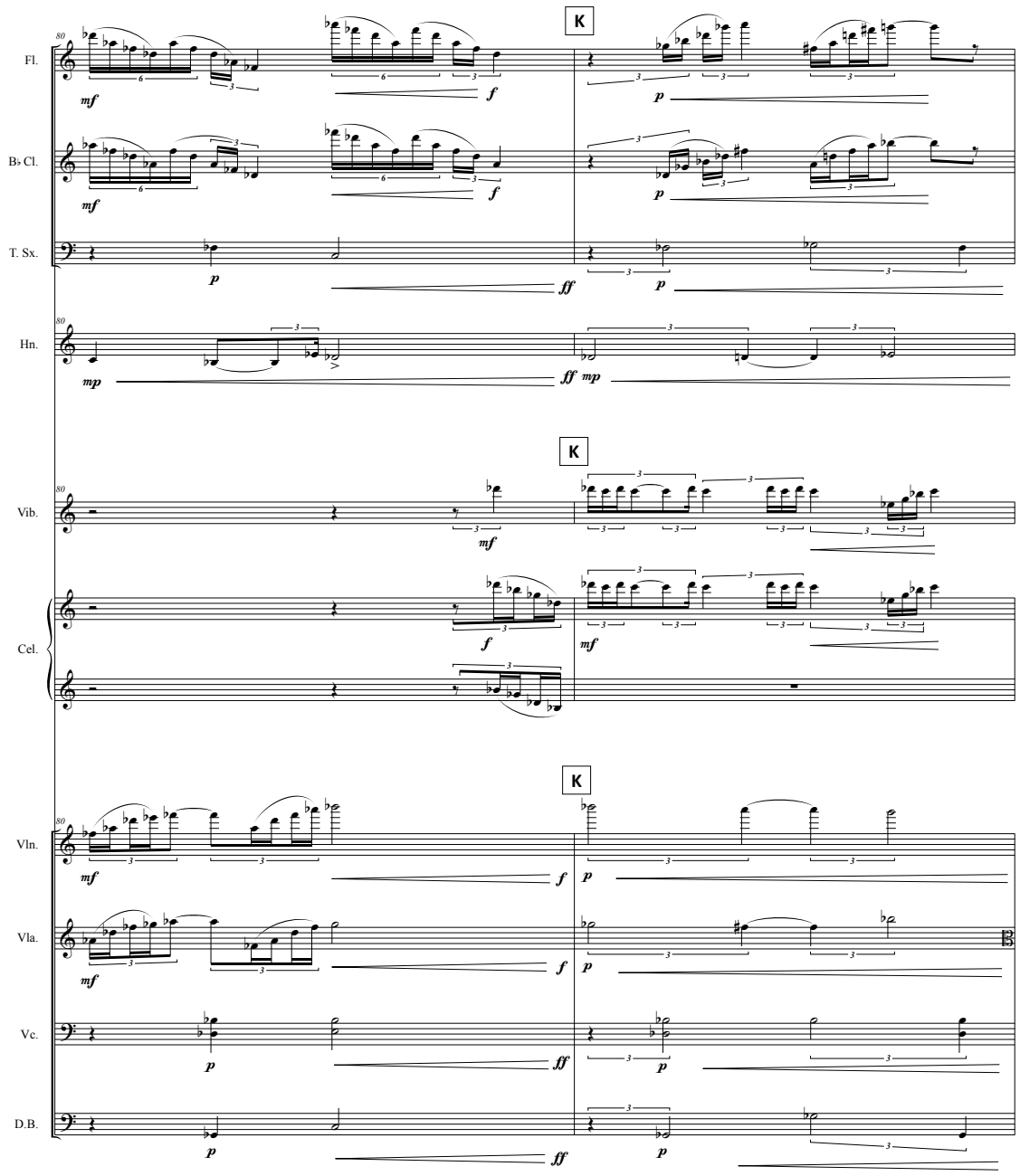

I
Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Celesta
Pno.
Vln.
Vla.
Vc.
D.B.

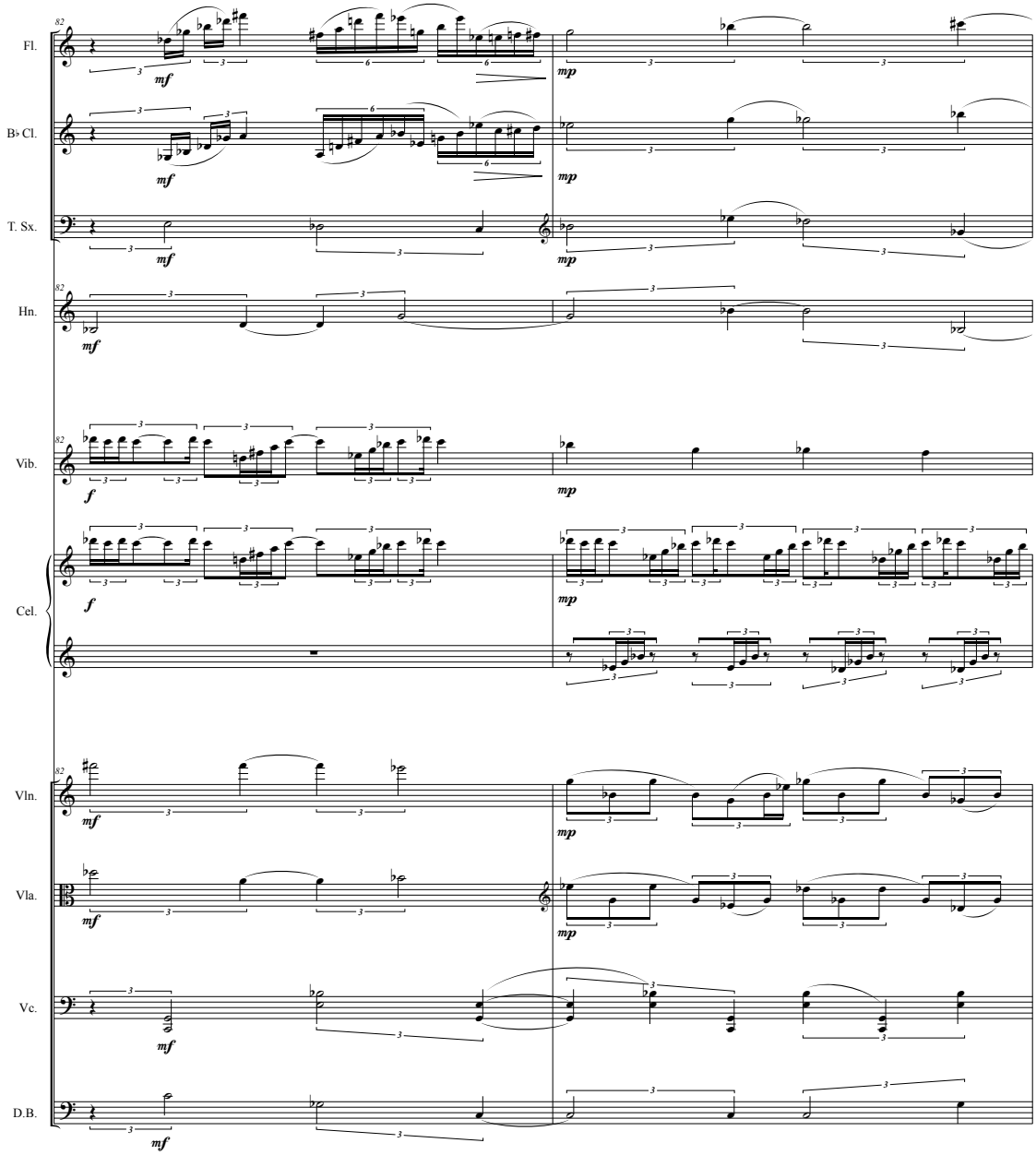

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
r.h.
Vln.
Vla.
Vc.
D.B.

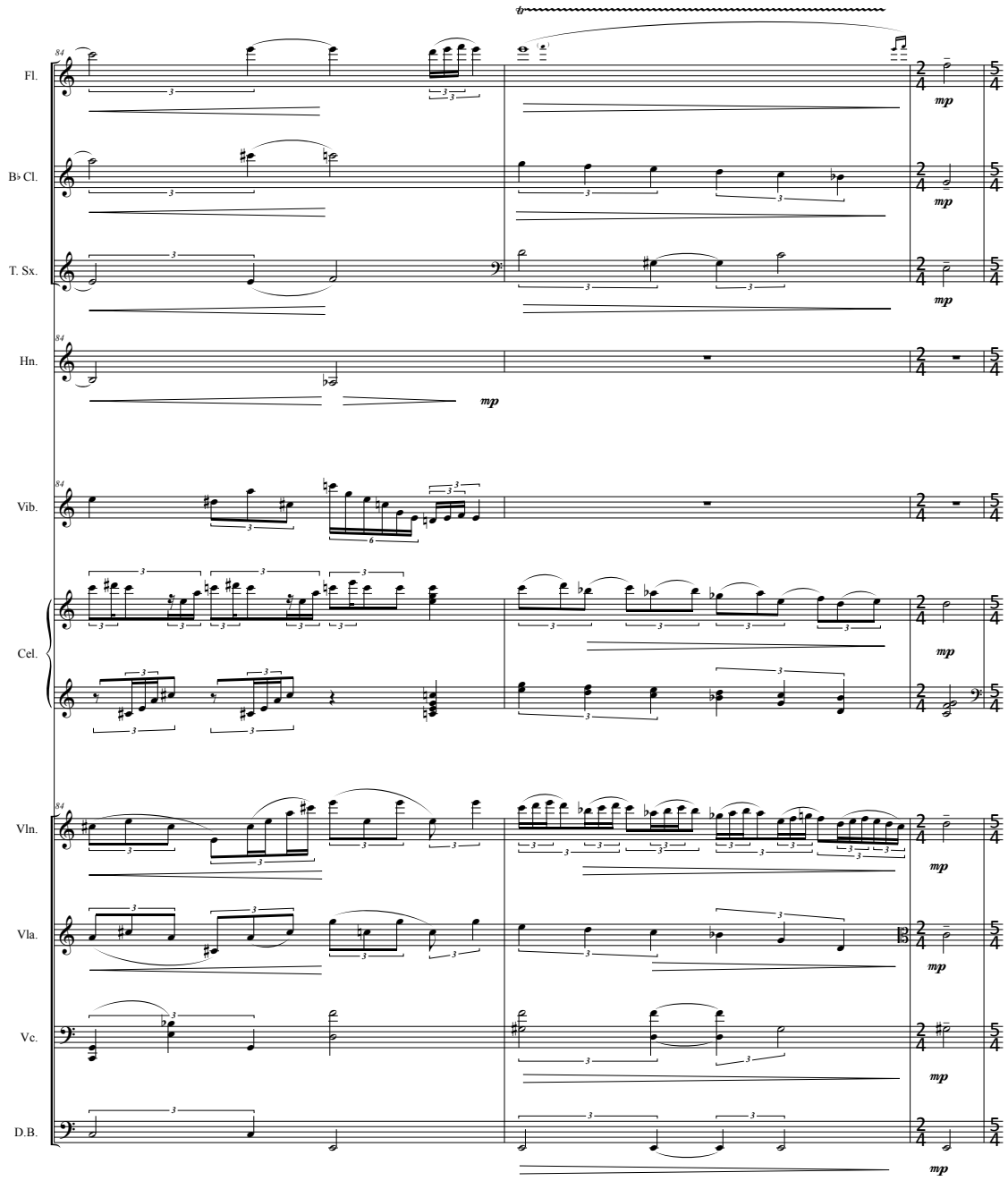

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.

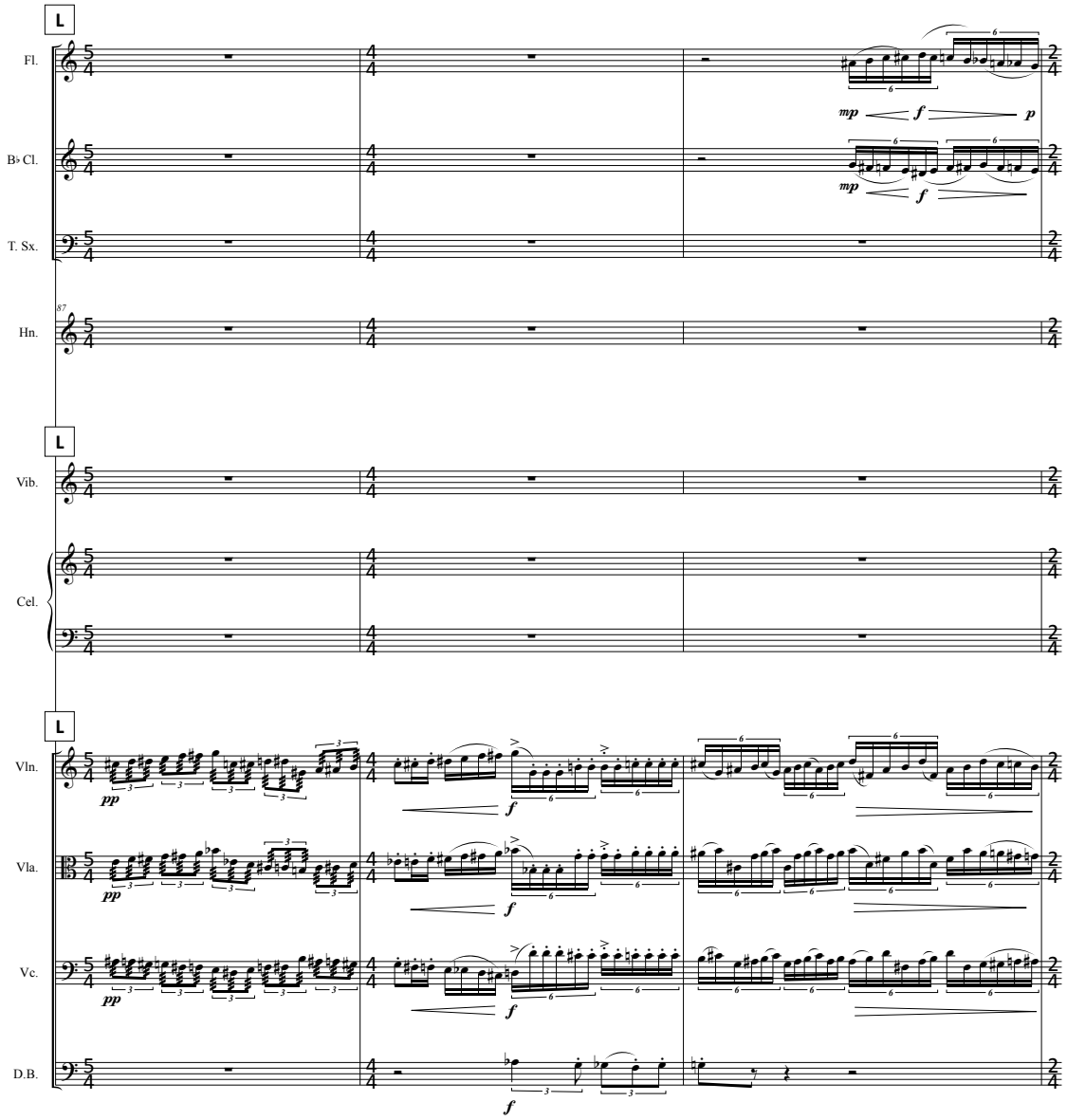

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.

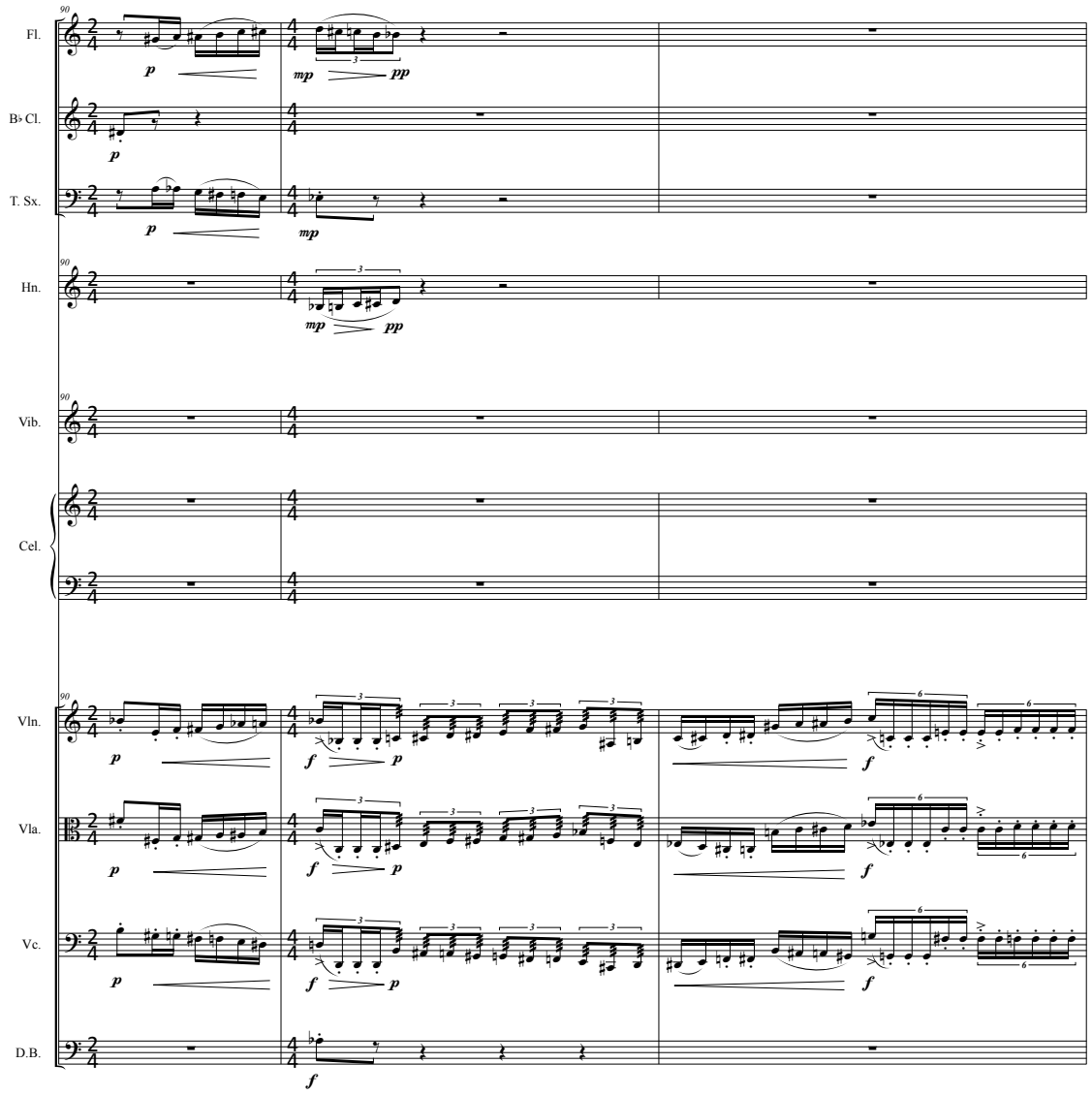

J
Fl.
B♭ Cl.
T. Sx.
77
Hn.
J
Vib.
Cel.
J
Vln.
Vla.
Vc.
D.B.

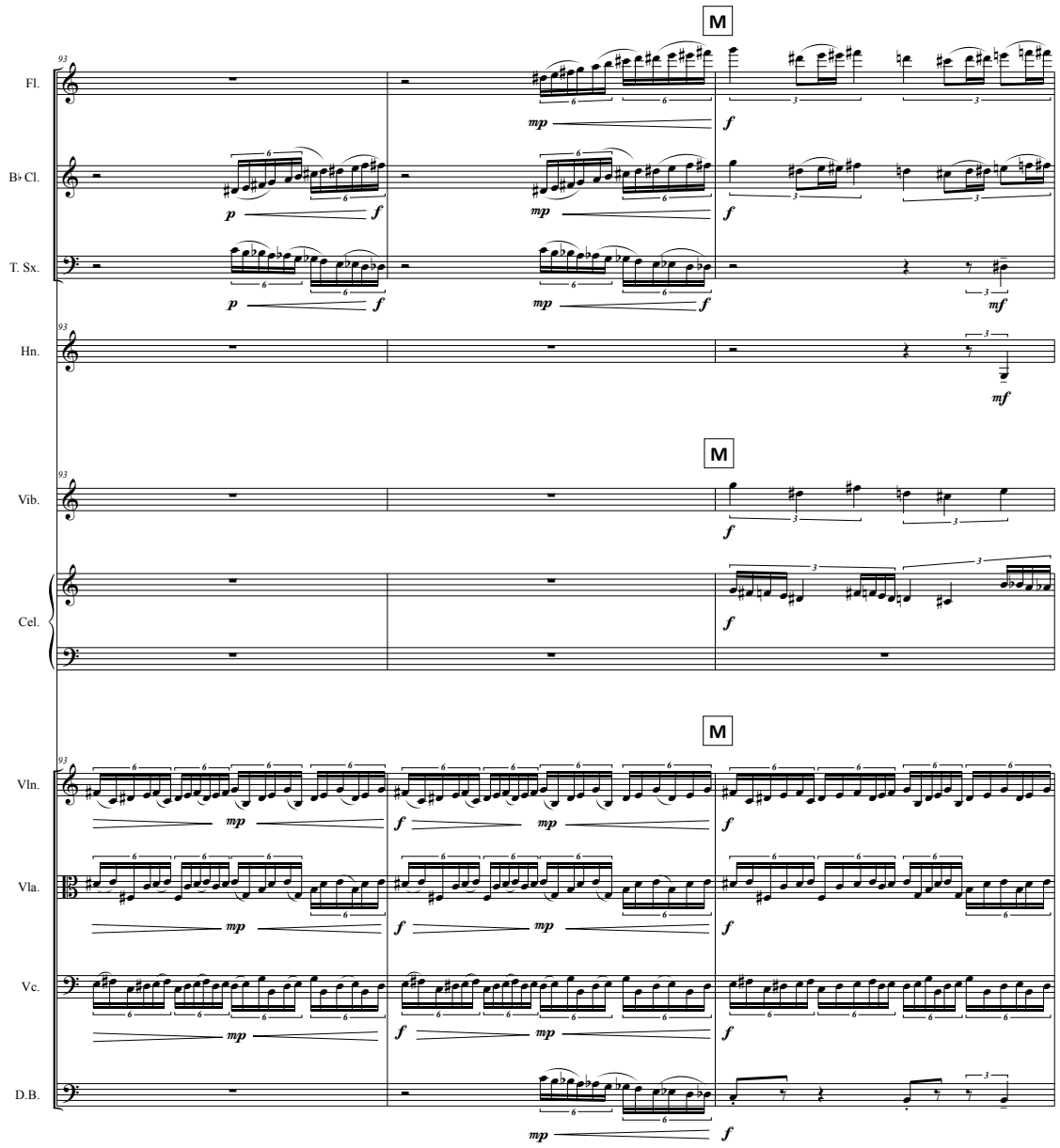

K
Fl.
B♭ Cl.
T. Sx.
Hn.
K
Vib.
Cel.
K
Vln.
Vla.
Vc.
D.B.

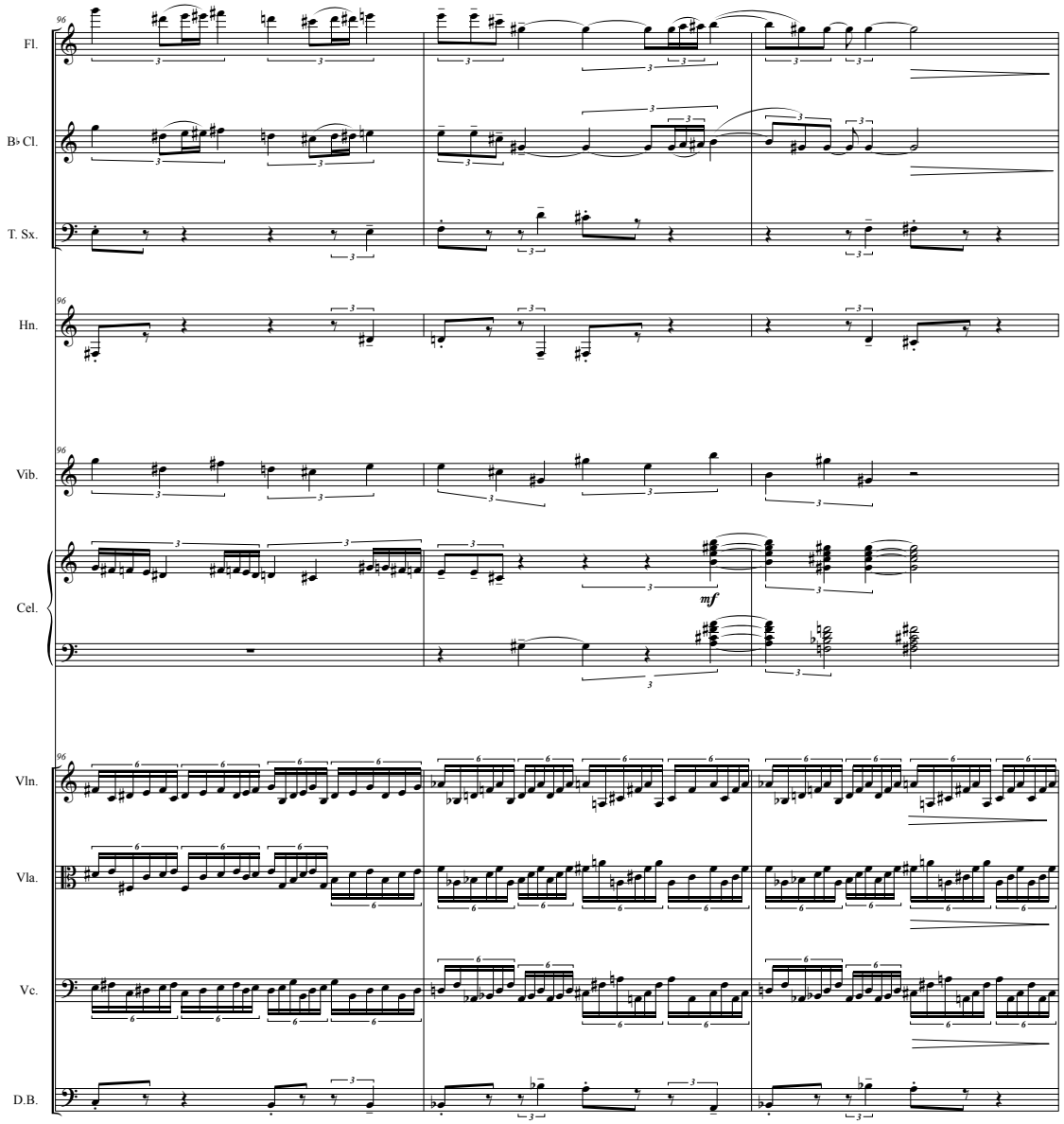

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
82
mf
mp
f

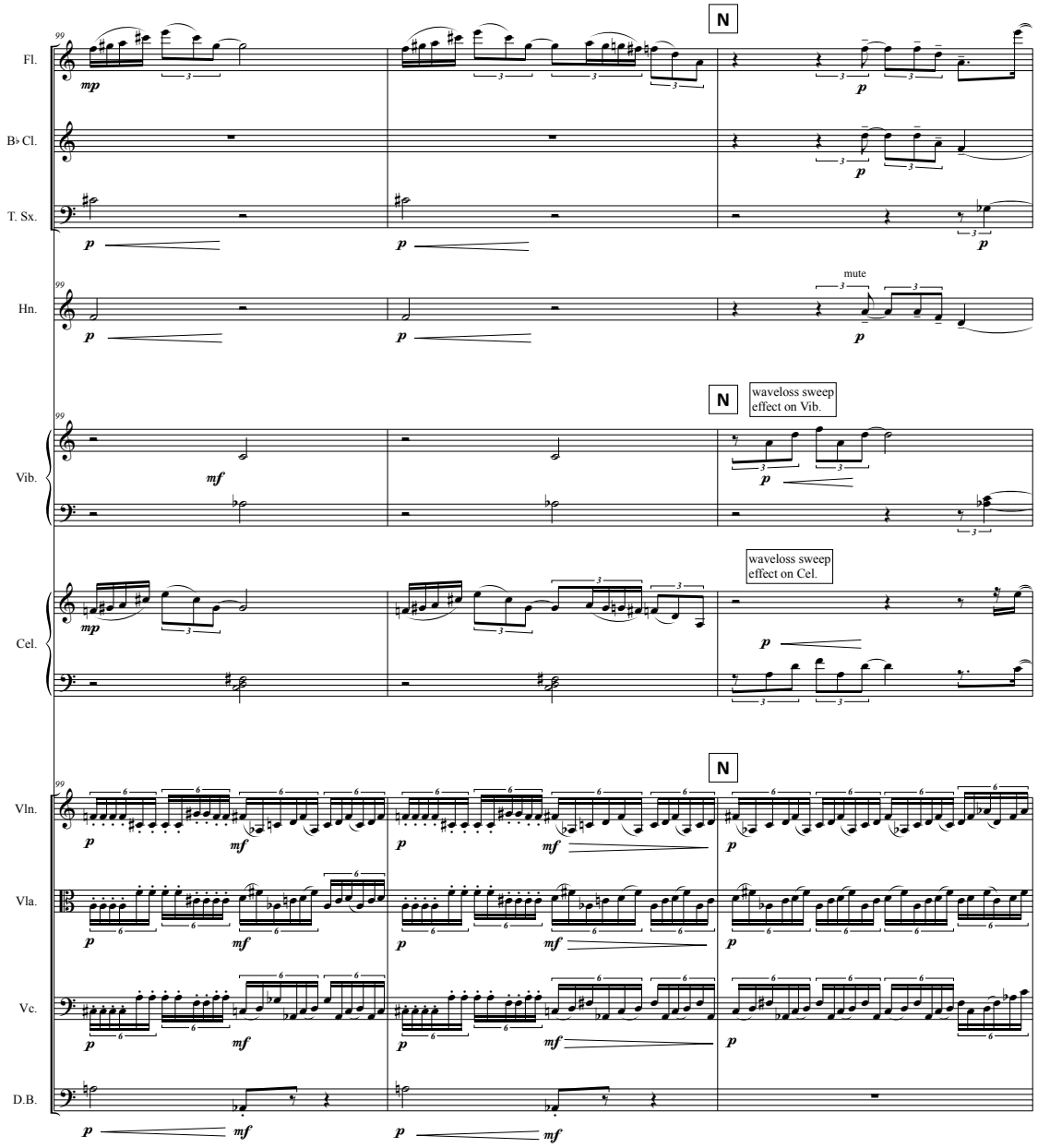

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
mp

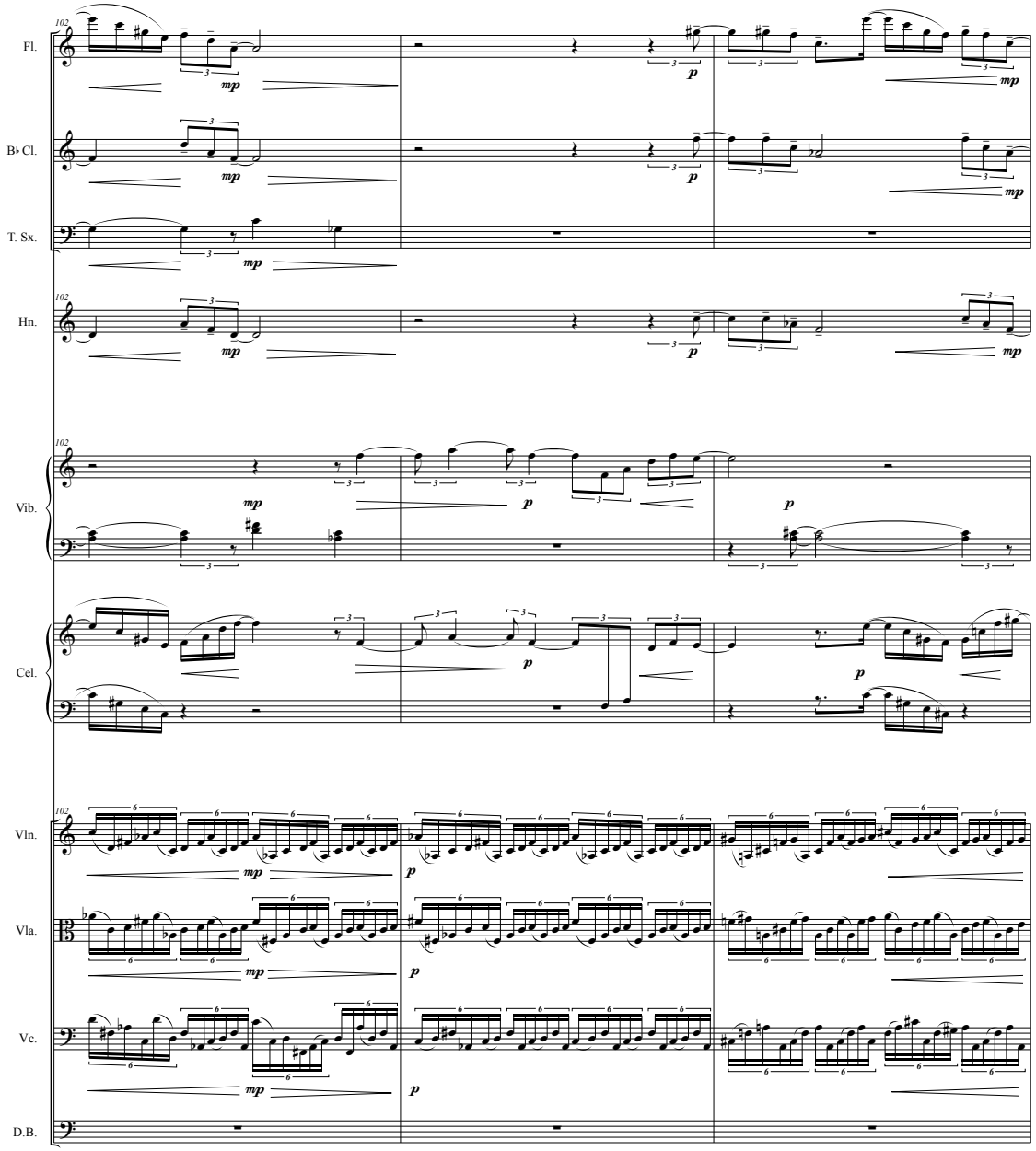

L
Fl.
B♭ Cl.
T. Sx.
87
Hn.
L
Vib.
Cel.
L
Vln.
Vla.
Vc.
D.B.
mp
f
p
pp

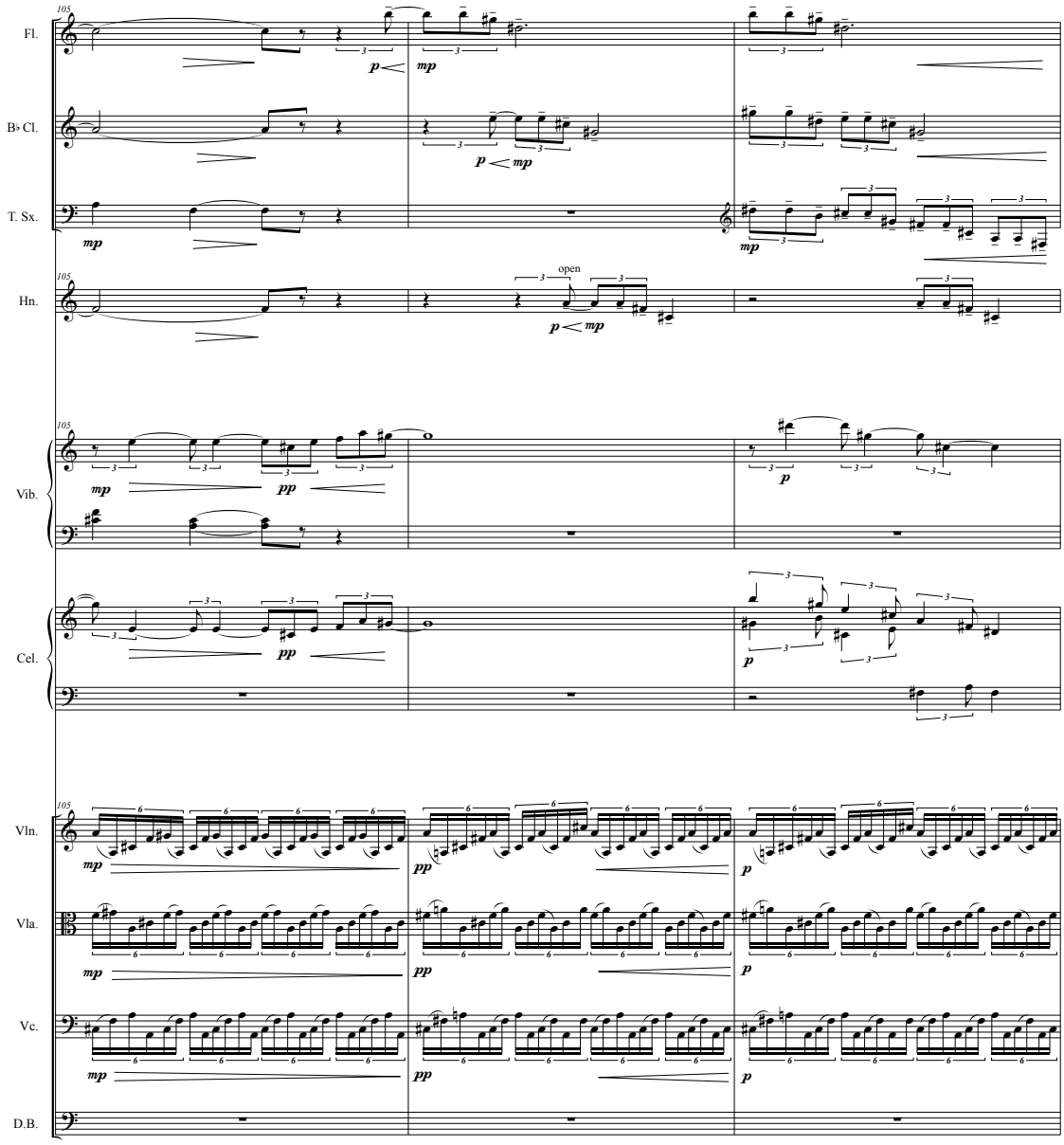

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.

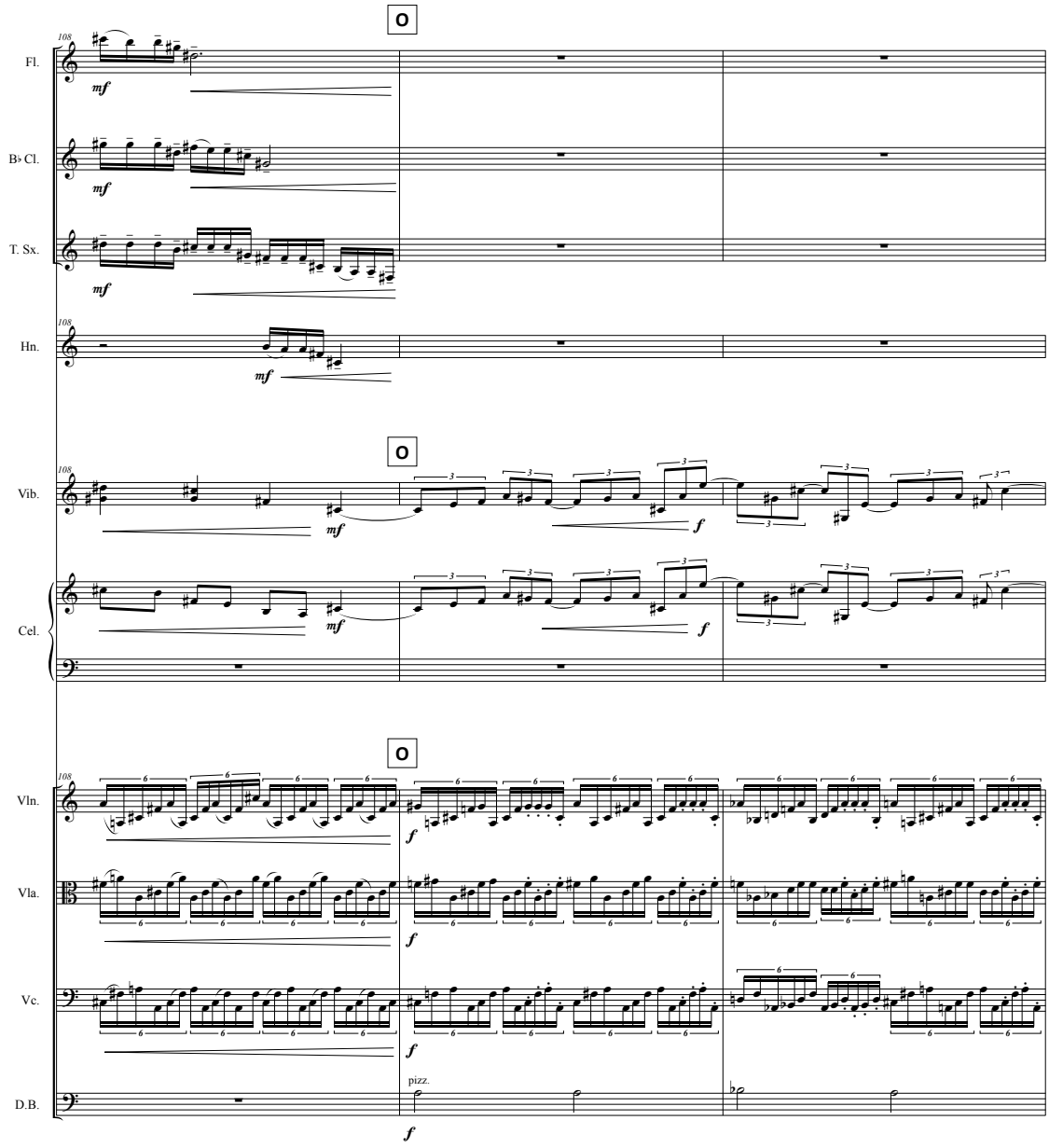

M
Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
93
p
mp
f
mf

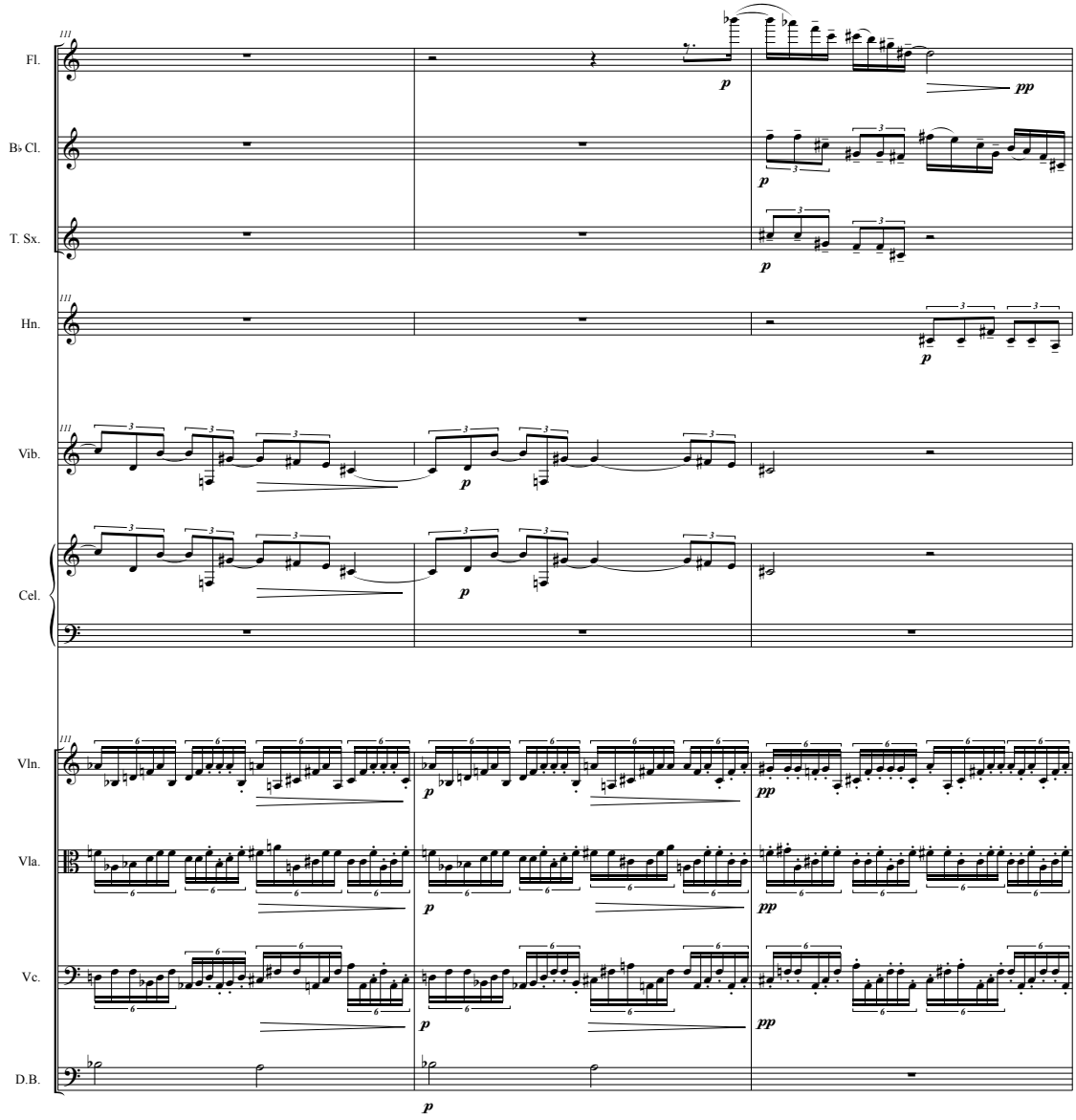

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
mf

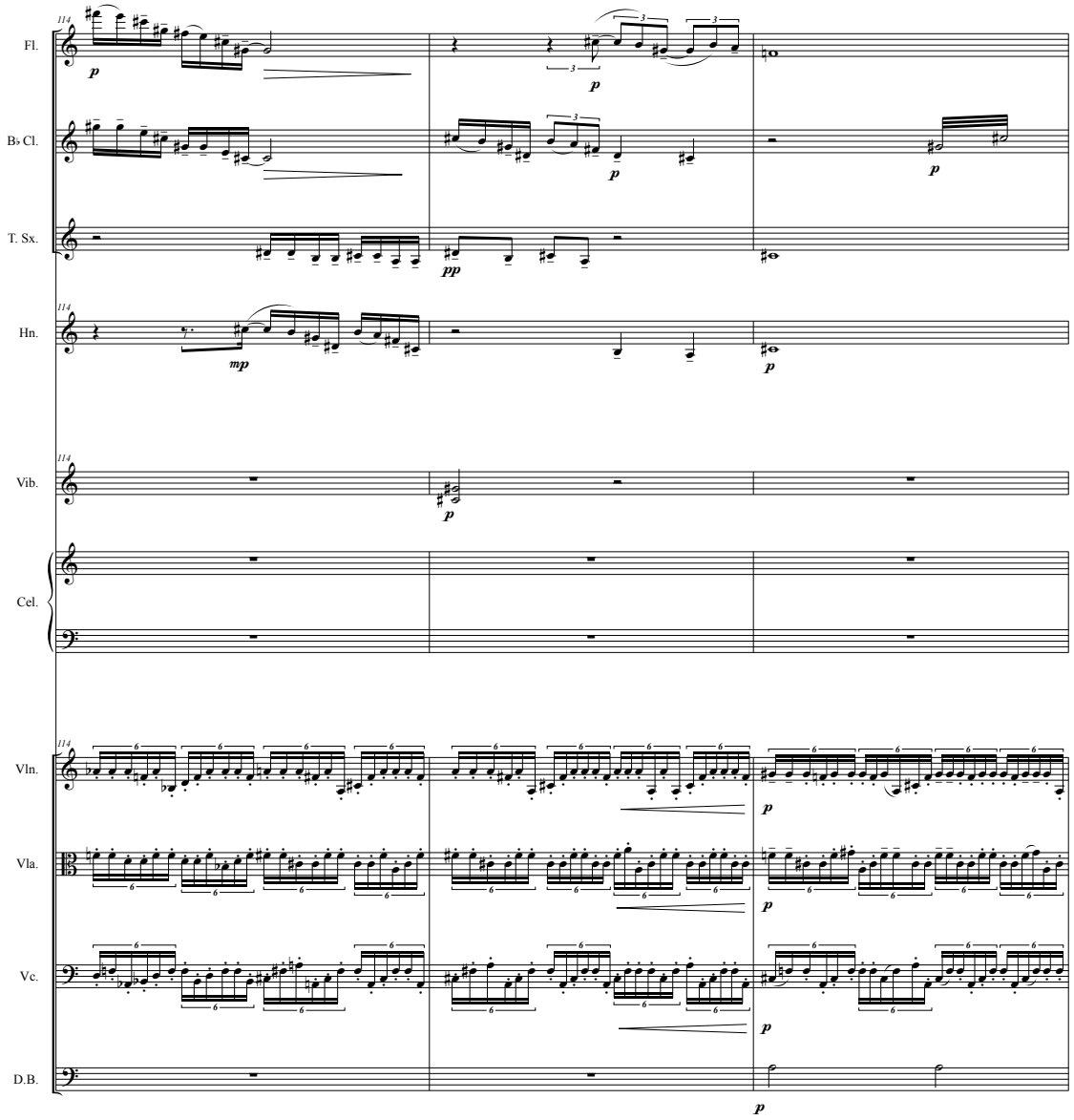

N
Fl.
B♭ Cl.
T. Sx.
mute
Hn.
N
waveloss sweep effect on Vib.
Vib.
waveloss sweep effect on Cel.
Cel.
N
Vln.
Vla.
Vc.
D.B.

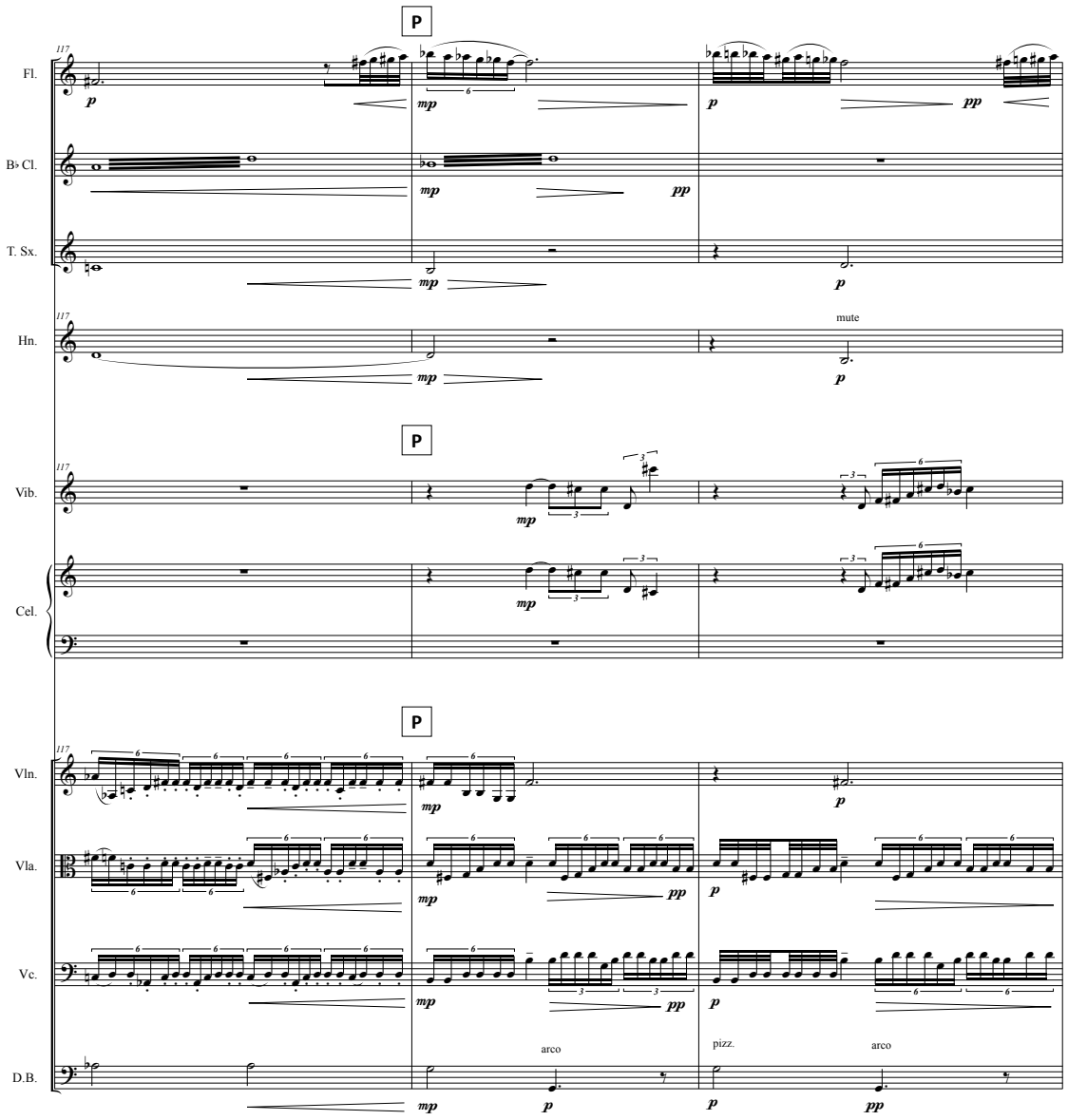

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
102
mp
p

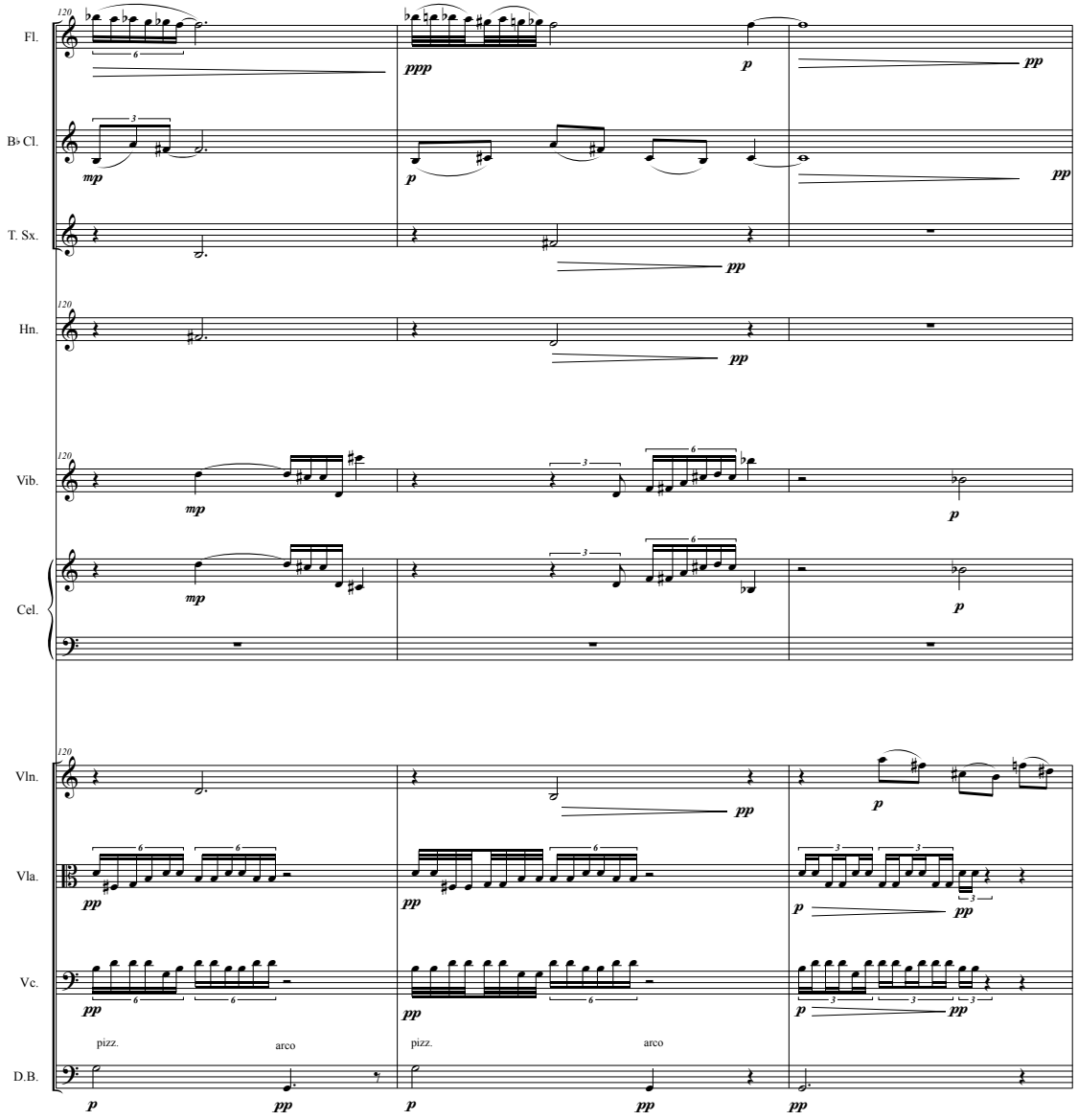

105
Fl.
B♭ Cl.
T. Sx.
Hn.
open
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
mp
p
pp

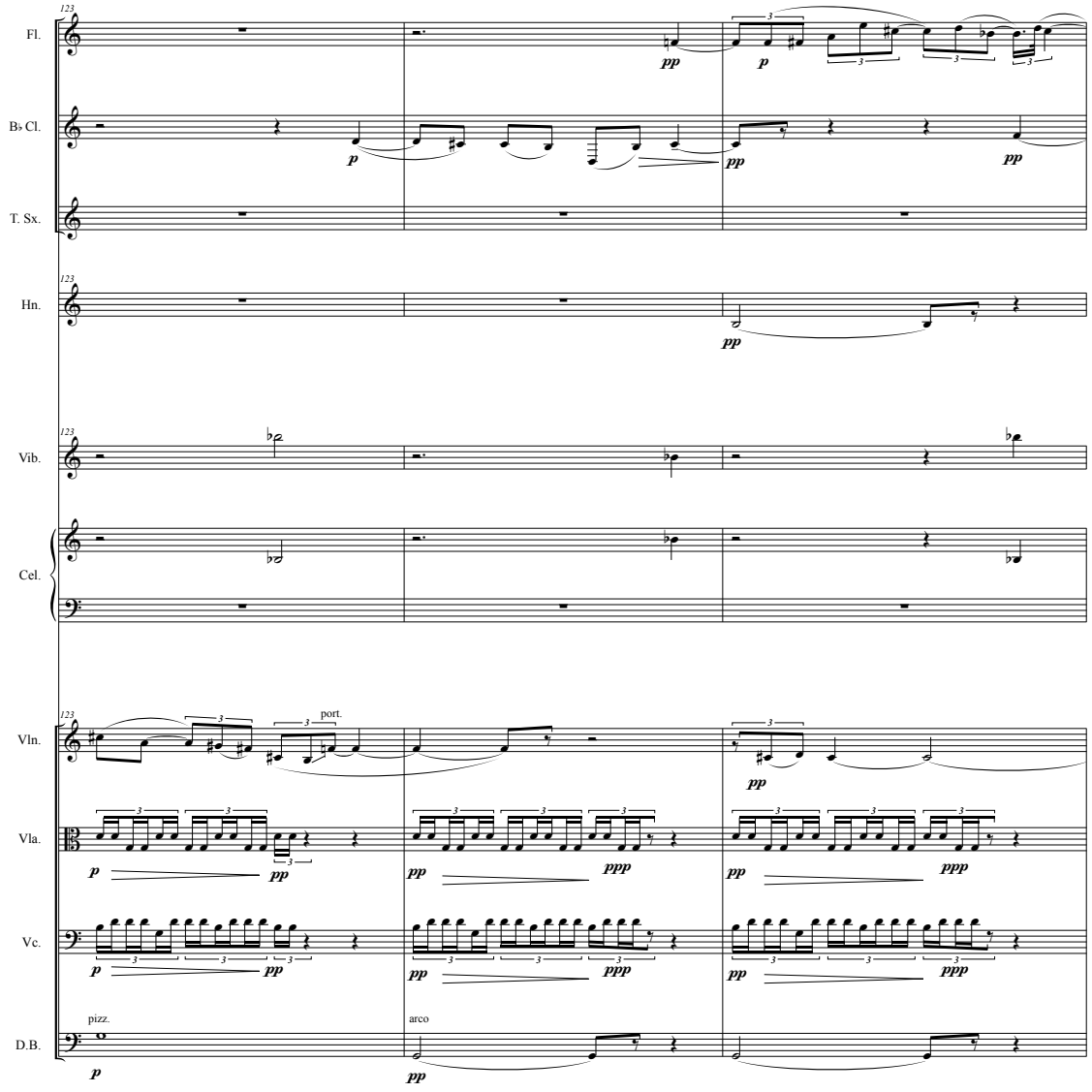

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
pizz.

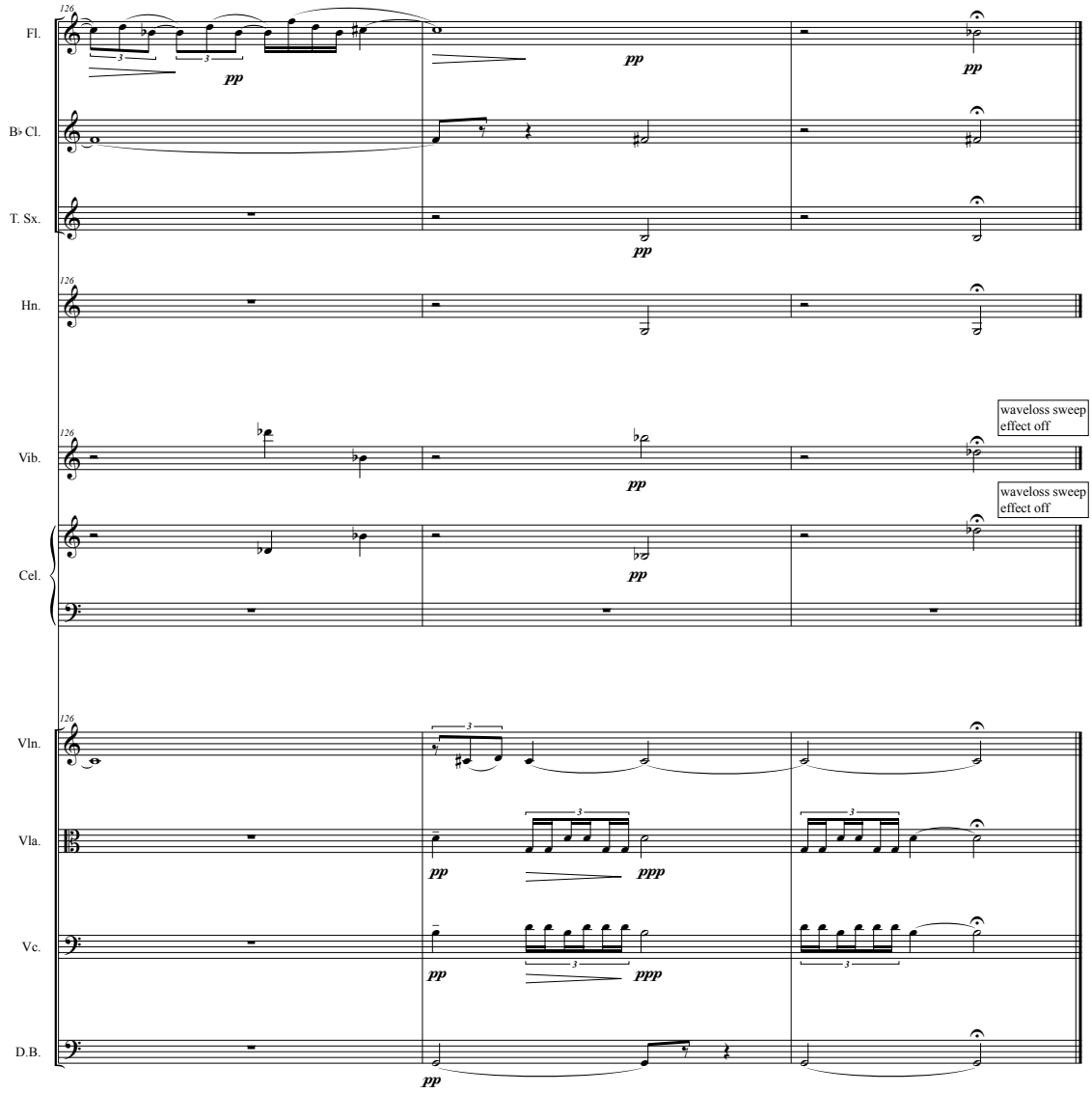

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.


Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.


P
Fl.
B♭ Cl.
T. Sx.
Hn.
mute
P
Vib.
Cel.
P
Vln.
Vla.
Vc.
D.B.
arco
pizz.
arco


Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
120
pizz.
arco
pizz.
arco

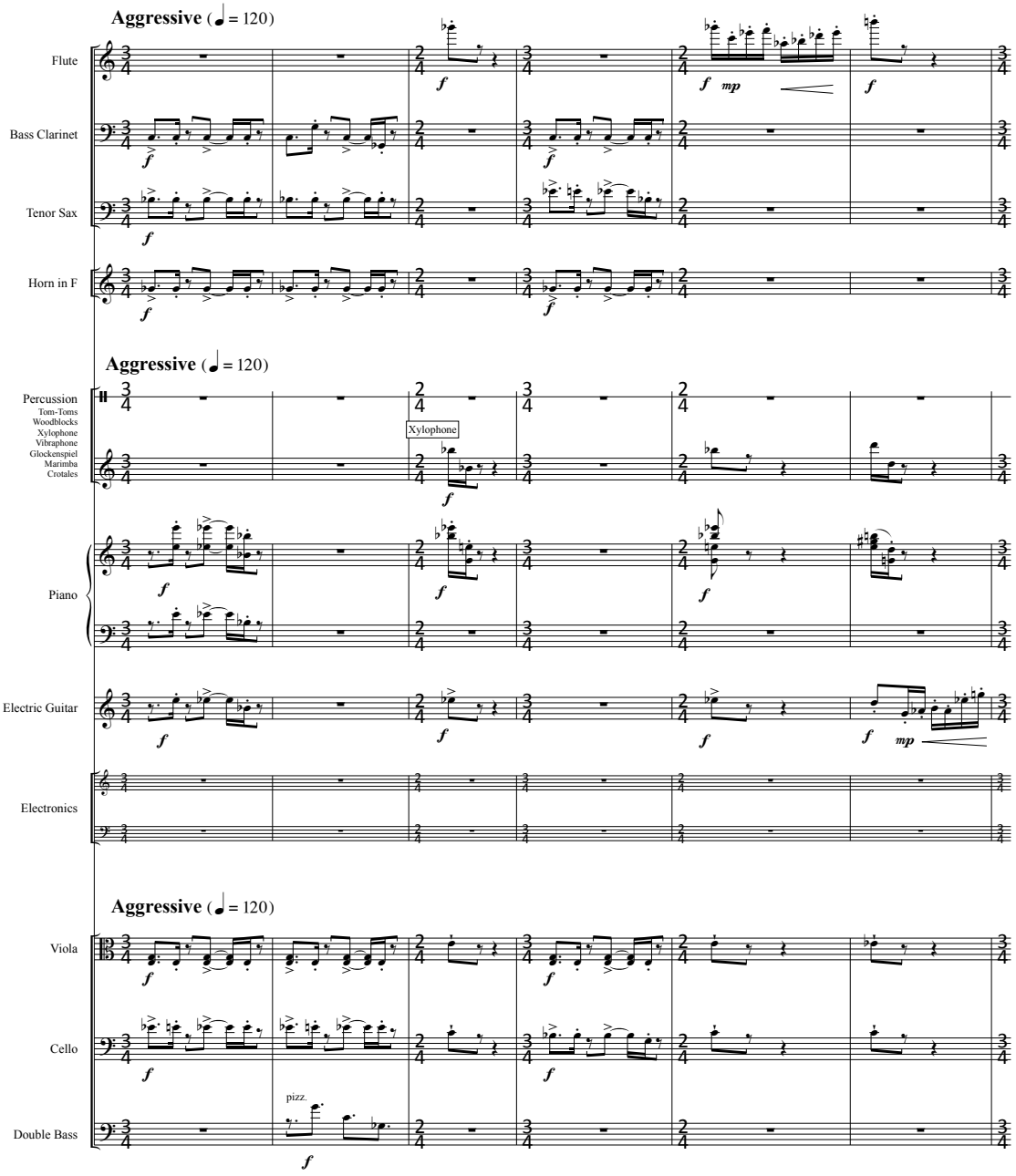

Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
port.
pizz.
arco

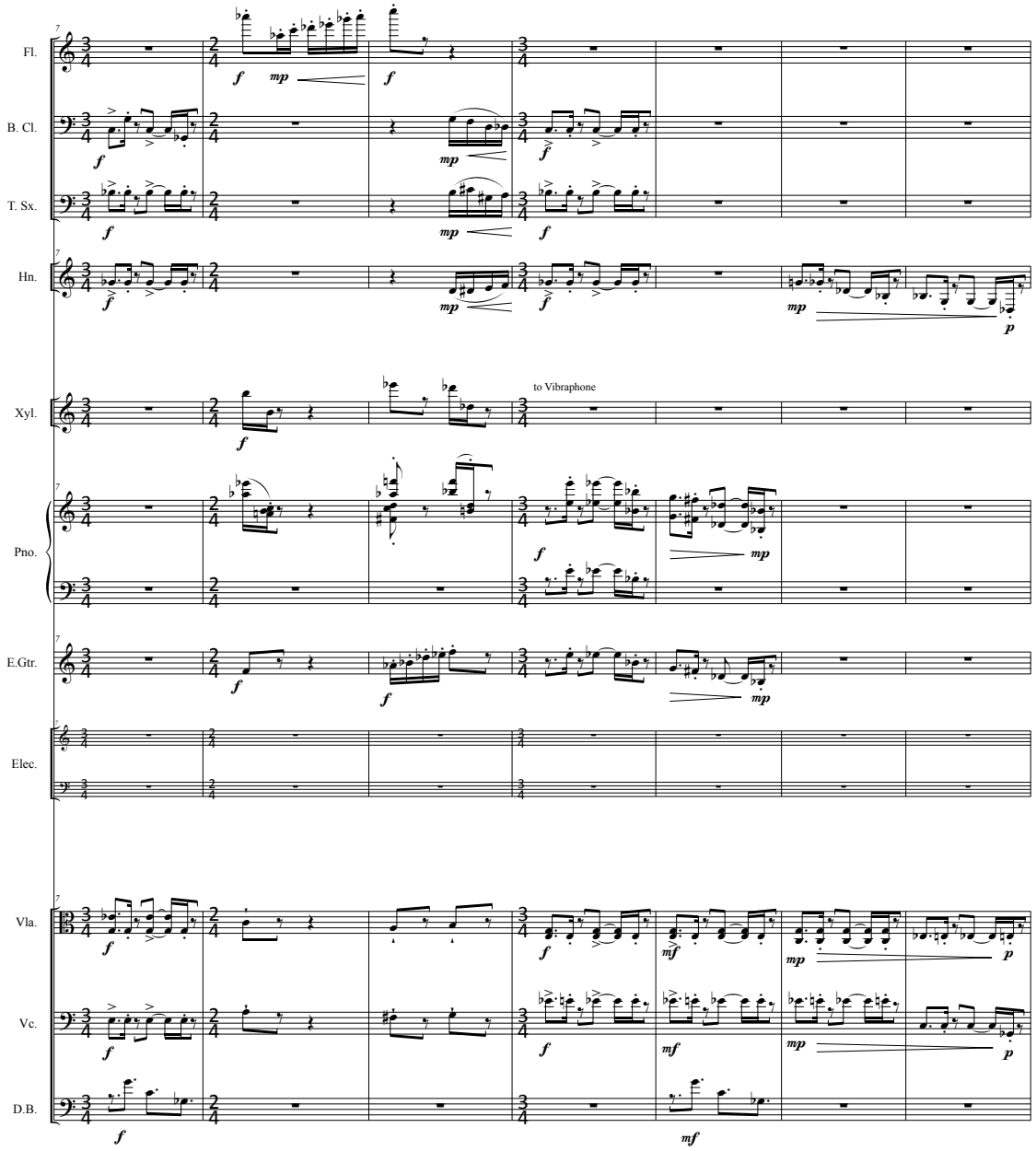

126
Fl.
B♭ Cl.
T. Sx.
Hn.
Vib.
Cel.
Vln.
Vla.
Vc.
D.B.
pp
ppp
waveloss sweep effect off
waveloss sweep effect off

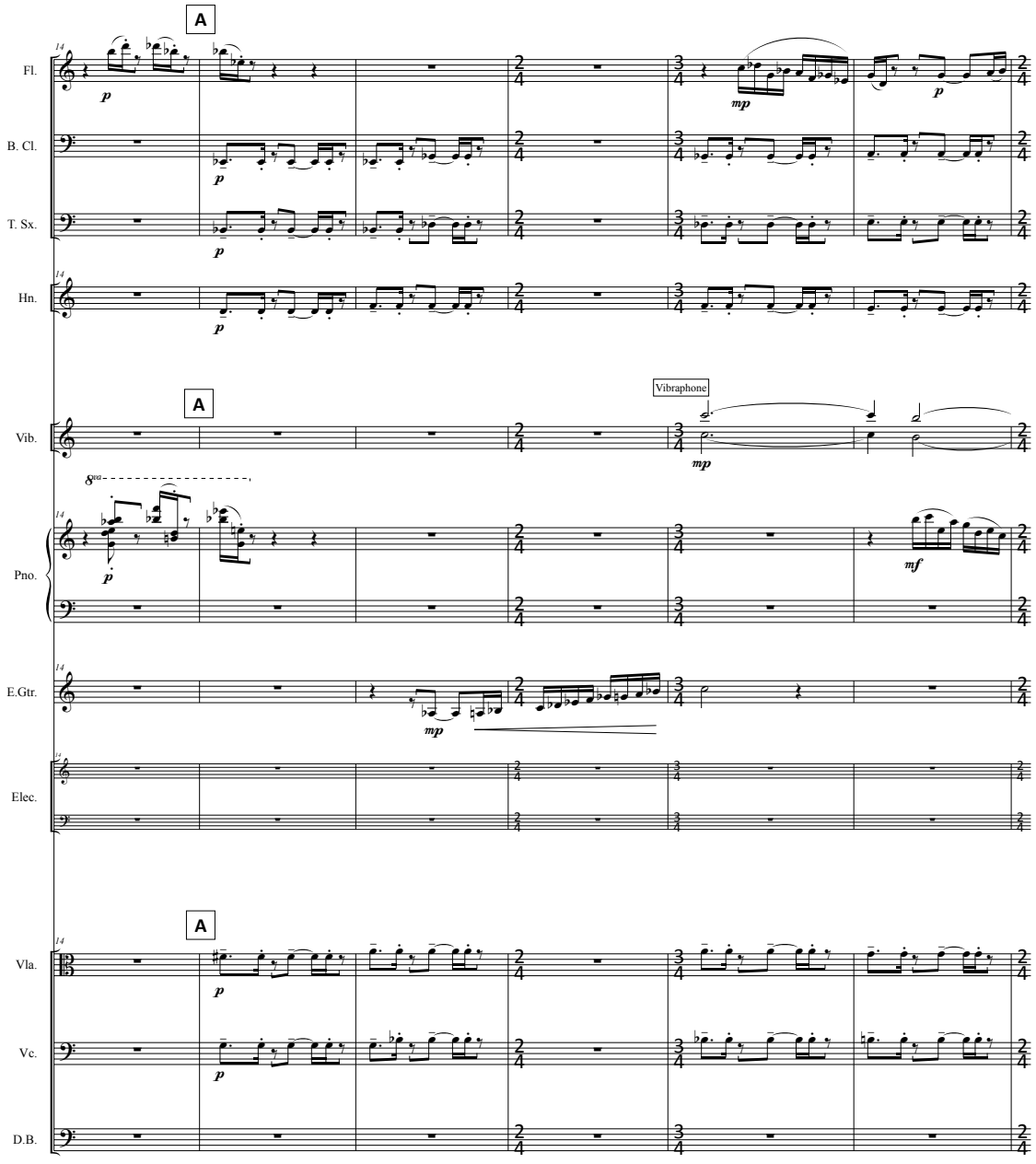
V. Eat the Damage

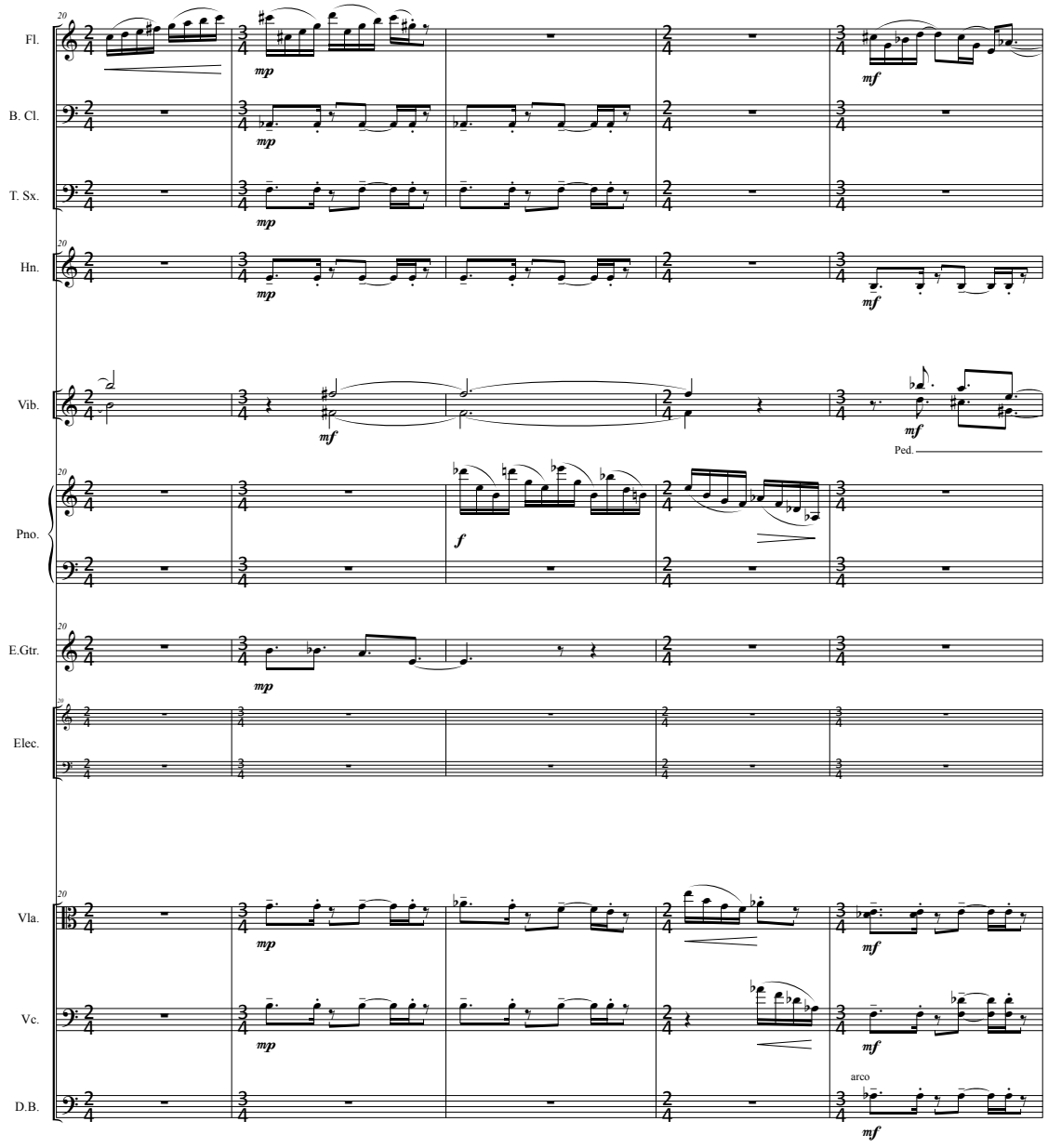
Score in C

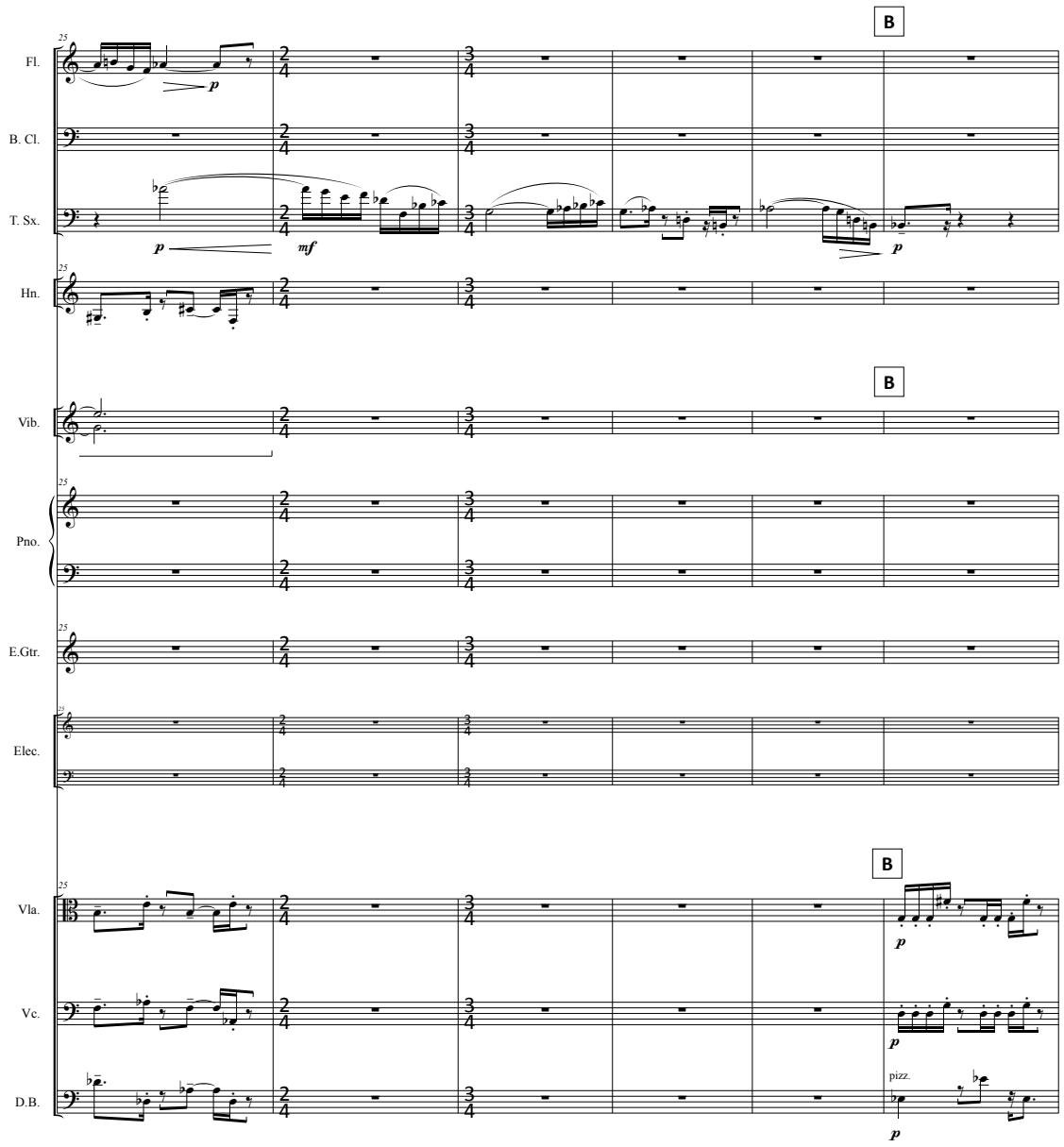
Jamie Keesecker

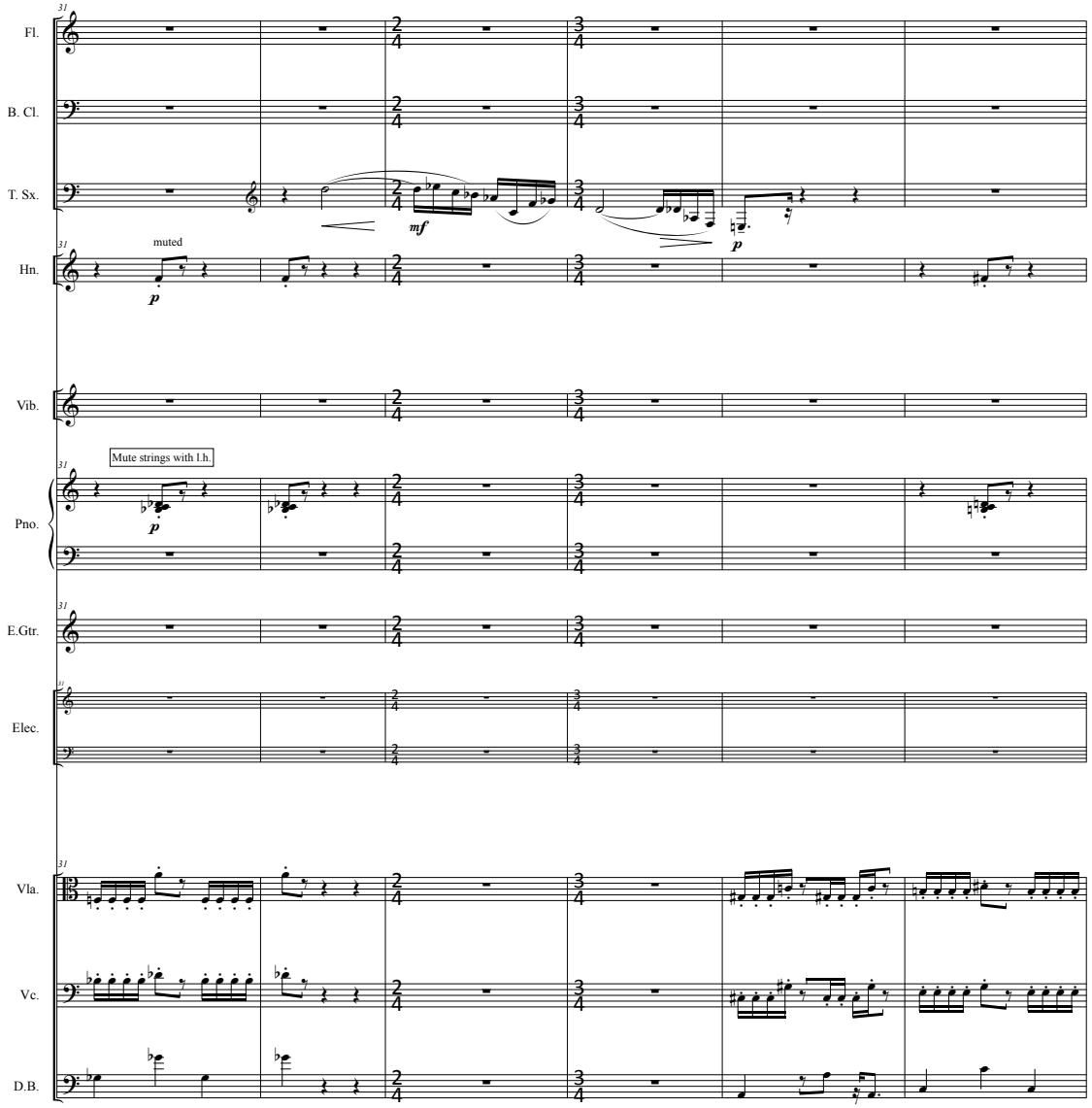


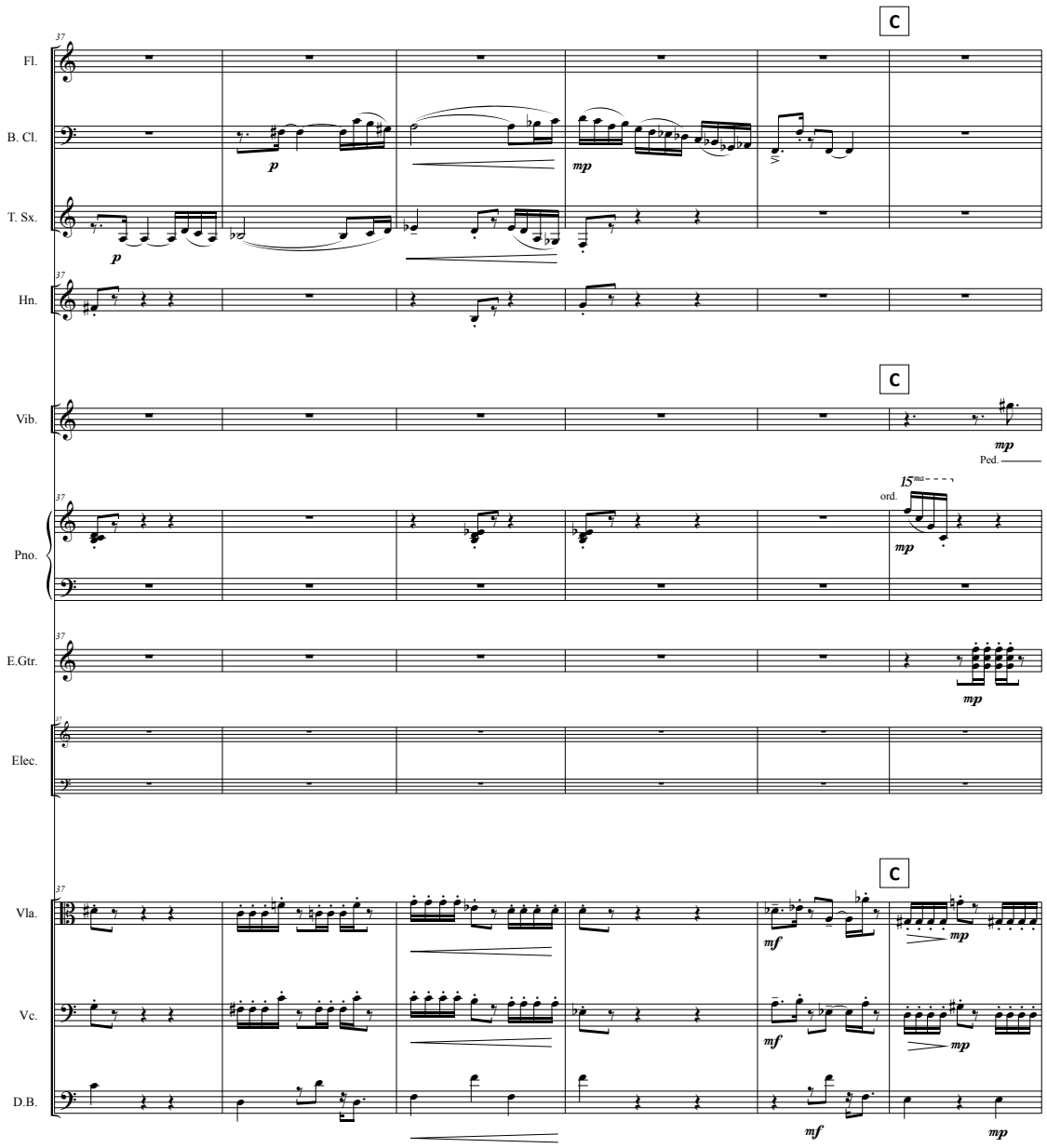

Fl.
B. Cl.
T. Sx.
Hn.
Xyl.
to Vibraphone
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

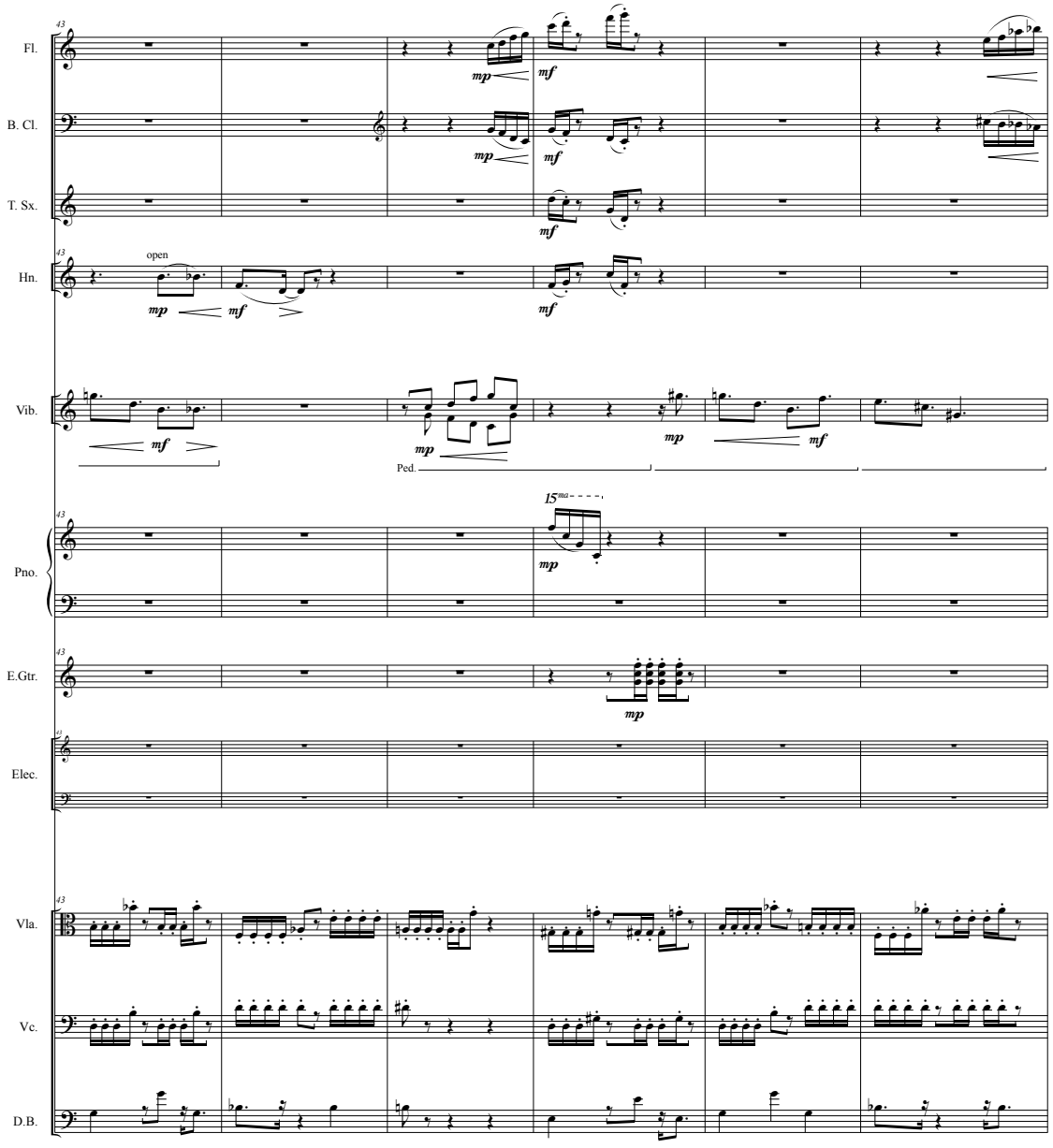

A
Fl.
B. Cl.
T. Sx.
Hn.
A
Vibraphone
Vib.
Pno.
E.Gtr.
Elec.
A
Vla.
Vc.
D.B.

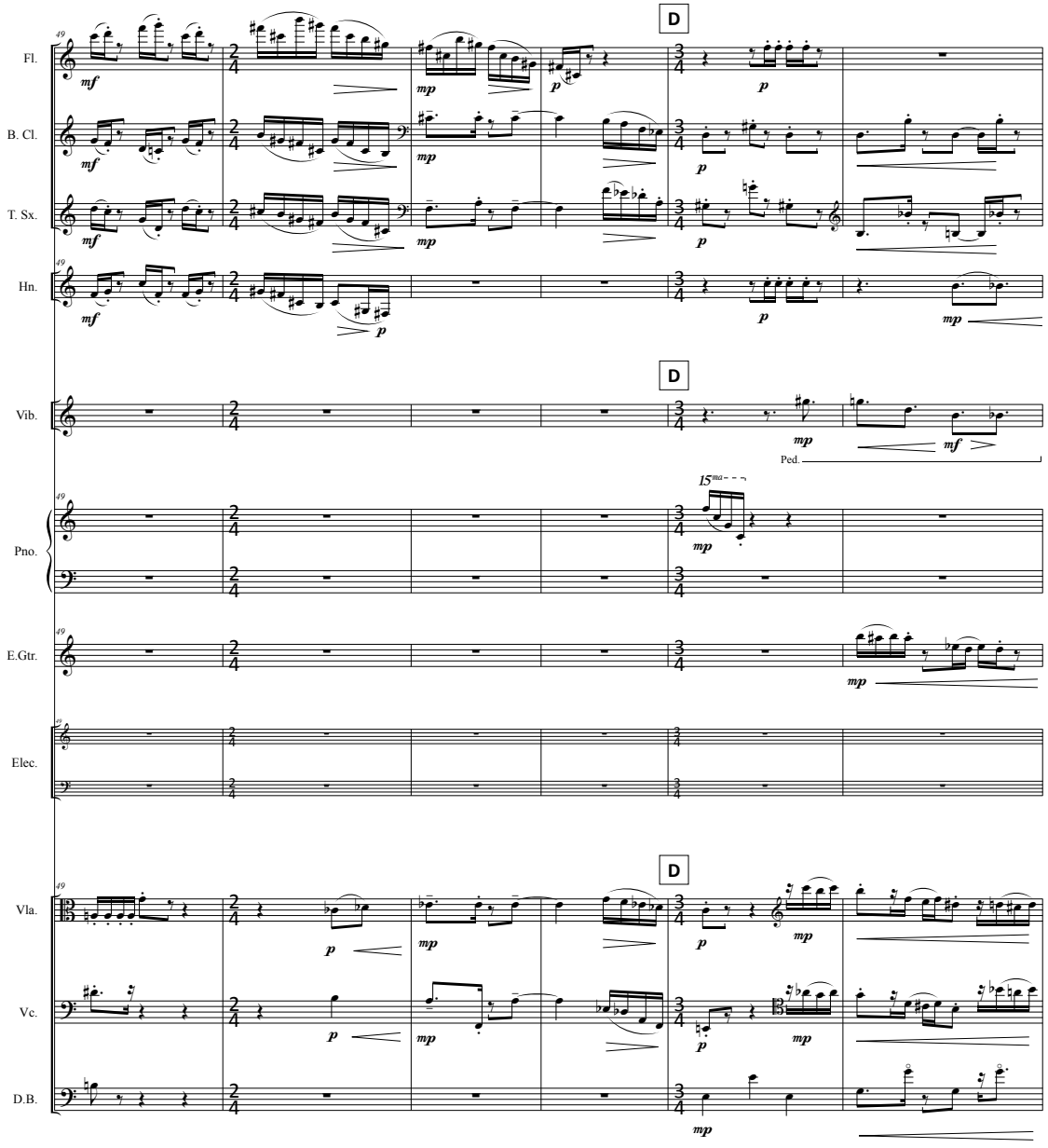

Fl.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
mp
mf
f
Ped.
arco

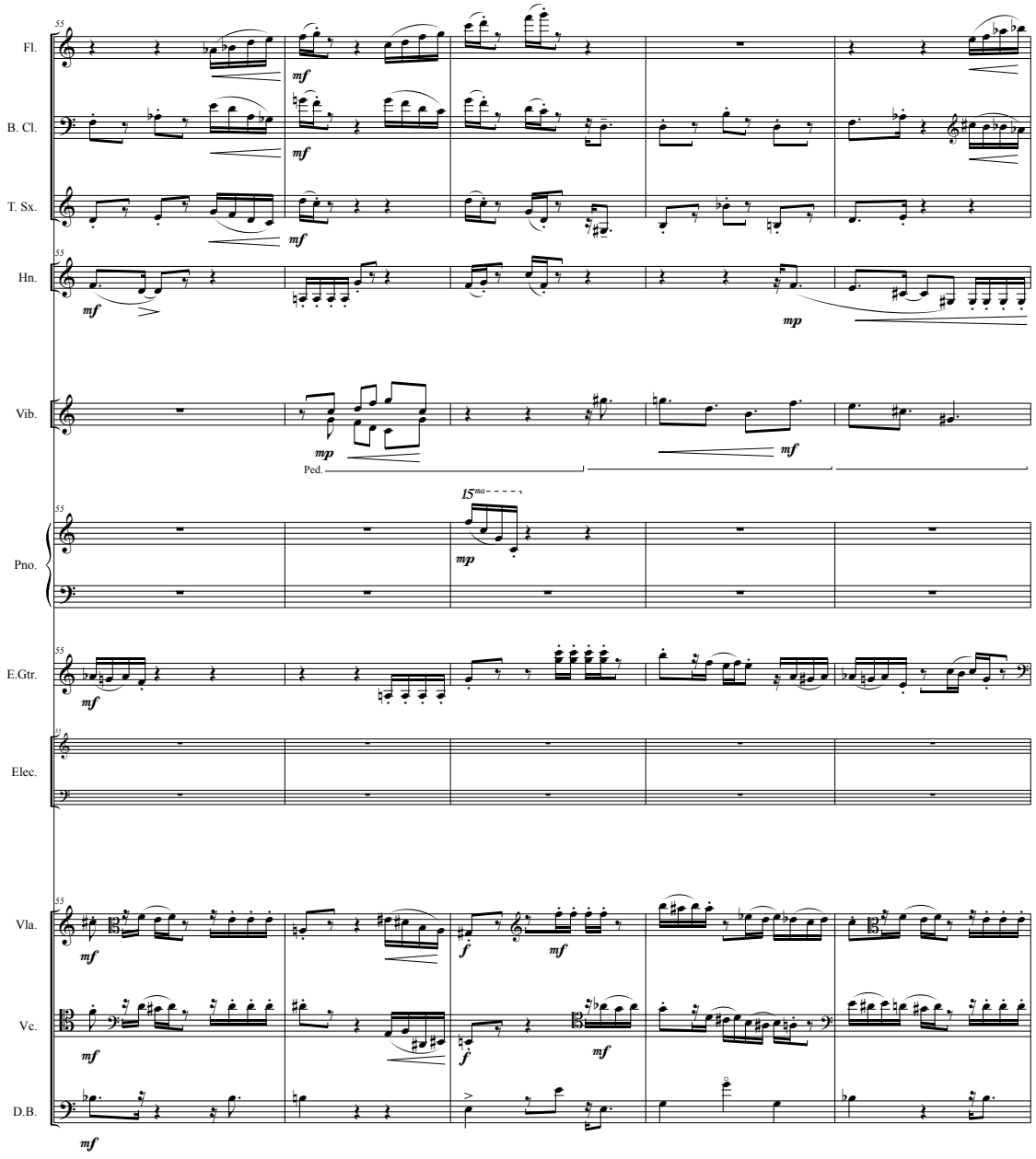

B
Fl.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
pizz.

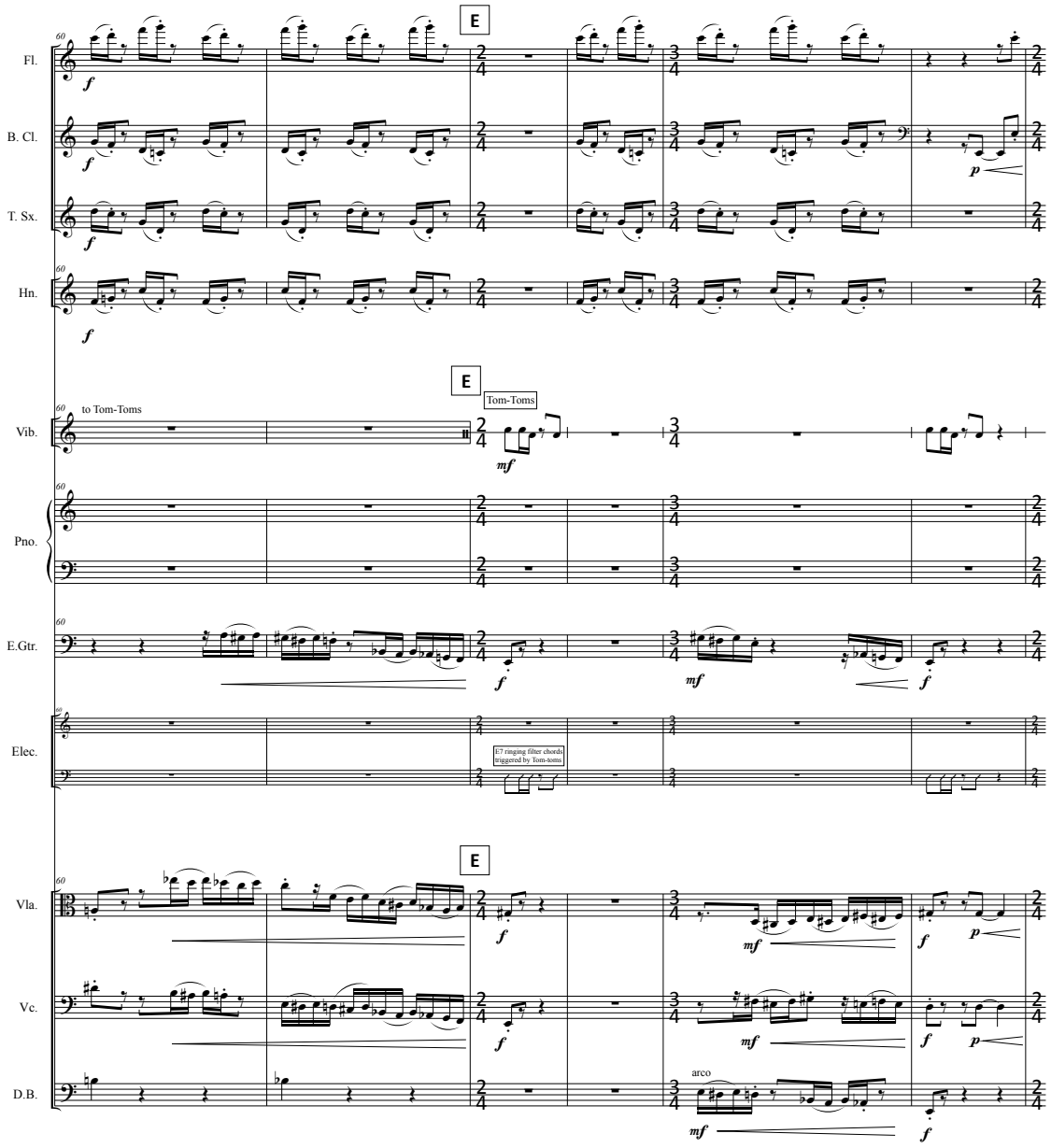

Fl.
B. Cl.
T. Sx.
Hn.
muted
Vib.
Mute strings with l.h.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

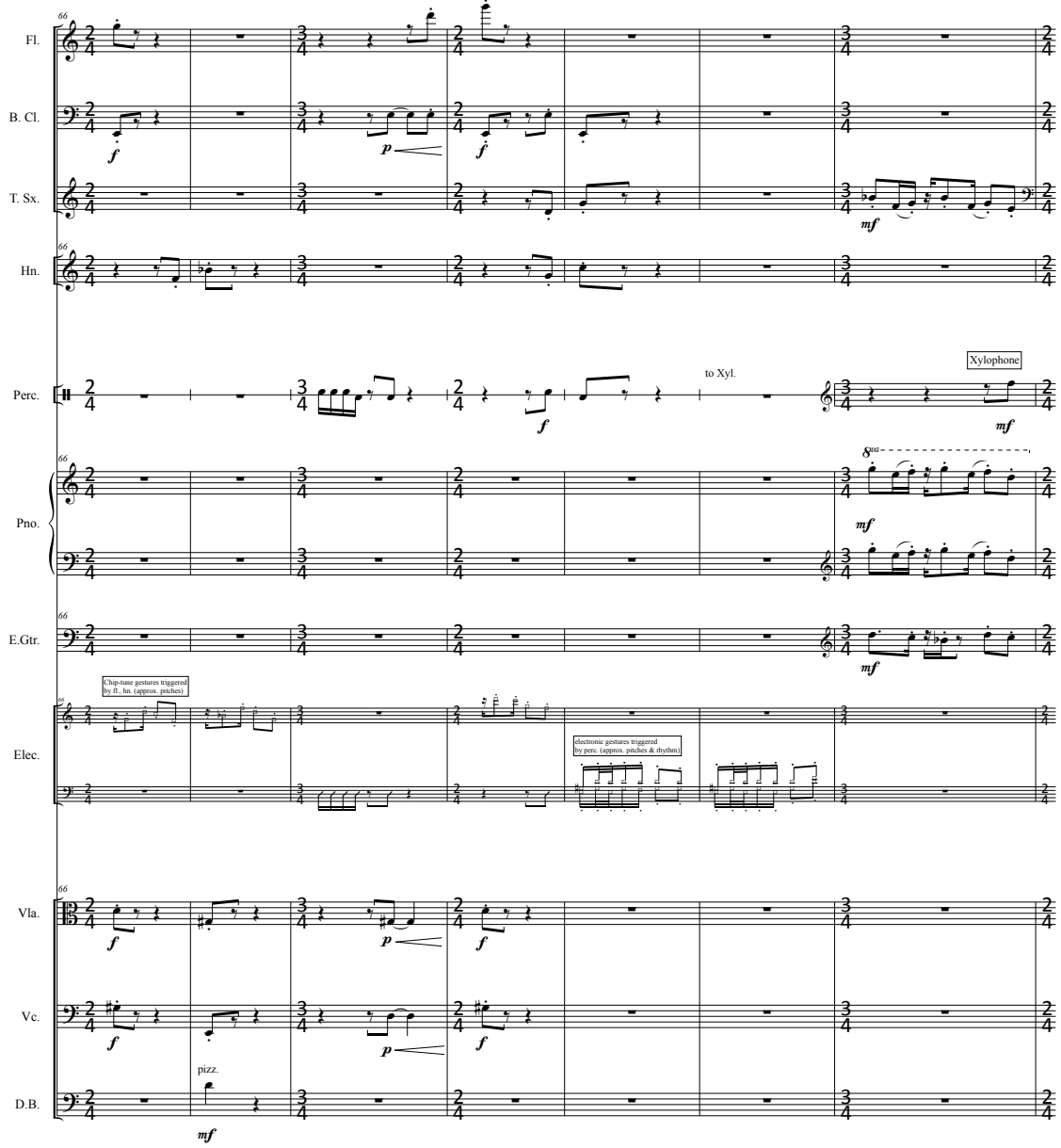

C
Fl.
B. Cl.
T. Sx.
Hn.
C
Vib.
Ped.
Pno.
ord.
E.Gtr.
Elec.
C
Vla.
Vc.
D.B.

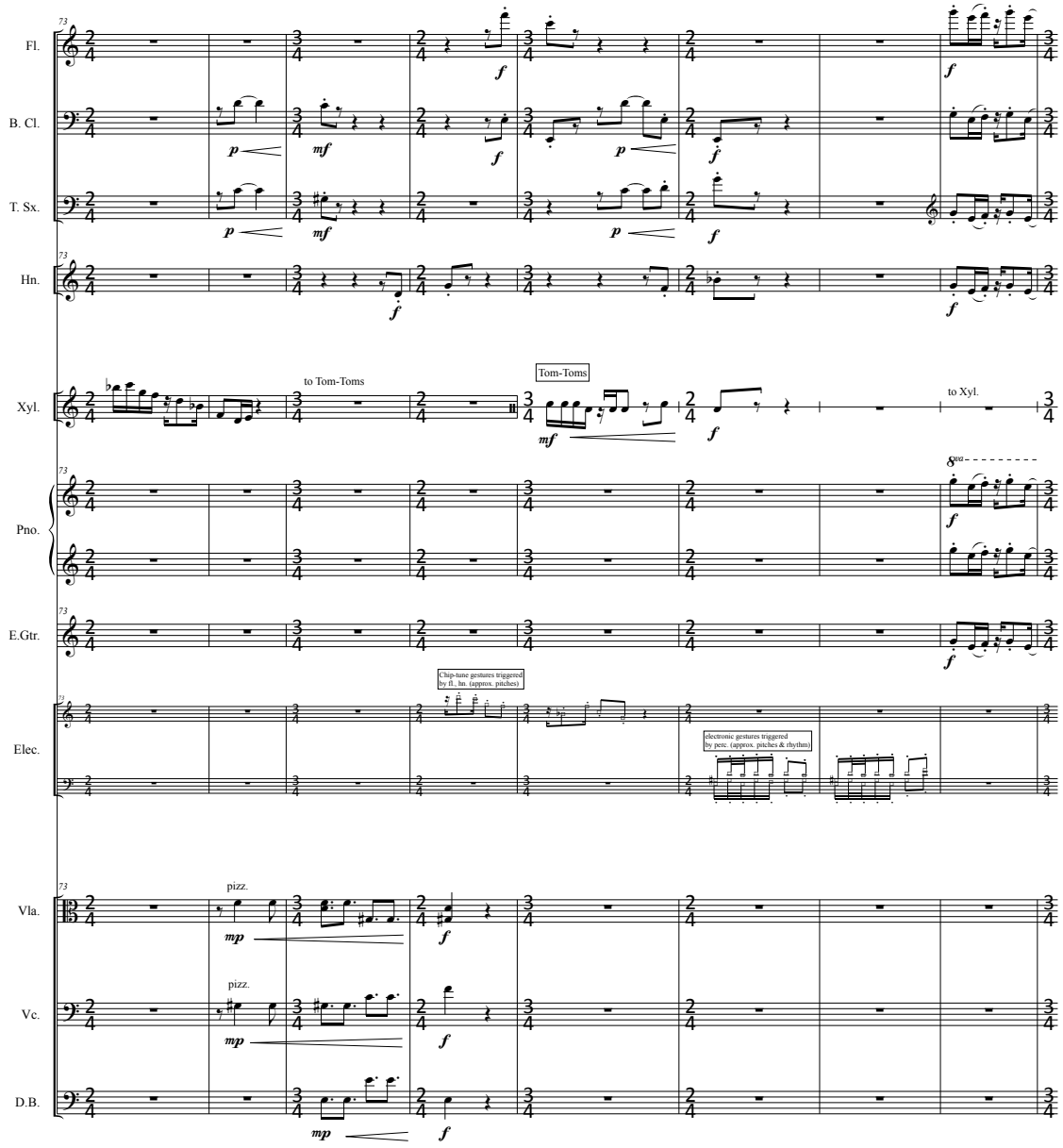

Fl.
B. Cl.
T. Sx.
Hn.
open
Vib.
Ped.
Pno.
15ma
E.Gtr.
Elec.
Vla.
Vc.
D.B.

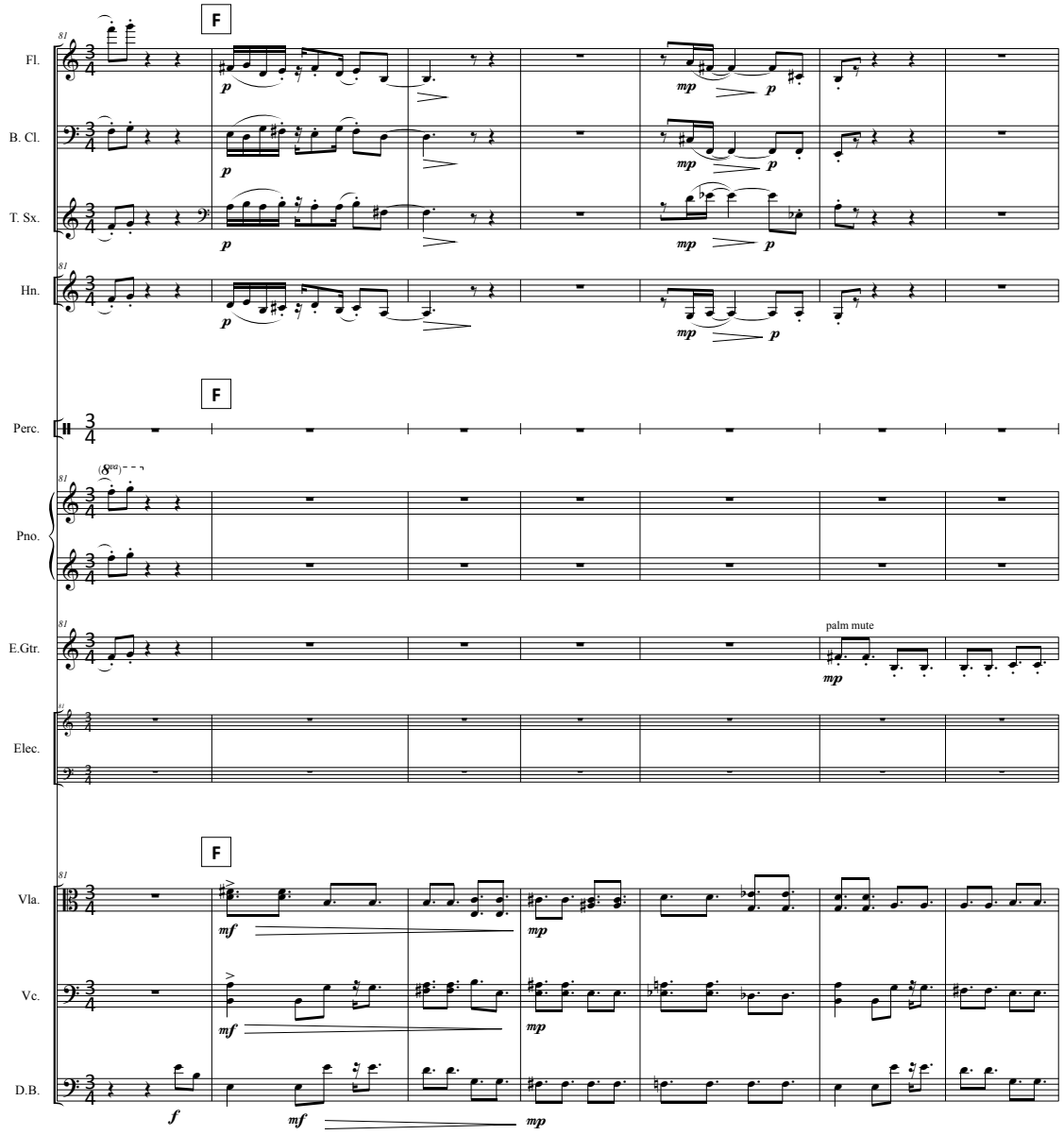

D
Fl.
B. Cl.
T. Sx.
Hn.
Vib.
Ped.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

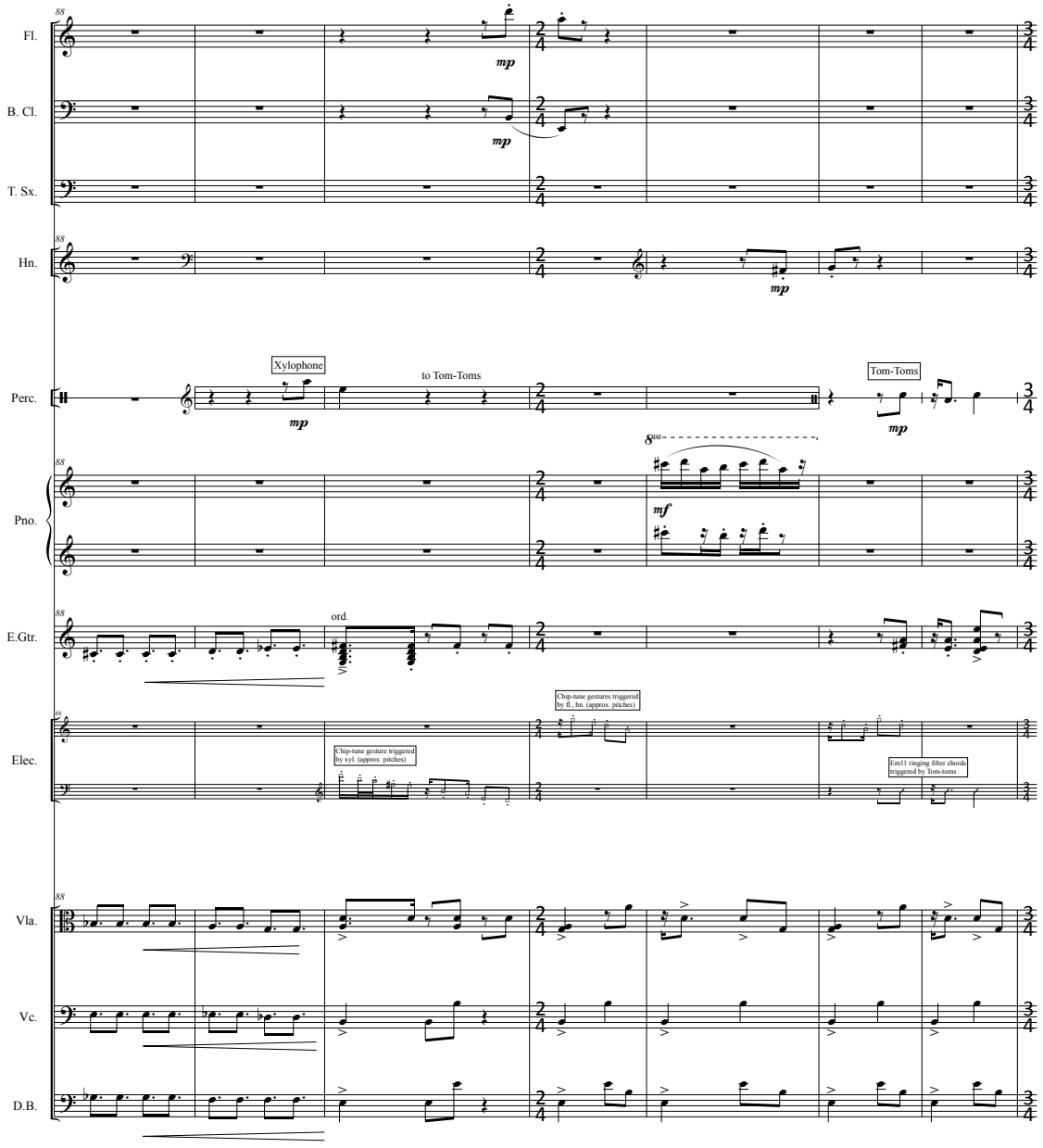

Fl.
B. Cl.
T. Sx.
Hn.
Vib.
Ped.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
mf
mp
f
15ma

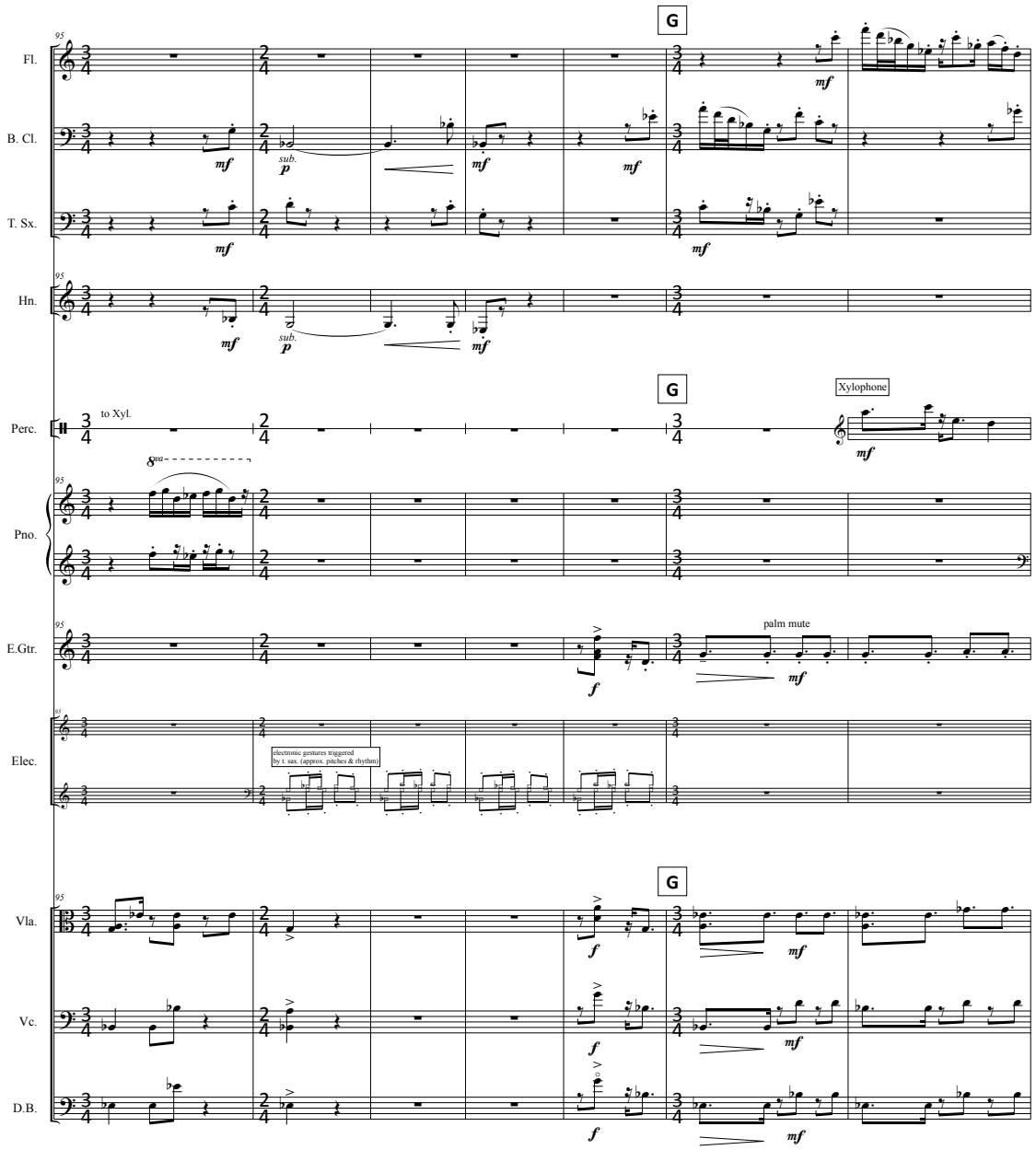

E
Fl.
B. Cl.
T. Sx.
Hn.
E
Tom-Toms
Vib.
to Tom-Toms
Pno.
E.Gtr.
Elec.
E7 ringing filter chords triggered by Tom-toms
E
Vla.
Vc.
D.B.
arco

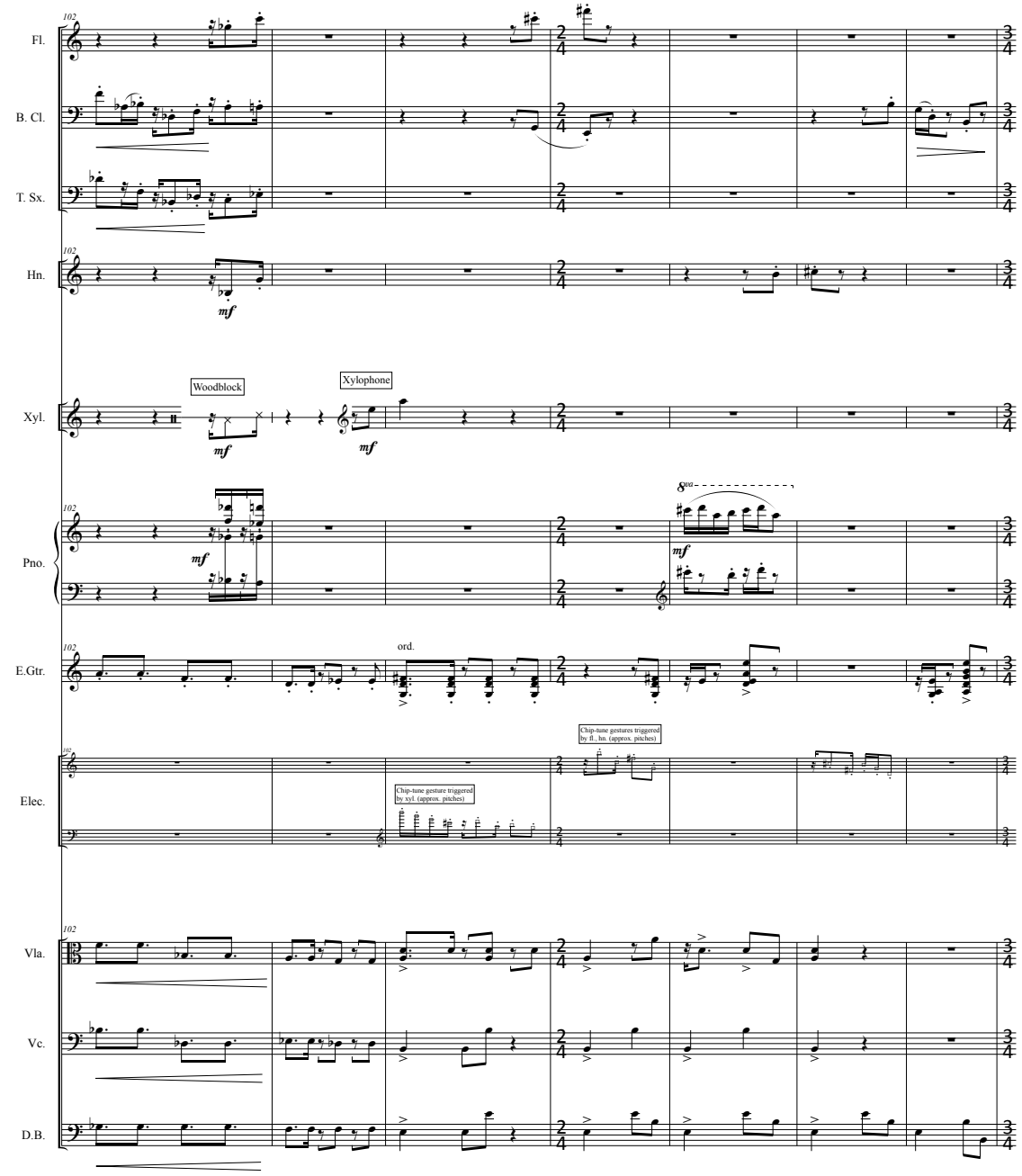

Fl.
B. Cl.
T. Sx.
Hn.
Perc.
to Xyl.
Xylophone
Pno.
E.Gtr.
Chip-tune gestures triggered by fl., hn. (approx. pitches)
Elec.
electronic gestures triggered by perc. (approx. pitches & rhythm)
Vla.
Vc.
pizz.
D.B.

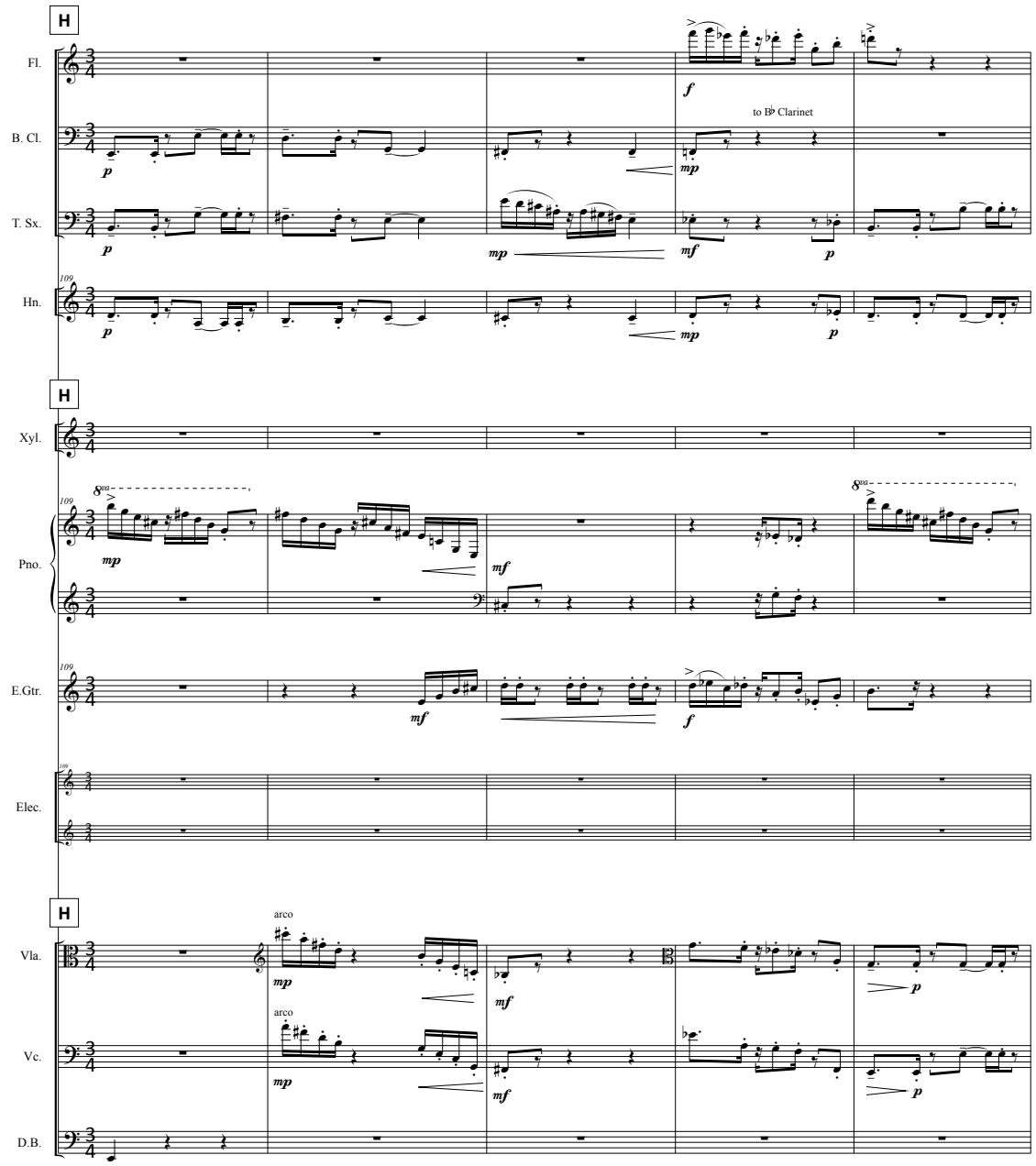

Fl.
B. Cl.
T. Sx.
Hn.
Xyl.
to Tom-Toms
Tom-Toms
to Xyl.
Pno.
E.Gtr.
Elec.
Chip-tune gestures triggered by fl., hn. (approx. pitches)
electronic gestures triggered by perc. (approx. pitches & rhythm)
Vla.
Vc.
D.B.
pizz.
pizz.

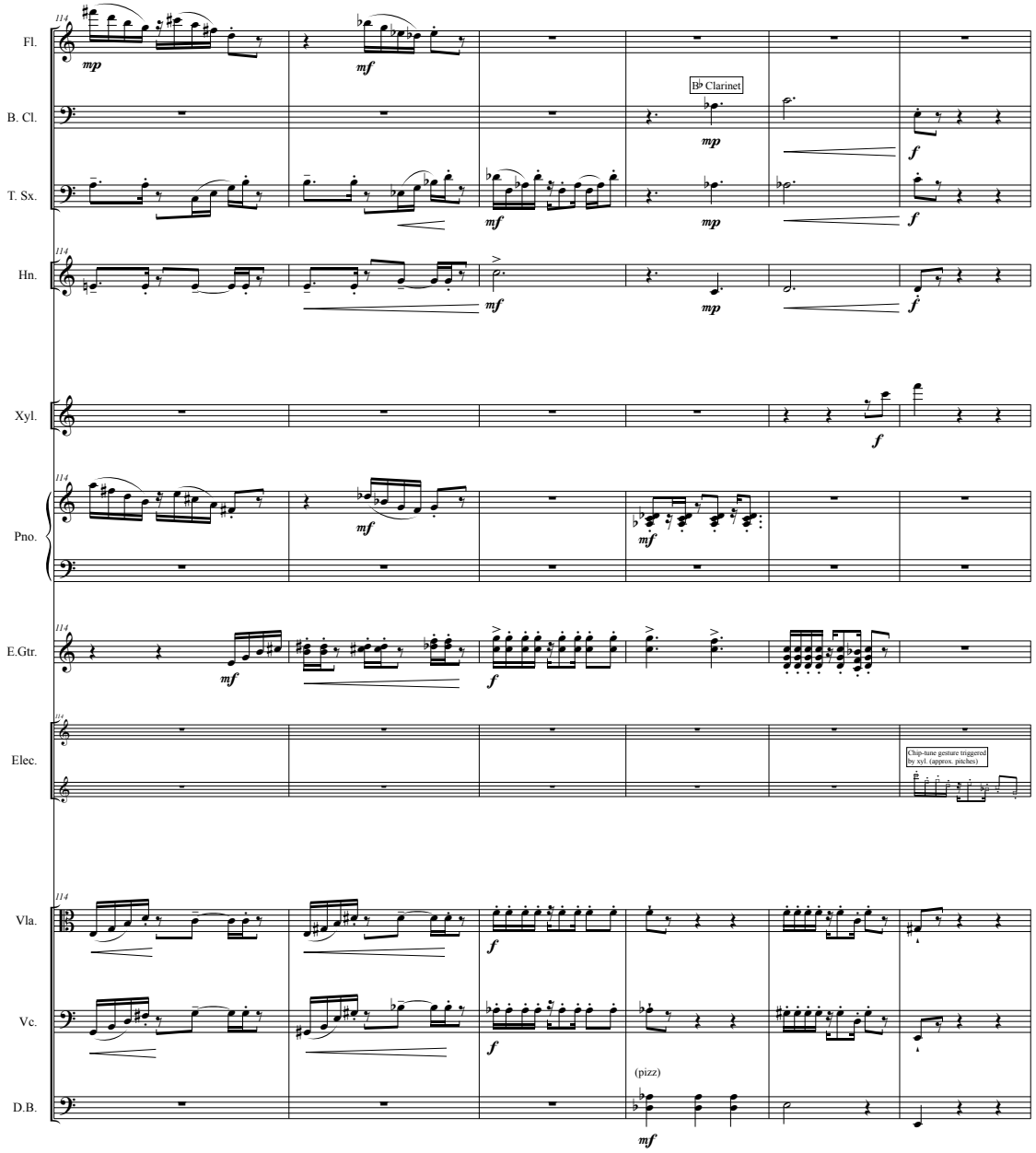

F
Fl.
B. Cl.
T. Sx.
Hn.
F
Perc.
Pno.
E.Gtr.
palm mute
Elec.
F
Vla.
Vc.
D.B.

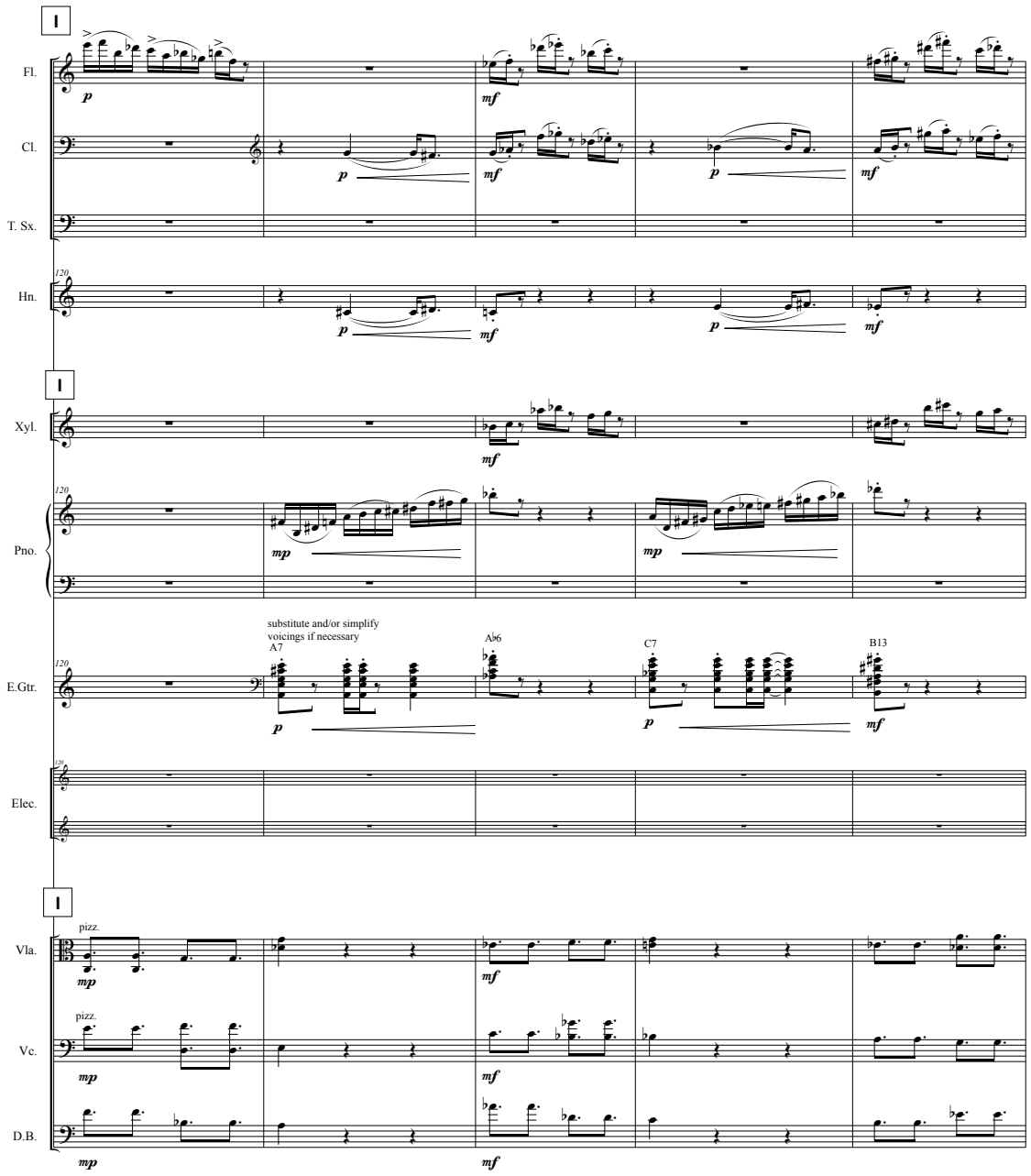

Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Xylophone
to Tom-Toms
Tom-Toms
Pno.
E.Gtr.
ord.
Elec.
Chip-tune gestures triggered by fl., hn. (approx. pitches)
Chip-tune gesture triggered by xyl. (approx. pitches)
Em11 ringing filter chords triggered by Tom-toms
Vla.
Vc.
D.B.

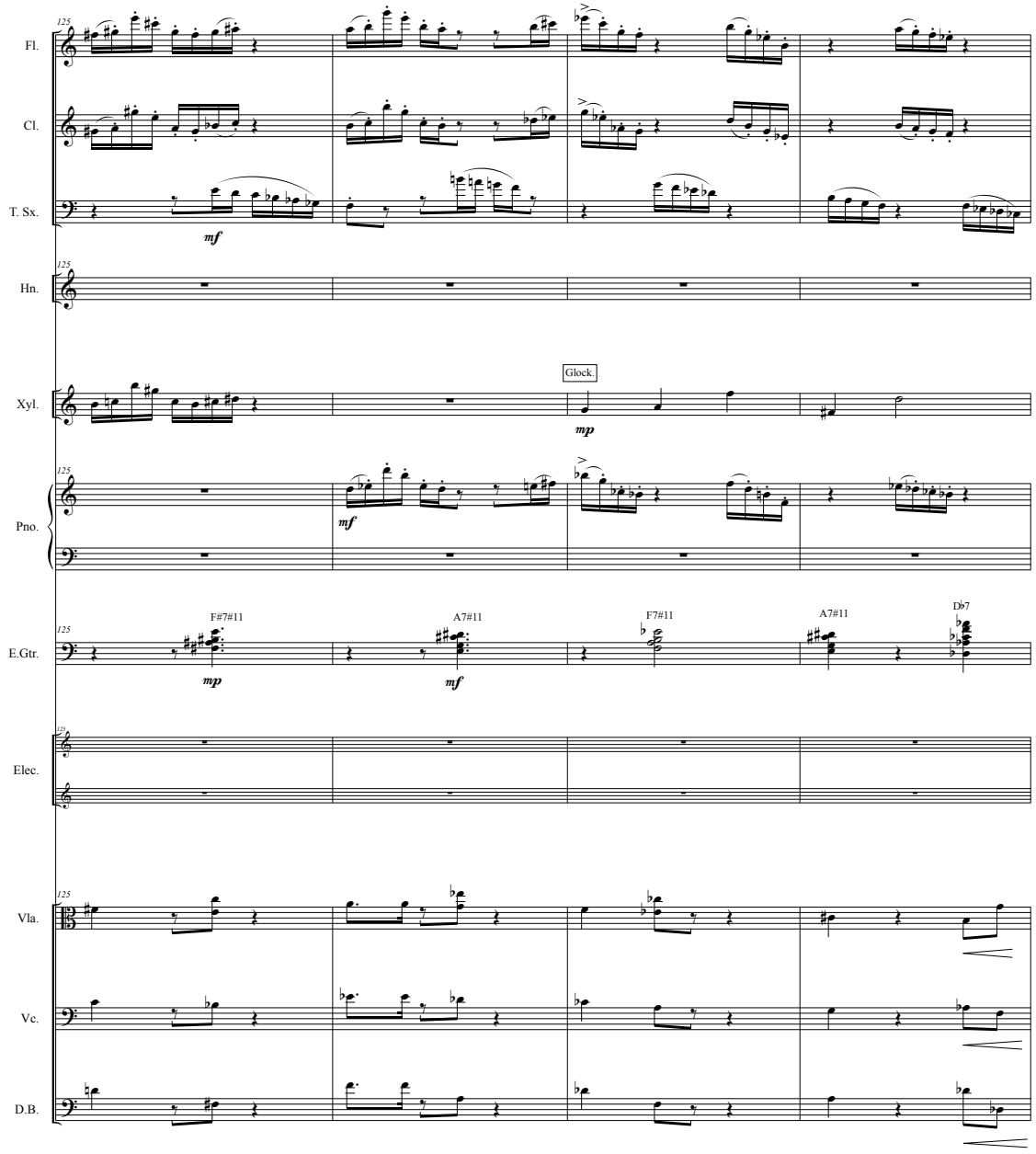

G
Fl.
B. Cl.
T. Sx.
Hn.
sub.
G
Xylophone
Perc.
to Xyl.
Pno.
E.Gtr.
palm mute
Elec.
electronic gestures triggered
by t. sax. (approx. pitches & rhythm)
G
Vla.
Vc.
D.B.

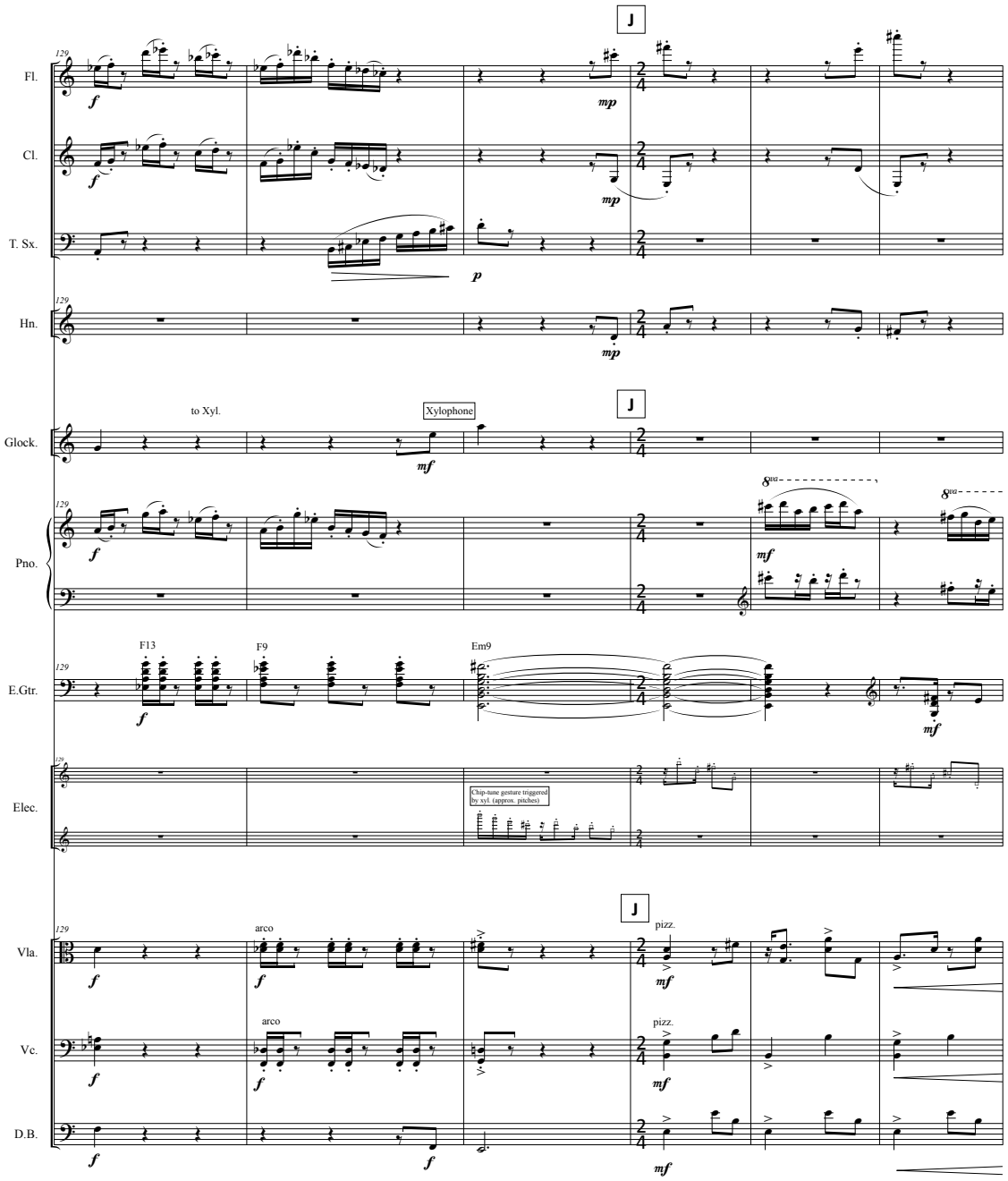

Fl.
B. Cl.
T. Sx.
Hn.
Xyl.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
102
mf
Woodblock
Xylophone
8va
ord.
Chip-tune gesture triggered by xyl. (approx. pitches)
Chip-tune gestures triggered by fl., hn. (approx. pitches)

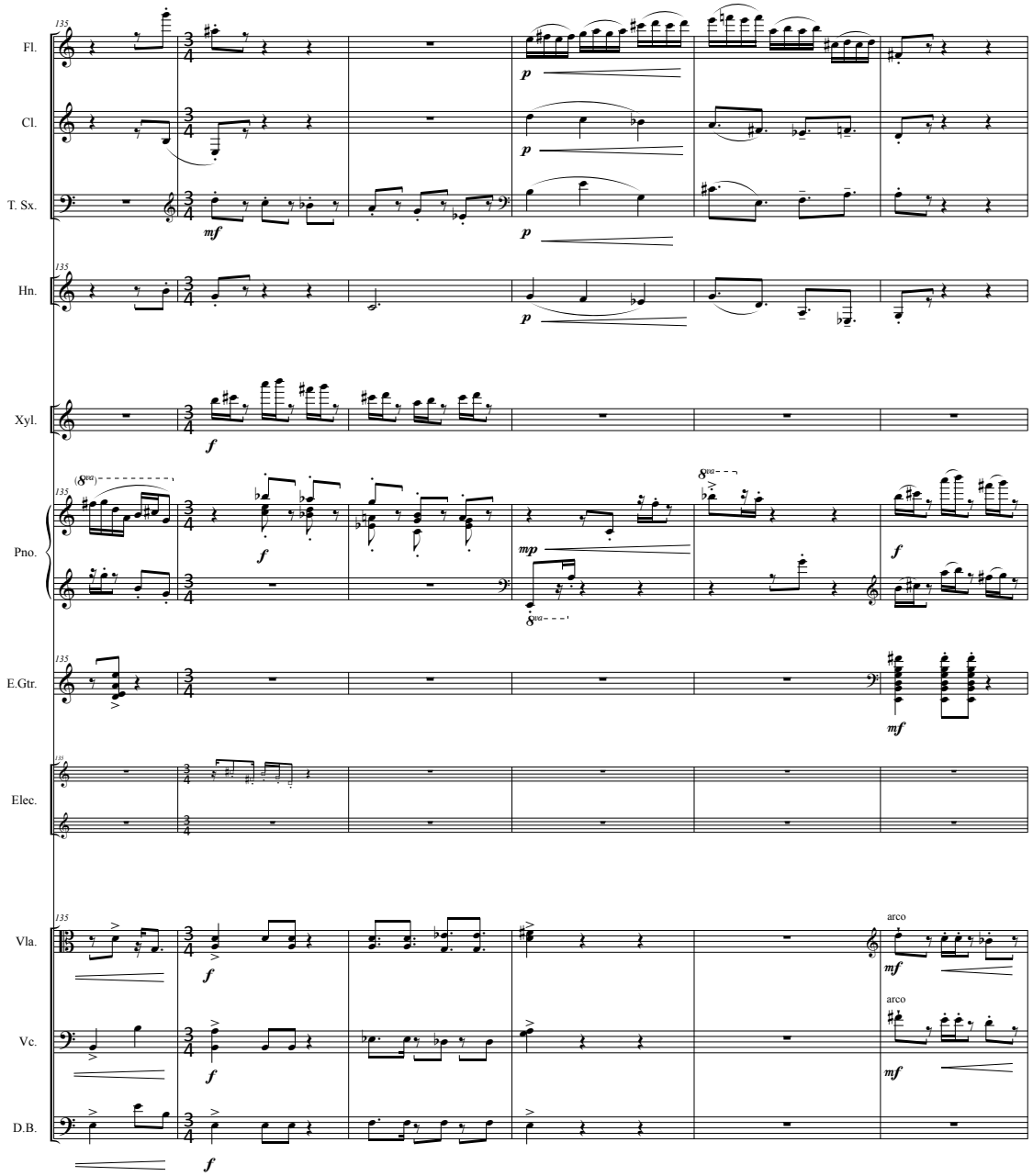

H
Fl.
B. Cl.
to B♭ Clarinet
T. Sx.
Hn.
H
Xyl.
Pno.
E.Gtr.
Elec.
H
Vla.
arco
Vc.
arco
D.B.

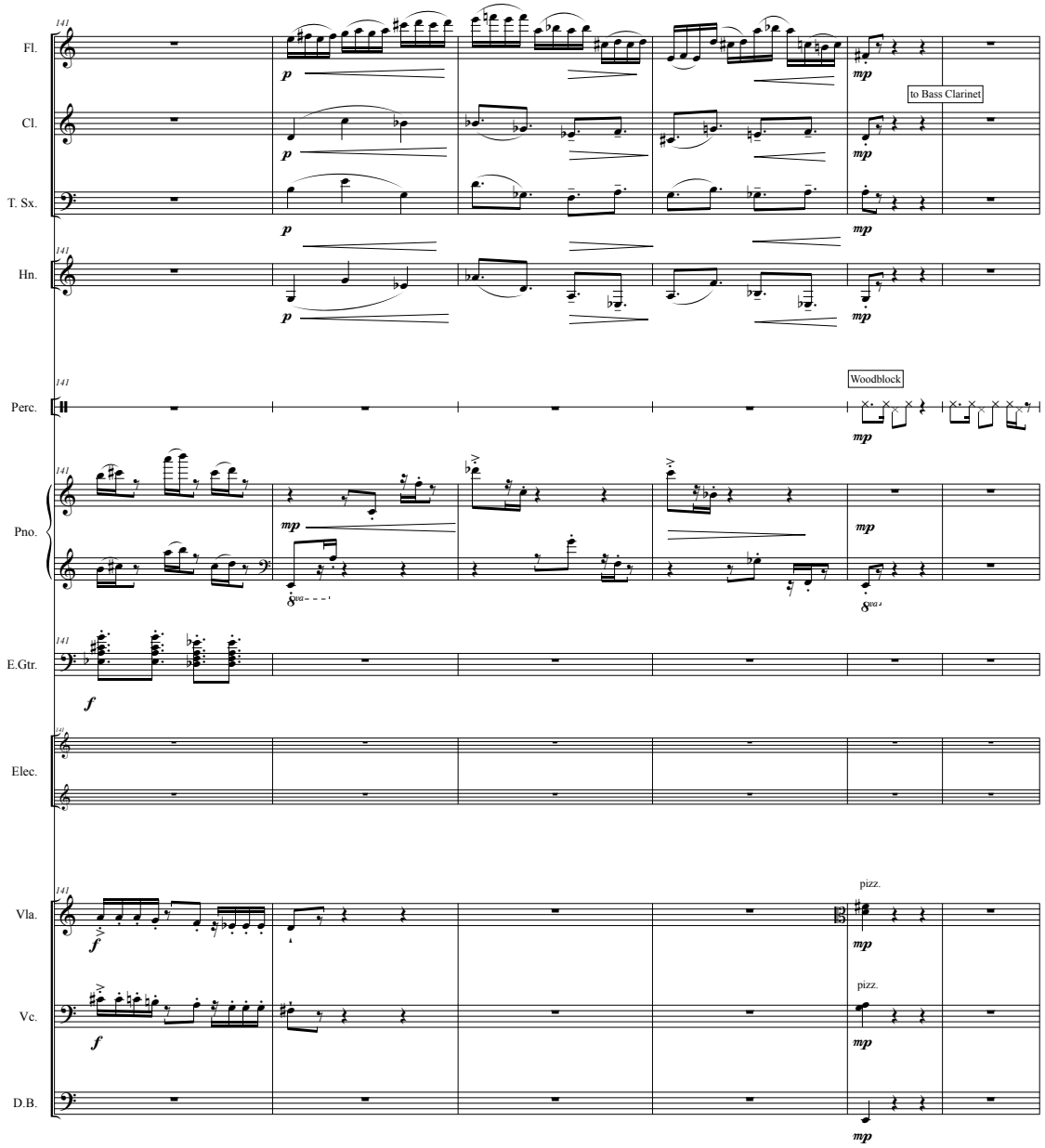

Fl.
B. Cl.
T. Sx.
Hn.
Xyl.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
B♭ Clarinet
Chip-tune gesture triggered by xyl. (approx. pitches)
(pizz)

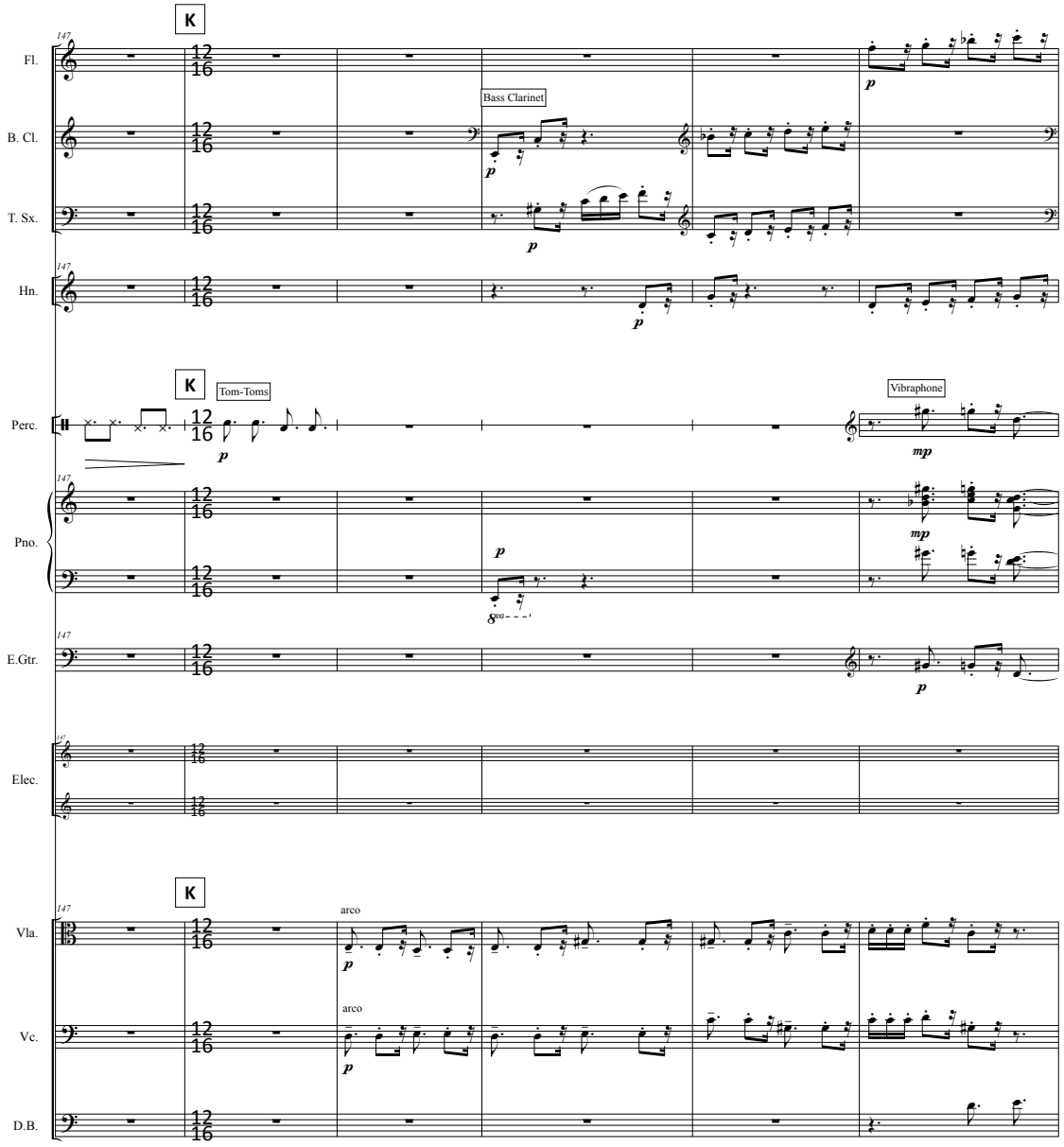

I
Fl.
Cl.
T. Sx.
Hn.
I
Xyl.
Pno.
E.Gtr.
substitute and/or simplify voicings if necessary
A7
A♭6
C7
B13
Elec.
I
Vla.
pizz.
Vc.
pizz.
D.B.

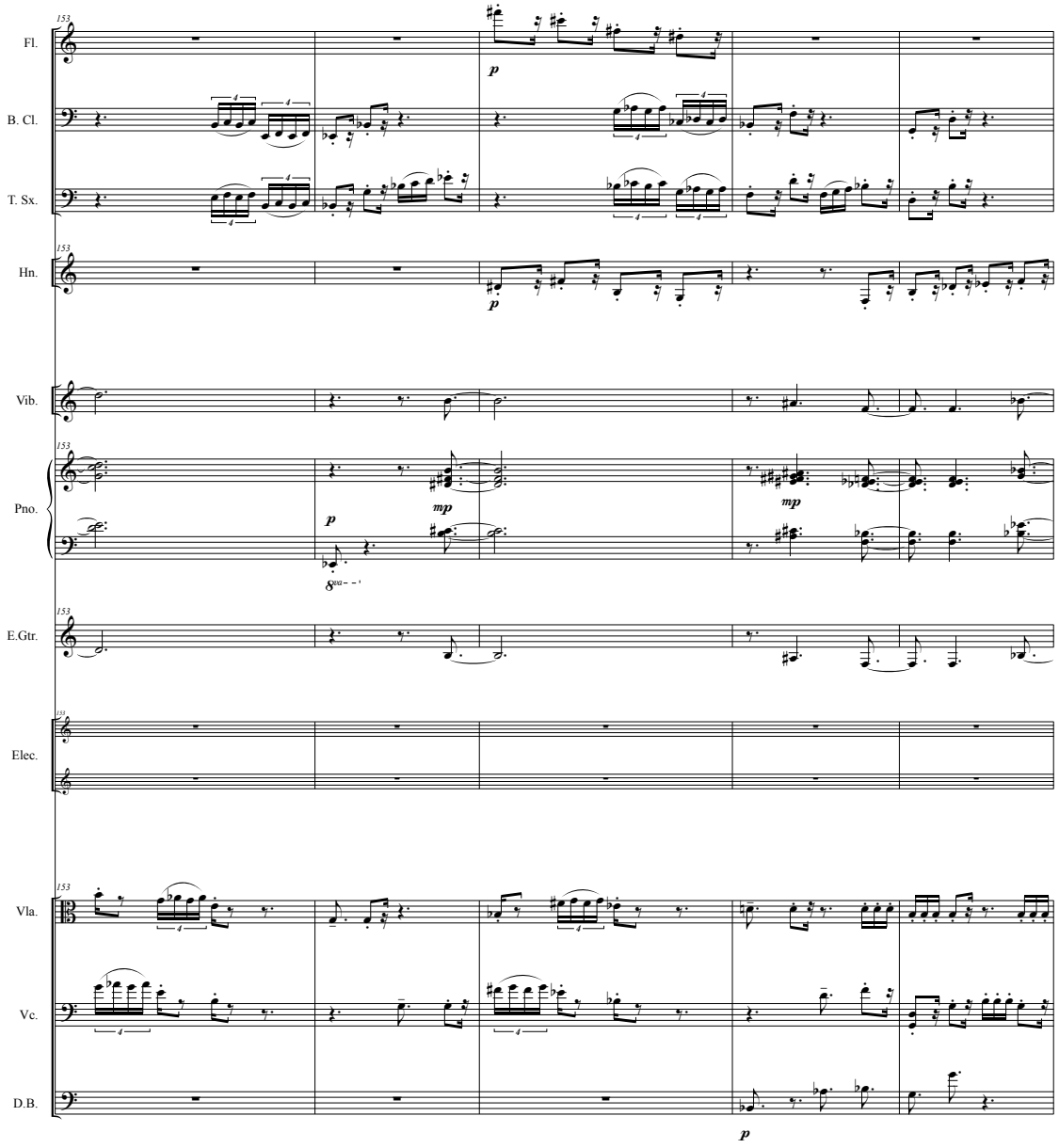

Fl.
Cl.
T. Sx.
Hn.
Xyl.
Glock.
Pno.
E.Gtr.
F#7#11
A7#11
F7#11
A7#11
D♭7
Elec.
Vla.
Vc.
D.B.
125
mf
mp

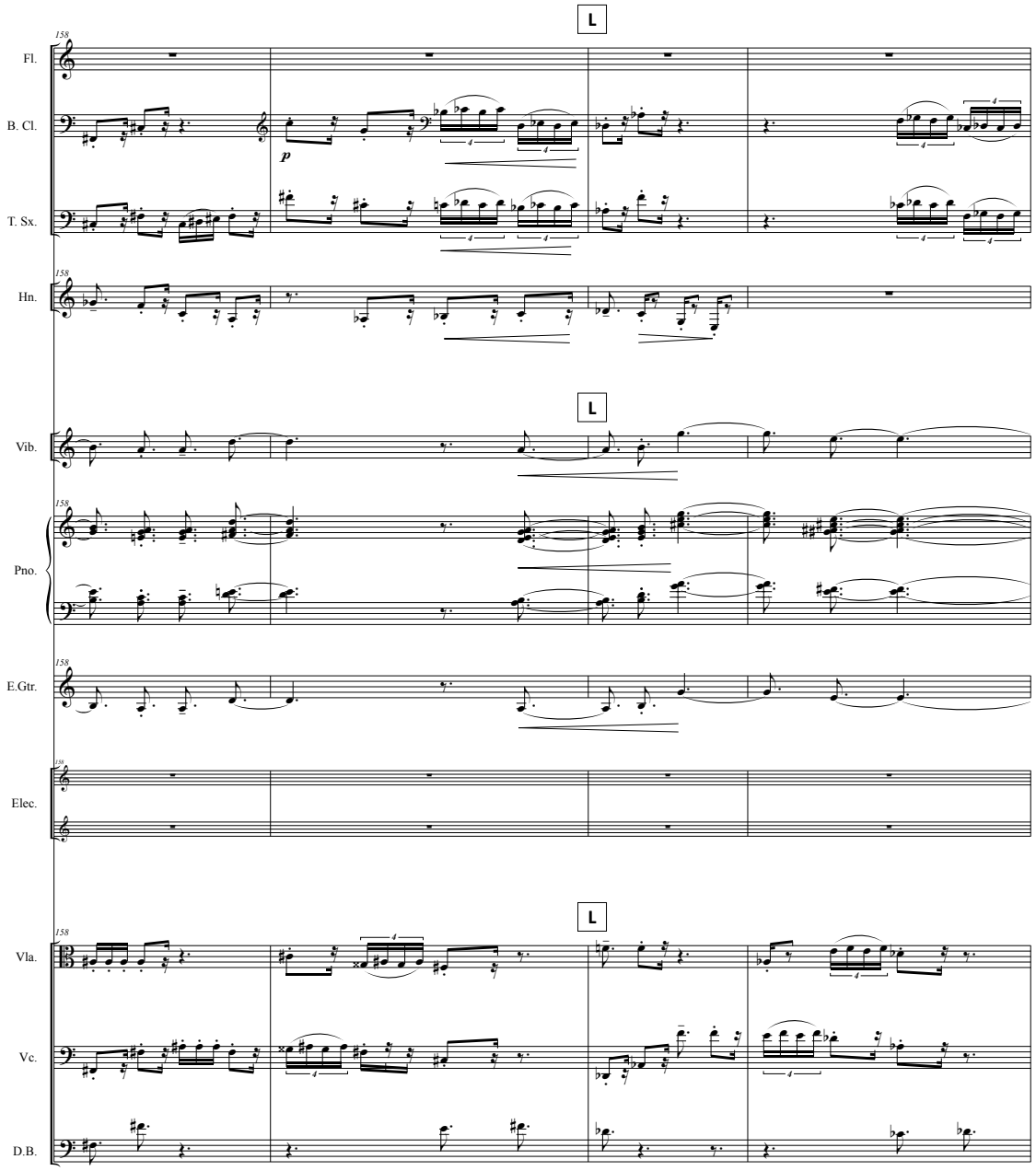

J
Fl.
Cl.
T. Sx.
Hn.
to Xyl.
Xylophone
Glock.
Pno.
F13
F9
Em9
E.Gtr.
Chip-tune gesture triggered by xyl. (approx. pitches)
Elec.
arco
pizz.
Vla.
Vc.
D.B.

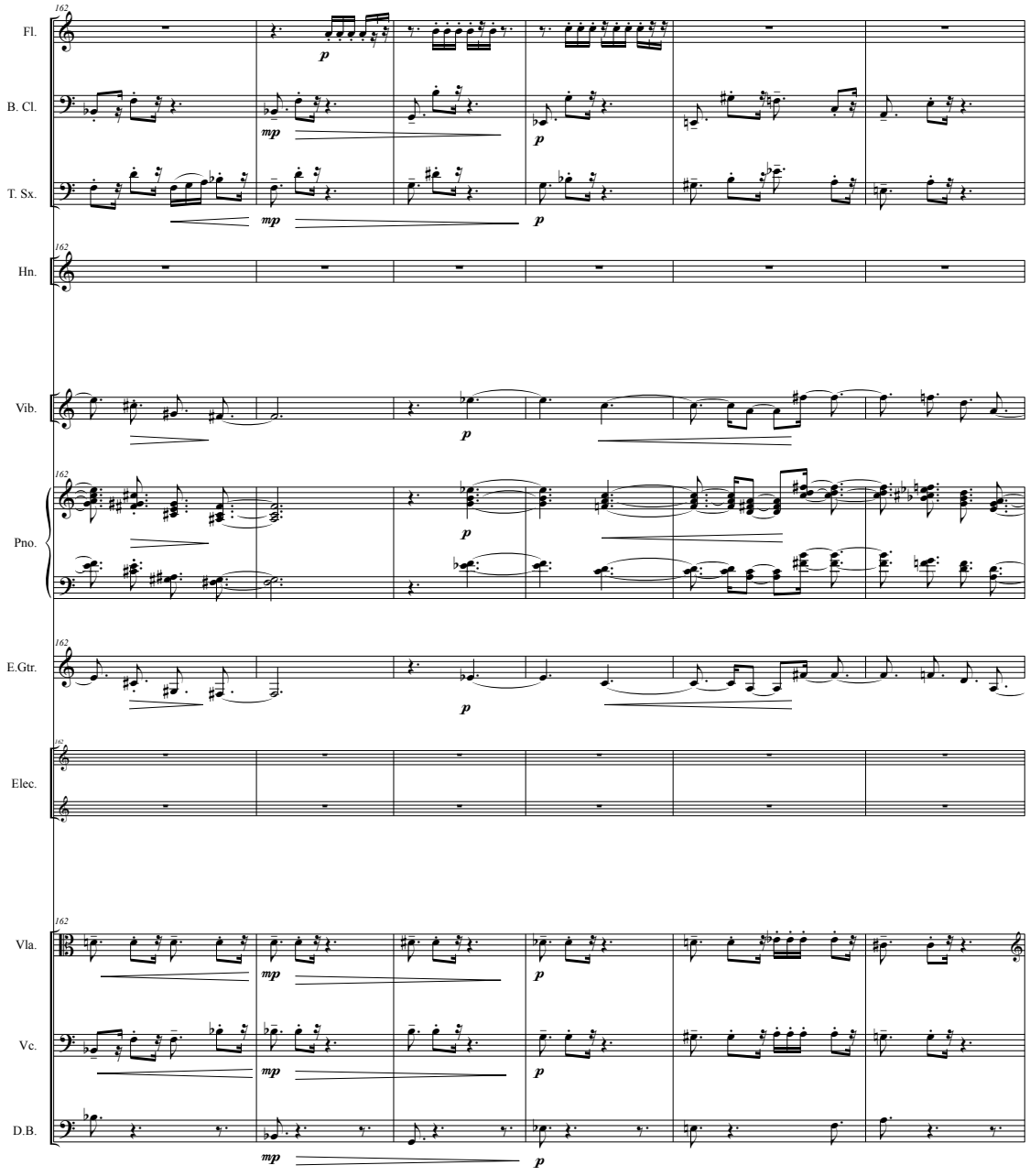

135
Fl.
Cl.
T. Sx.
Hn.
Xyl.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
p
mf
f
mp
arco

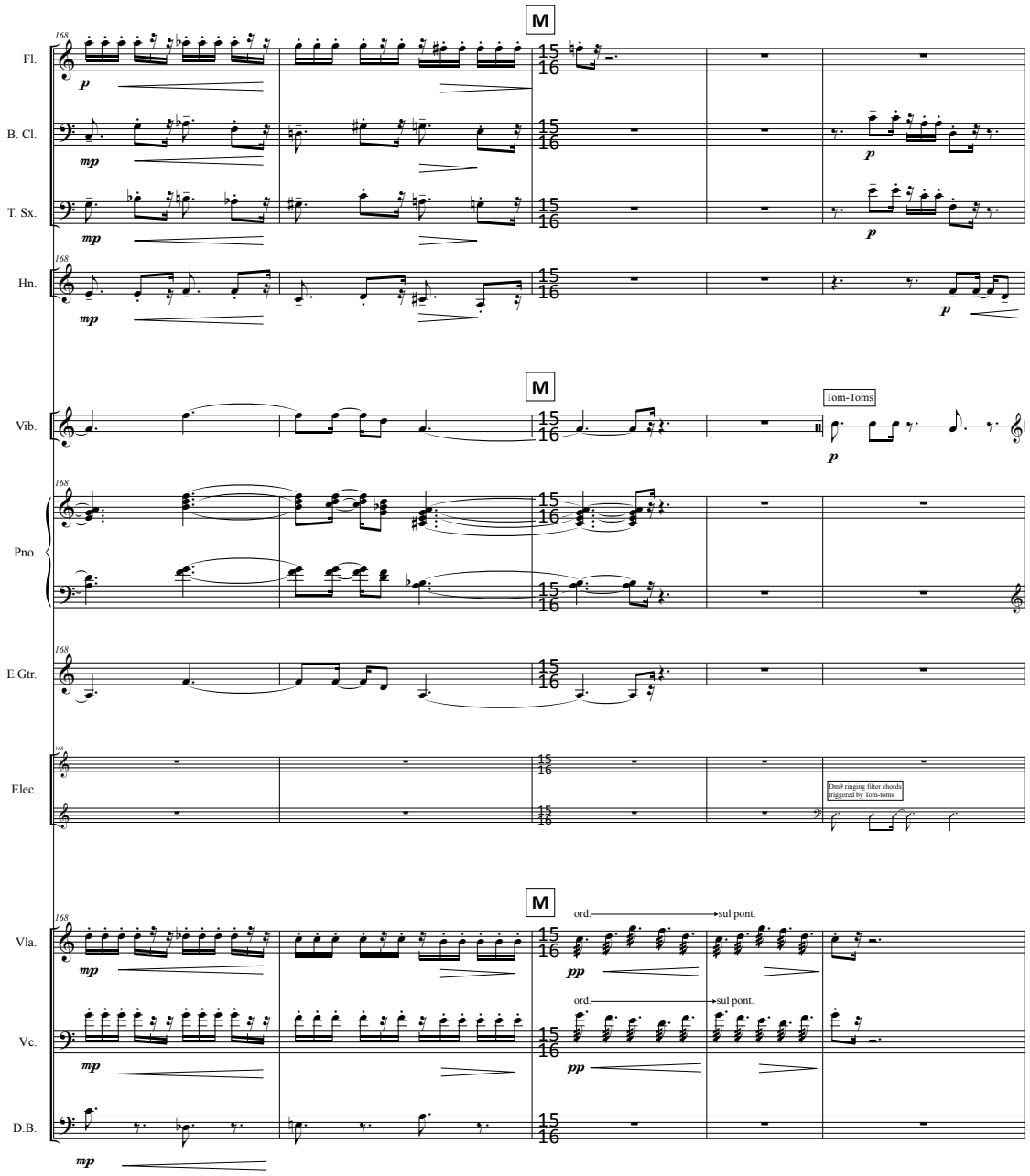

141
Fl.
Cl.
T. Sx.
Hn.
Perc.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
p
mp
f
to Bass Clarinet
Woodblock
pizz.
8va

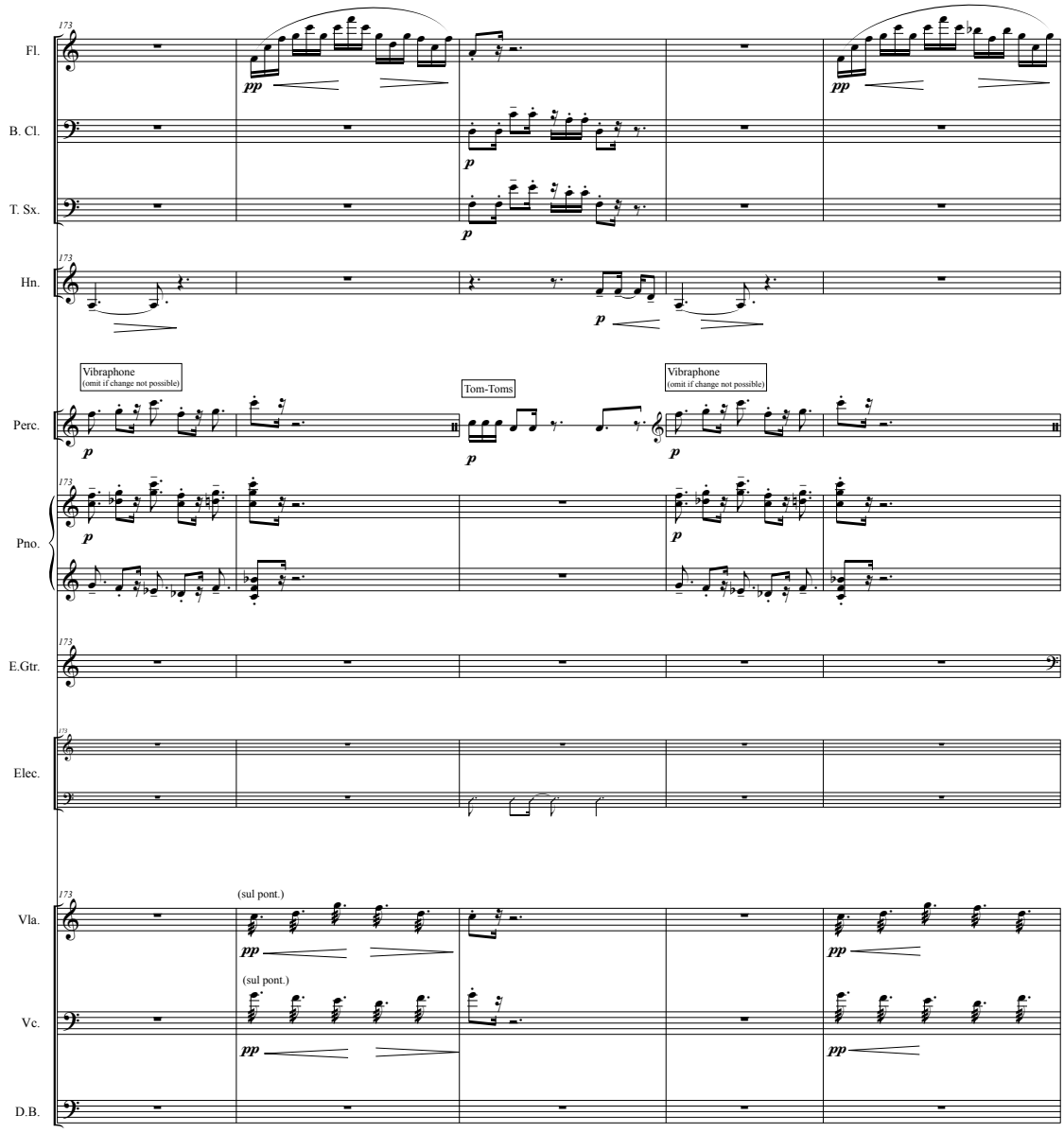

K
147
Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
12
16
Bass Clinet
Tom-Toms
Vibraphone
arco
arco
p
mp

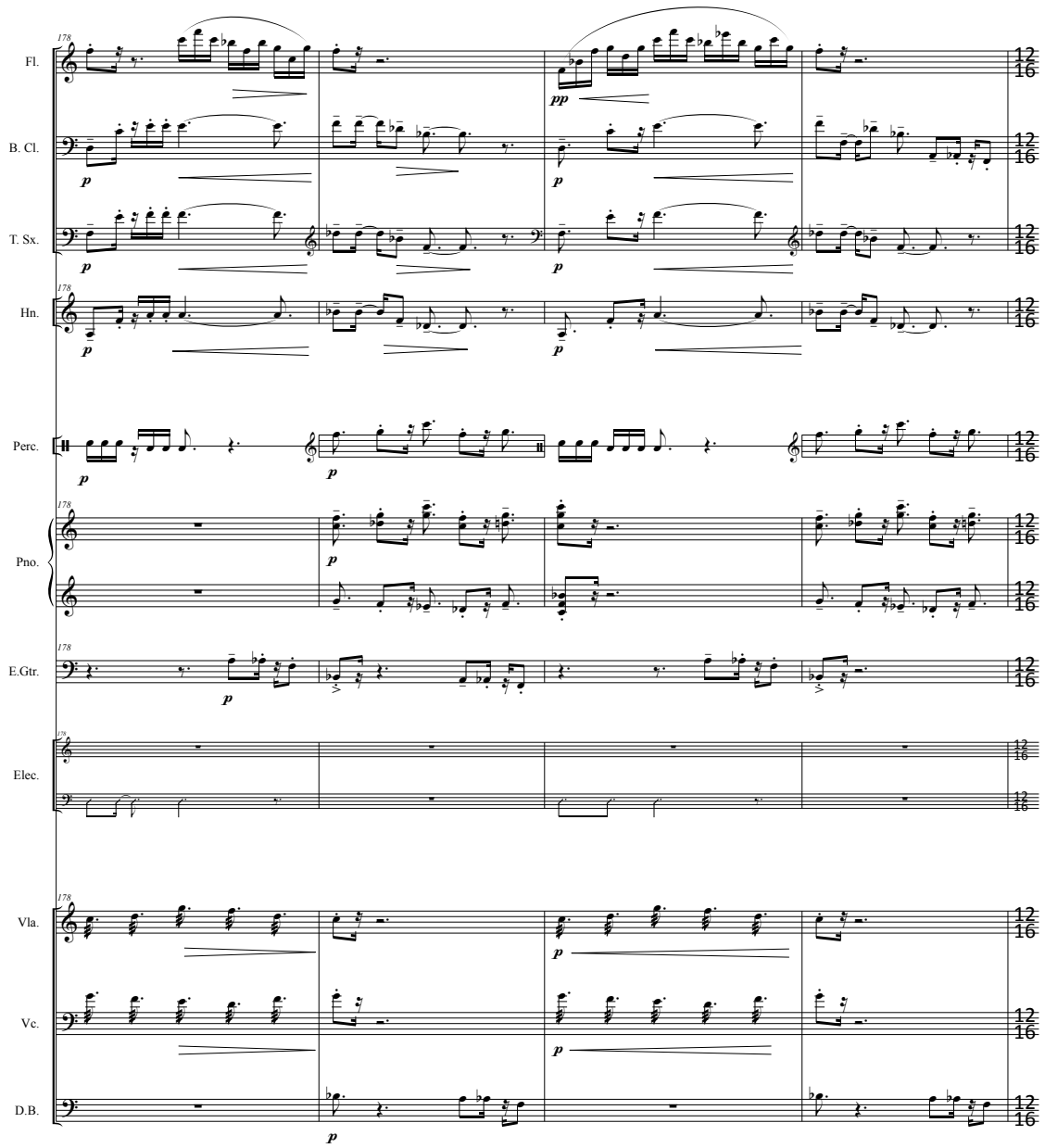

153
Fl.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
p
mp
8va

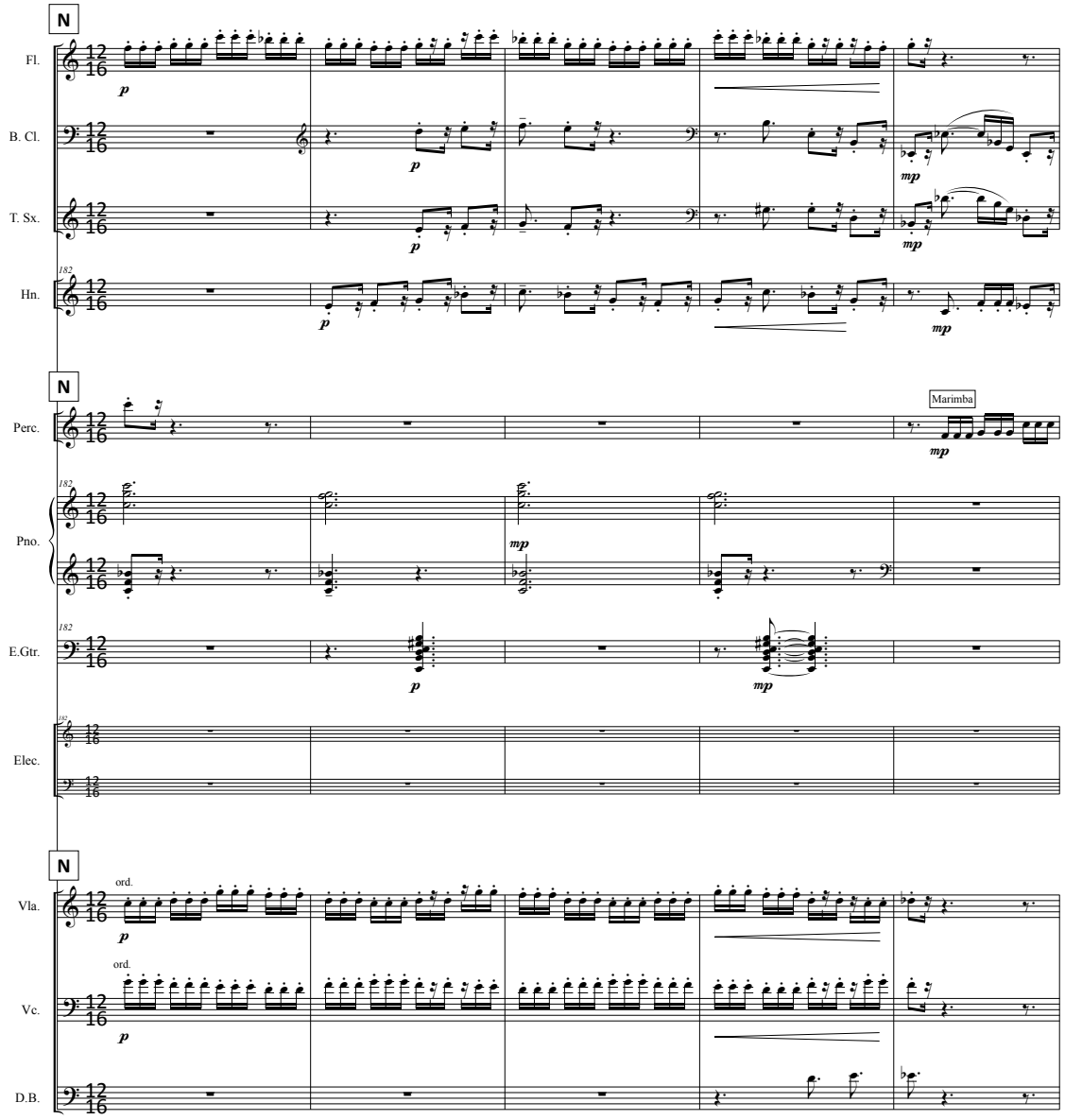

L
158
Fl.
B. Cl.
p
T. Sx.
Hn.
L
Vib.
158
Pno.
E.Gtr.
Elec.
L
158
Vla.
Vc.
D.B.

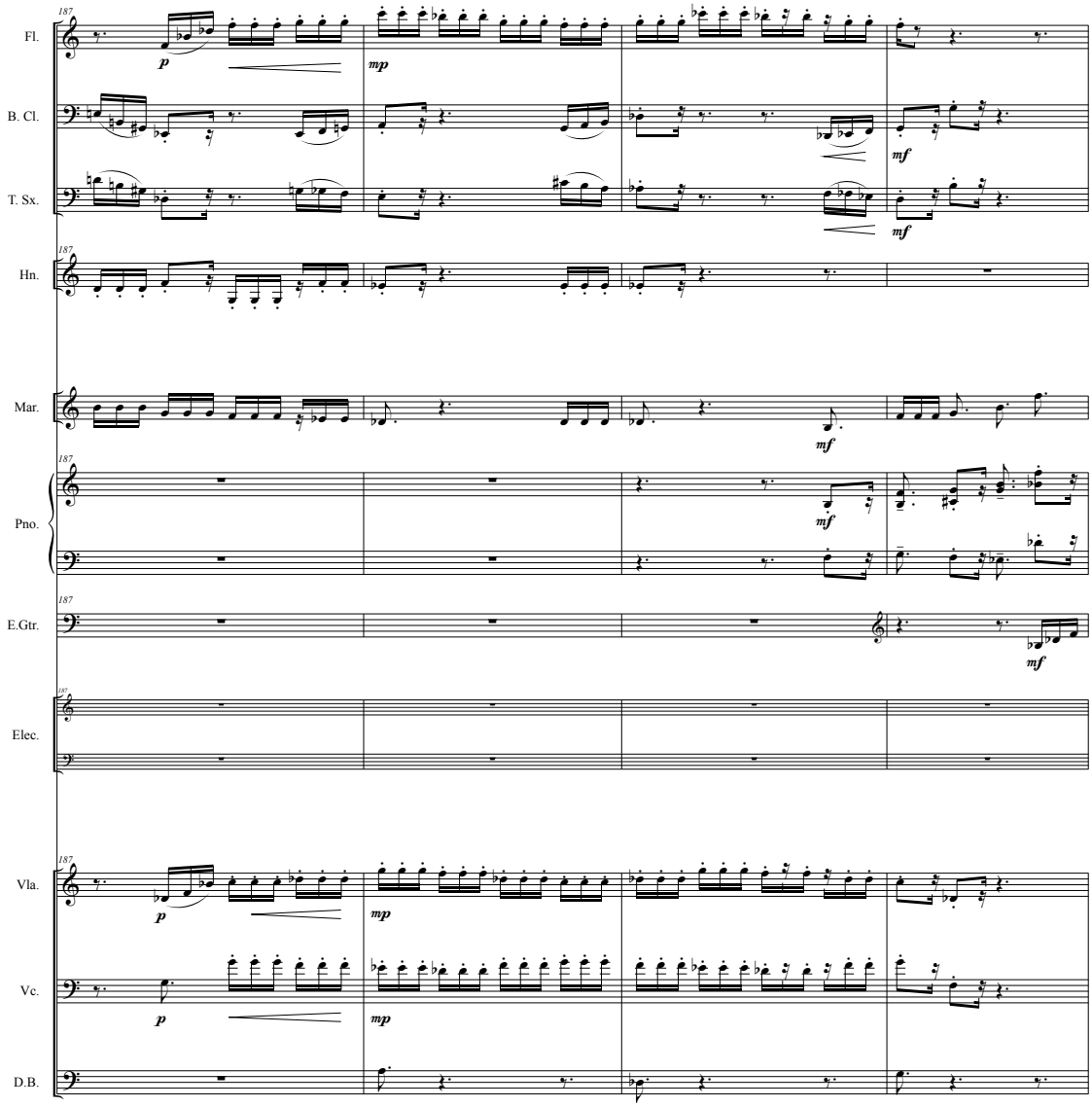

Fl.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
162
mp
p

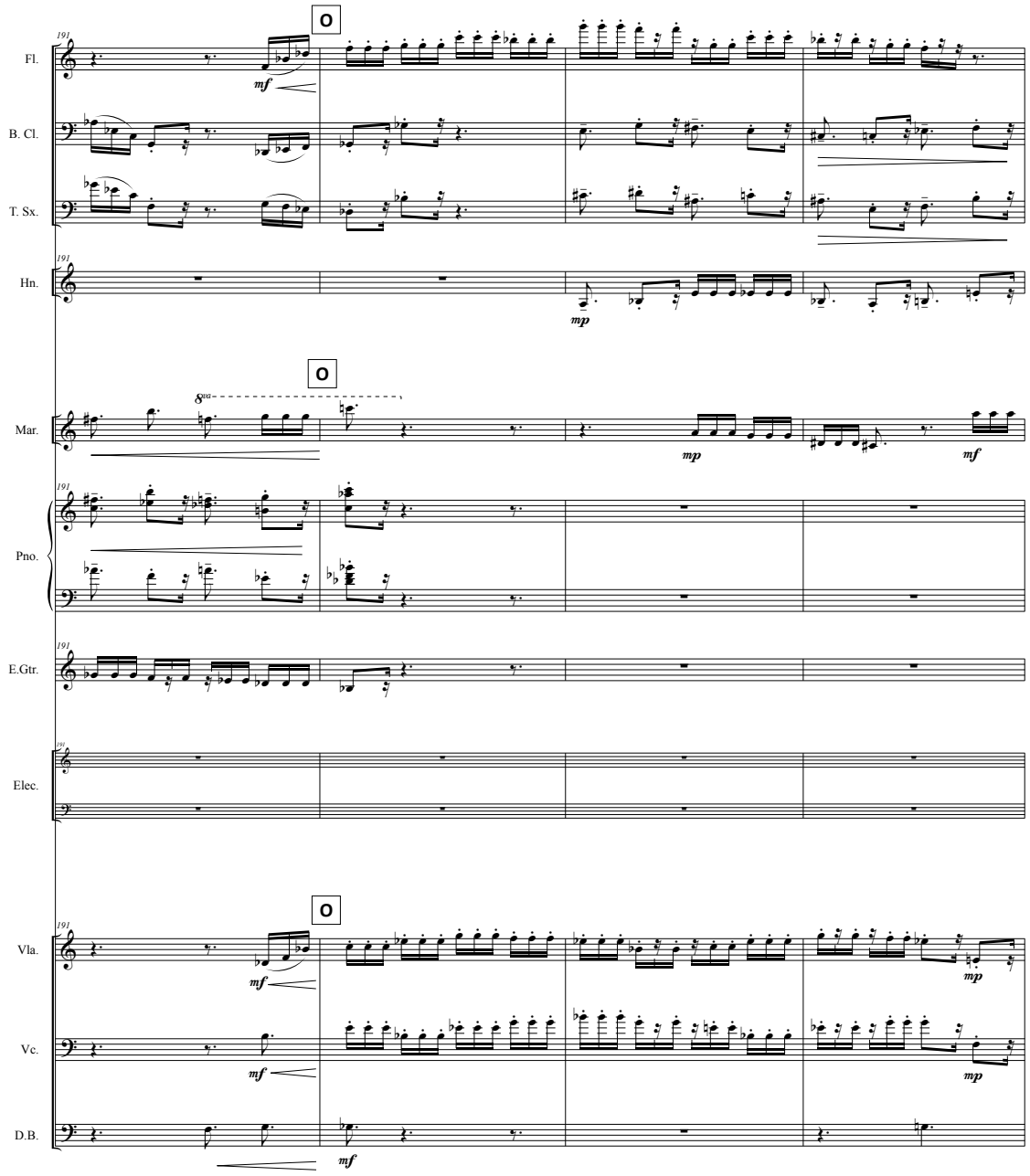

M
Fl.
B. Cl.
T. Sx.
Hn.
Vib.
Tom-Toms
Pno.
E.Gtr.
Elec.
Dm9 ringing filter chords triggered by Tom-toms
Vla.
Vc.
D.B.
ord.
sul pont.
mp
p
pp

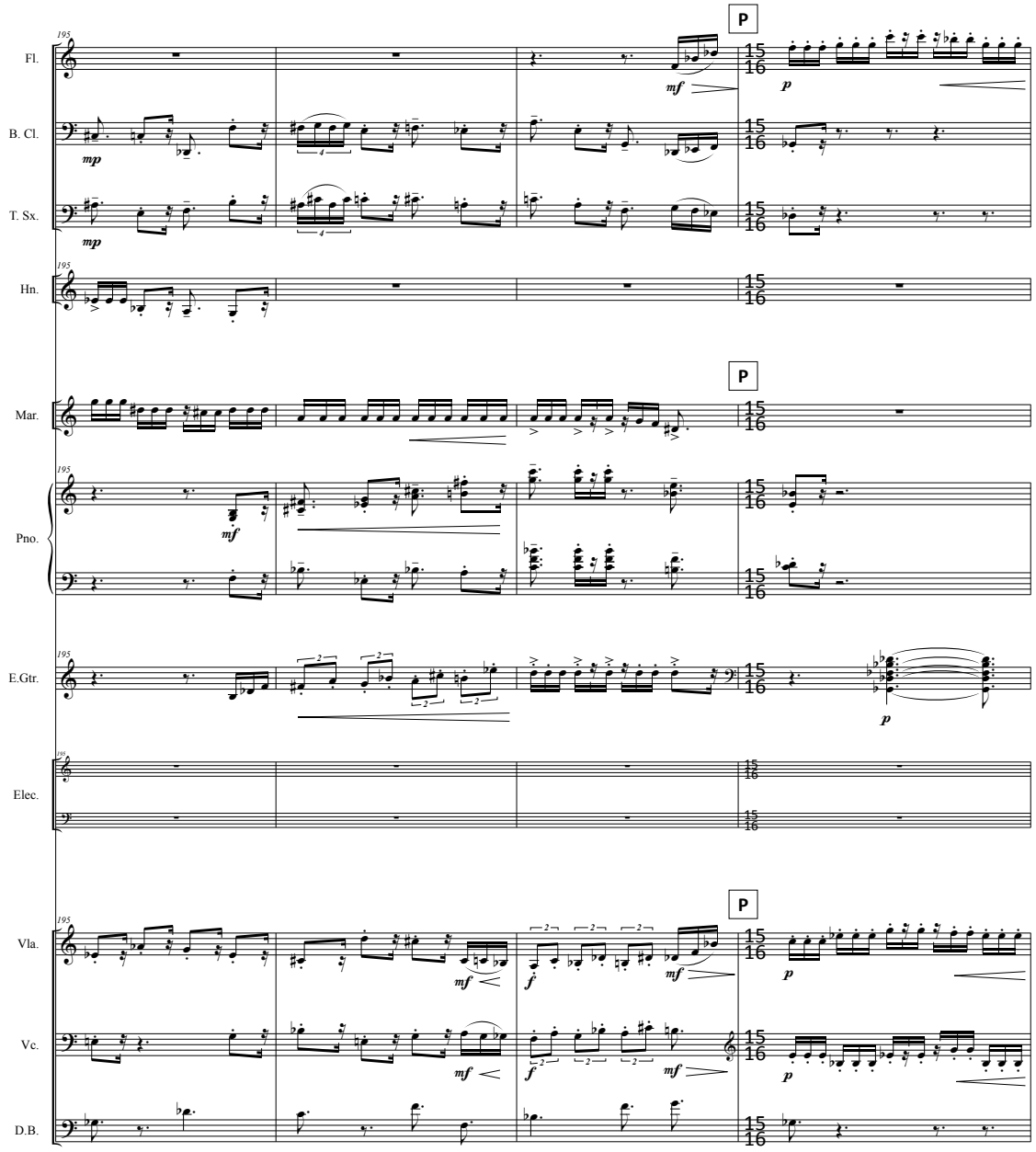

173
Fl.
pp
B. Cl.
p
T. Sx.
p
Hn.
p
Vibraphone
(omit if change not possible)
Tom-Toms
Vibraphone
(omit if change not possible)
Perc.
p
p
p
Pno.
p
p
E.Gtr.
Elec.
Vla.
(sul pont.)
pp
pp
Vc.
(sul pont.)
pp
pp
D.B.

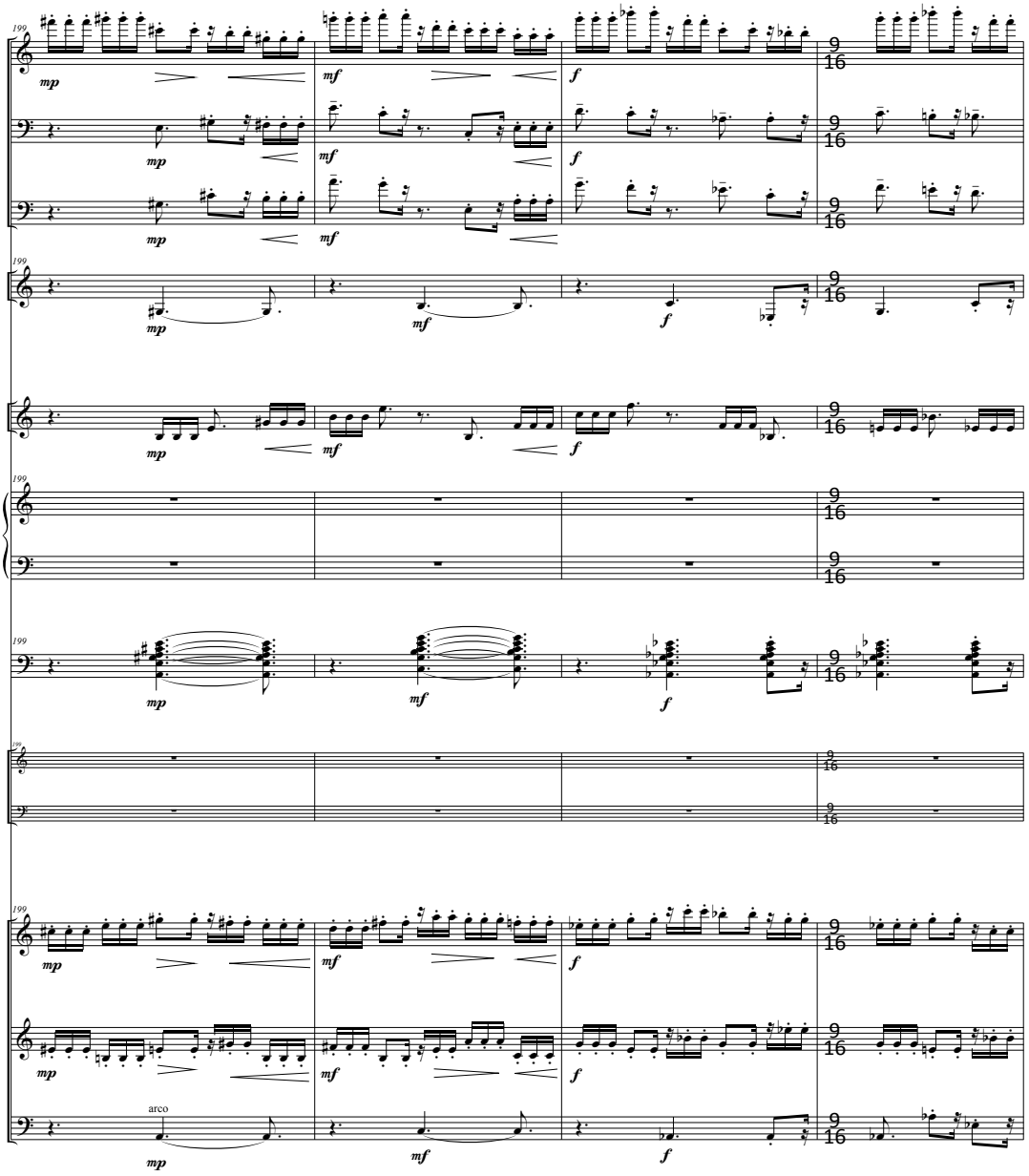

Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
178
pp
p

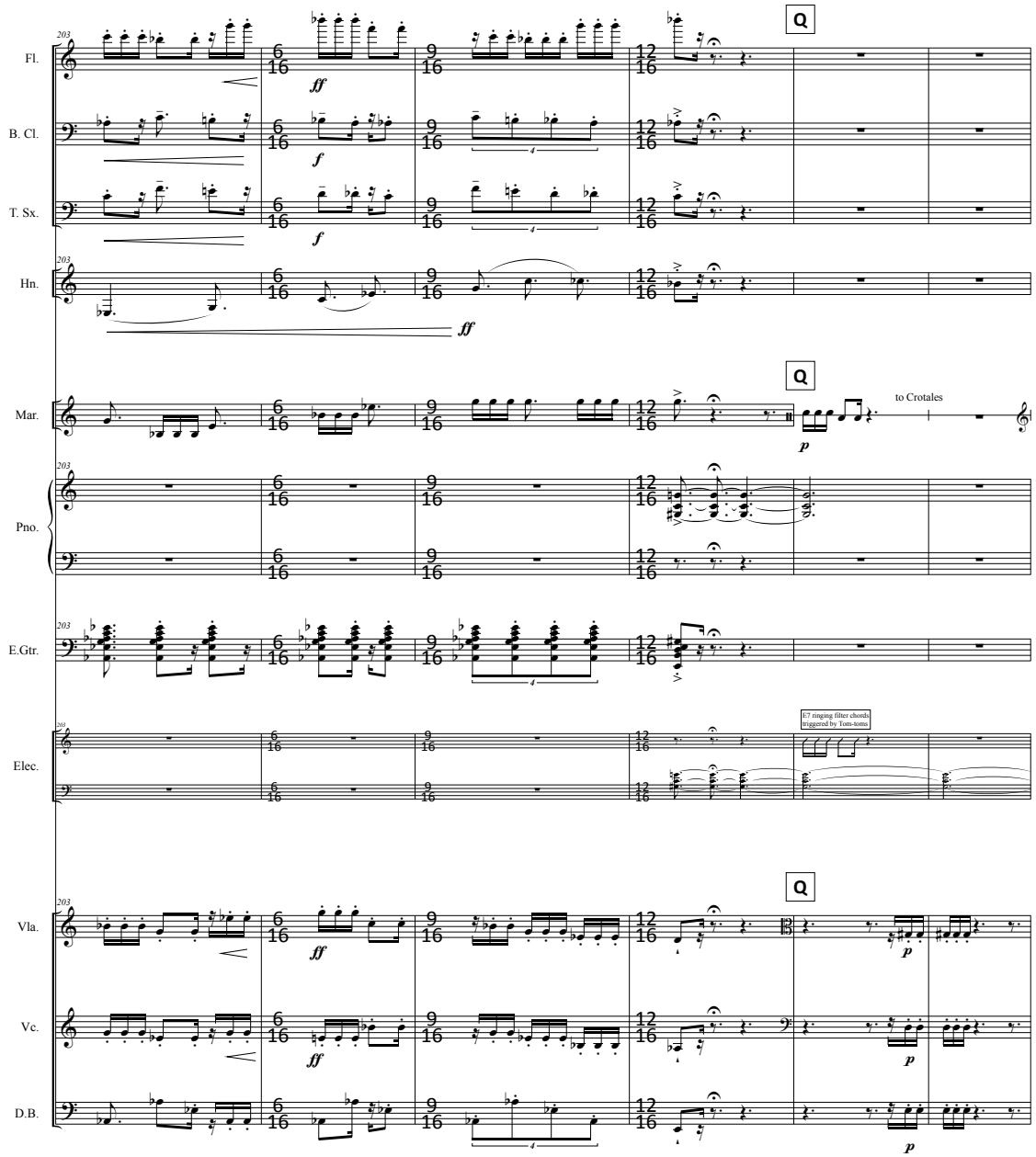

N
Fl.
B. Cl.
T. Sx.
182
Hn.
N
Perc.
Marimba
182
Pno.
182
E.Gtr.
Elec.
N
ord.
Vla.
ord.
Vc.
D.B.

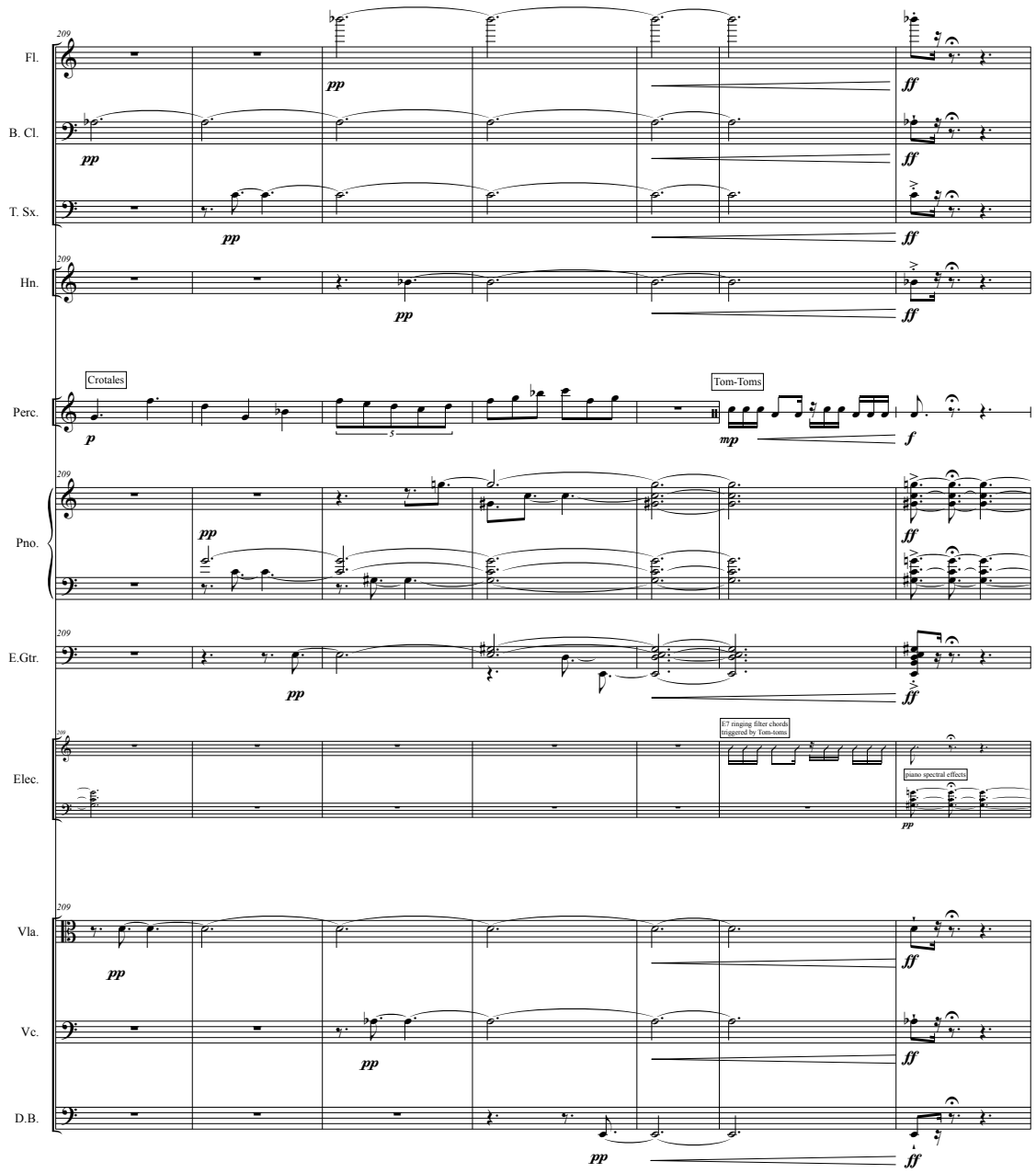

187
Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
p
mp
mf

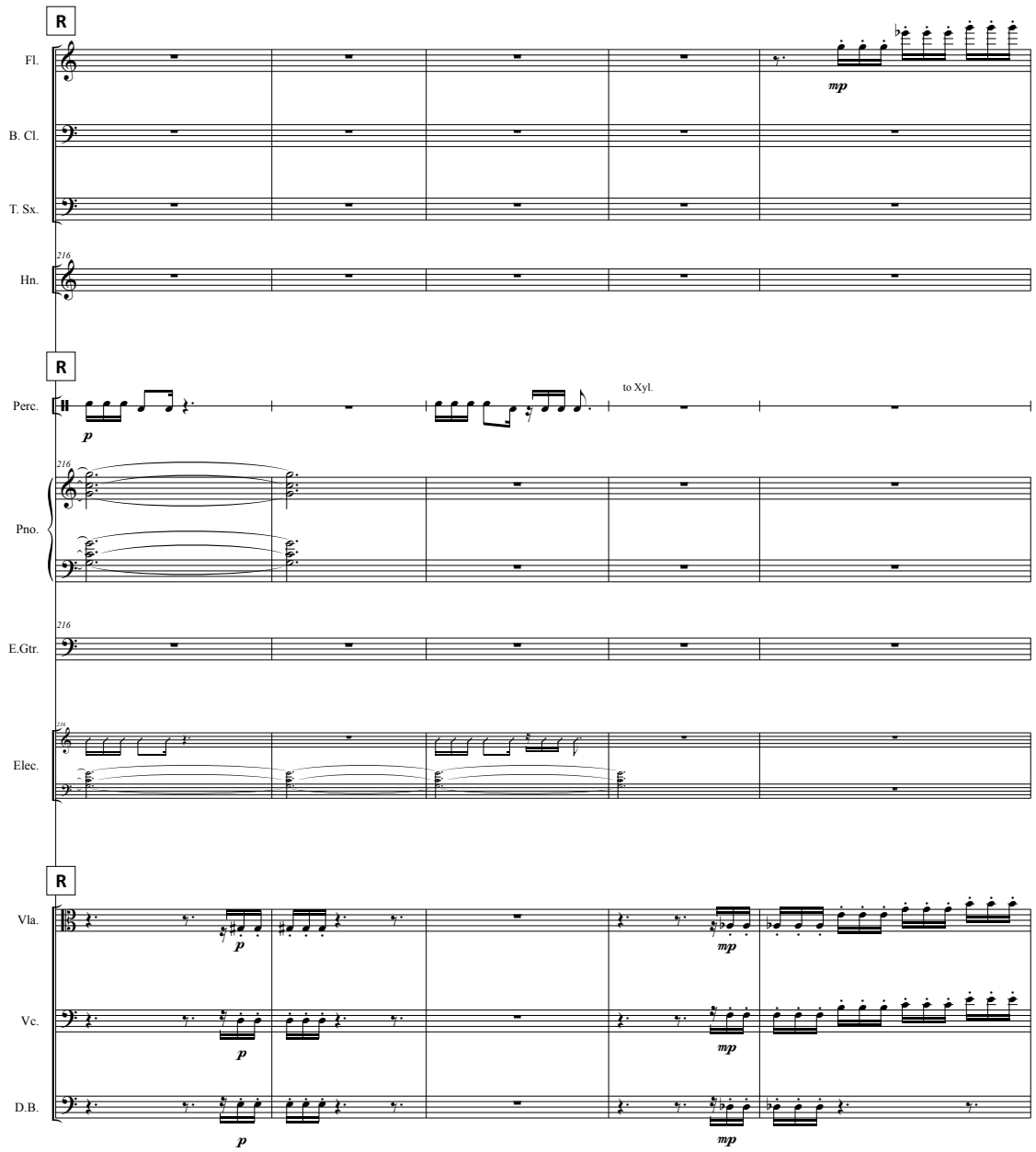

Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
191
mf
mp
8va

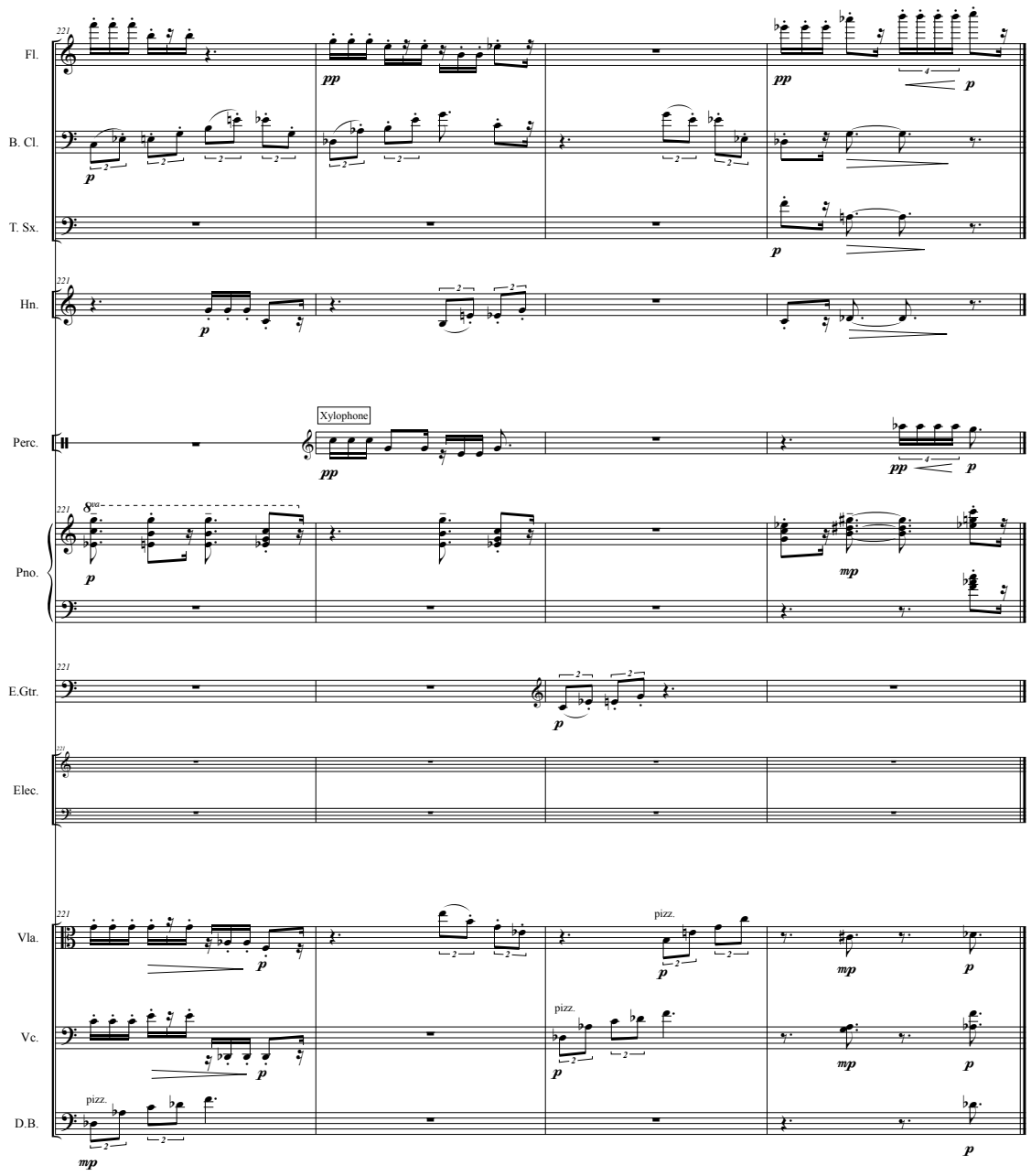

P
Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
mf
mp
p
f


199
Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
arco
mp
mf
f
9
16


Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
to Crotales
E7 ringing filter chords triggered by Toms-toms


209
Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Crotales
Tom-Toms
Pno.
E.Gtr.
Elec.
E7 ringing filter chords triggered by Tom-toms
piano spectral effects
Vla.
Vc.
D.B.
pp
ff
p
mp
f

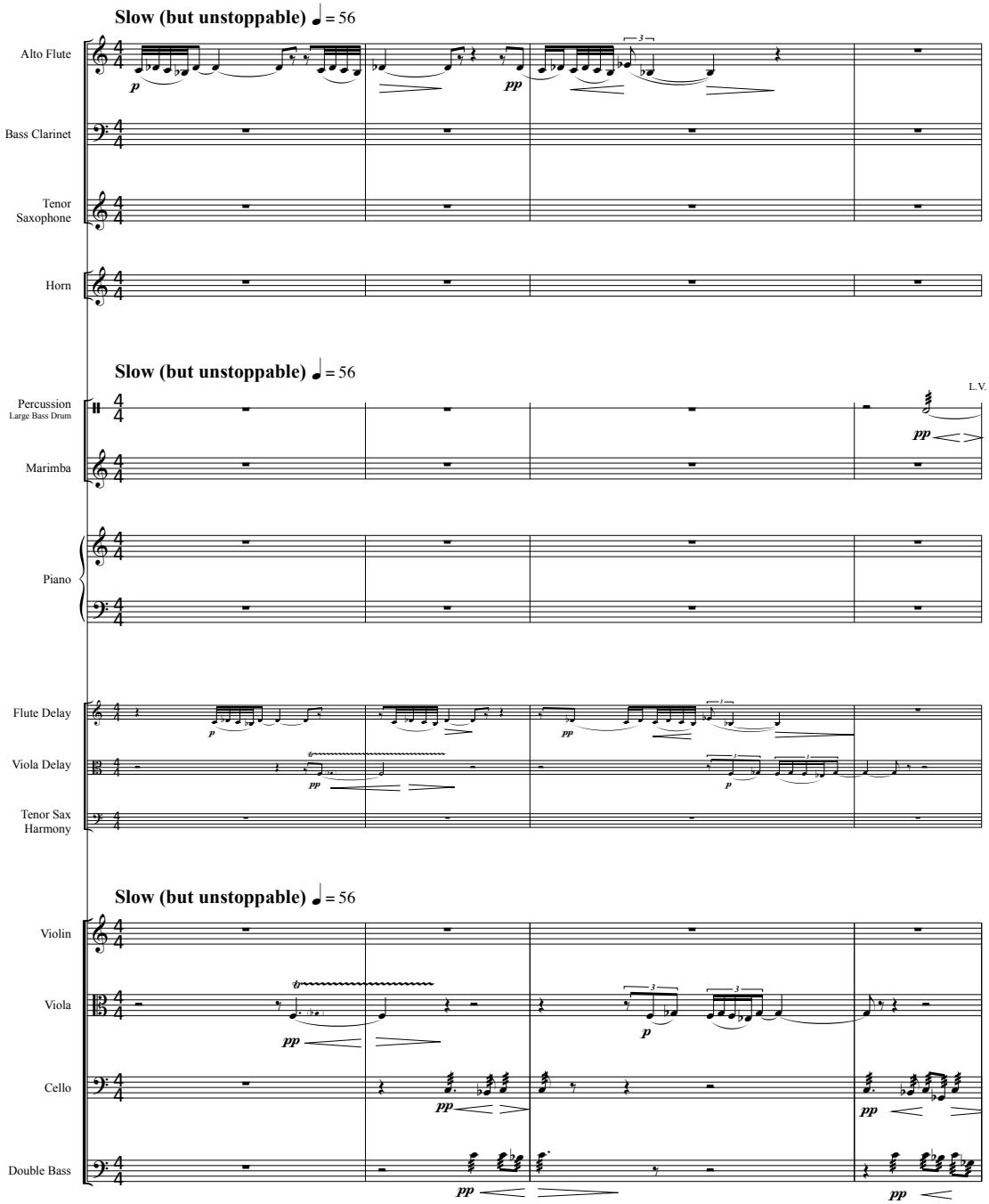

R
Fl.
B. Cl.
T. Sx.
Hn.
mp
R
Perc.
p
to Xyl.
Pno.
E.Gtr.
Elec.
R
Vla.
Vc.
D.B.
p
mp

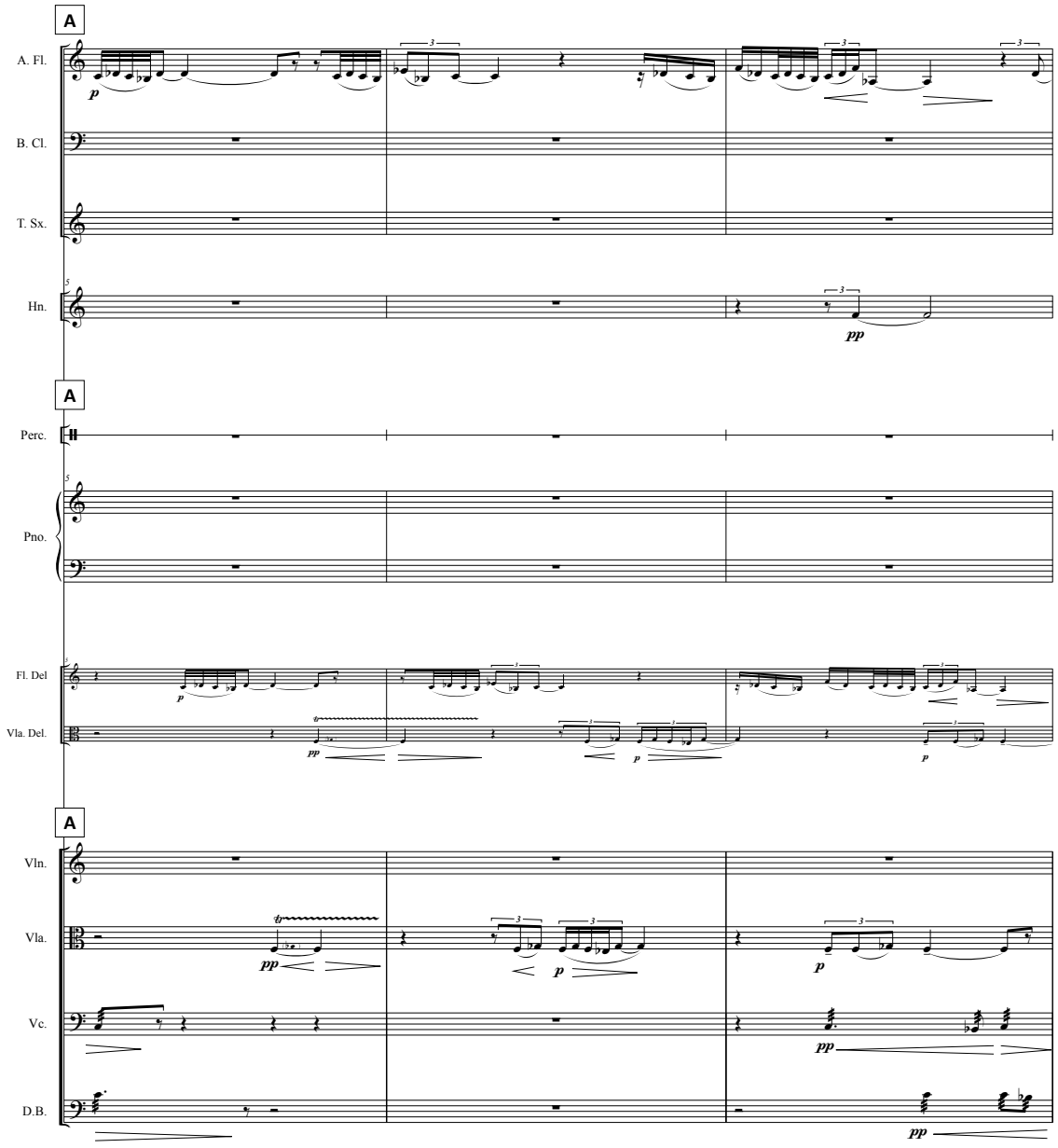

Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Xylophone
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
pizz.

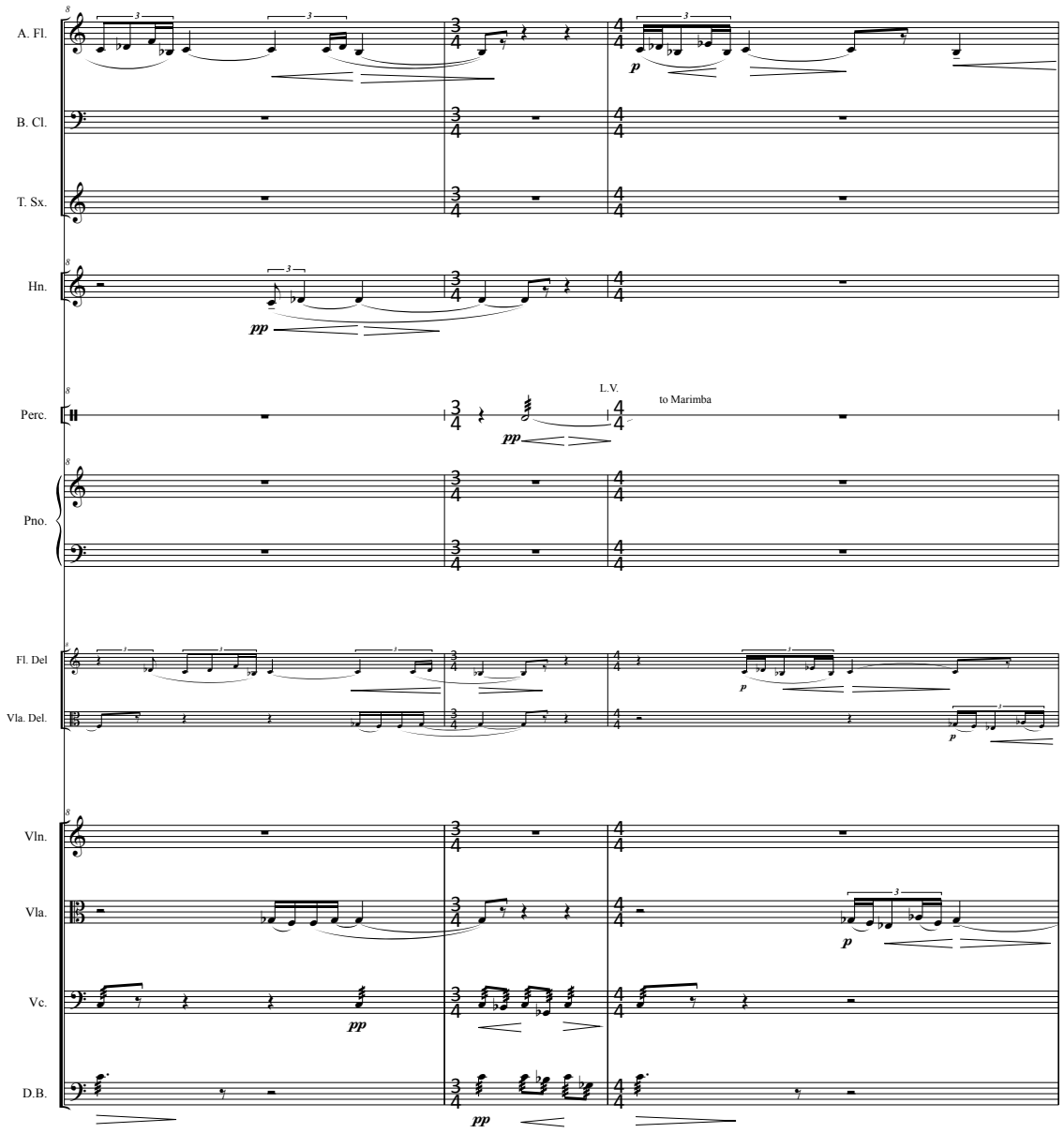
VI. Echoes in the Current

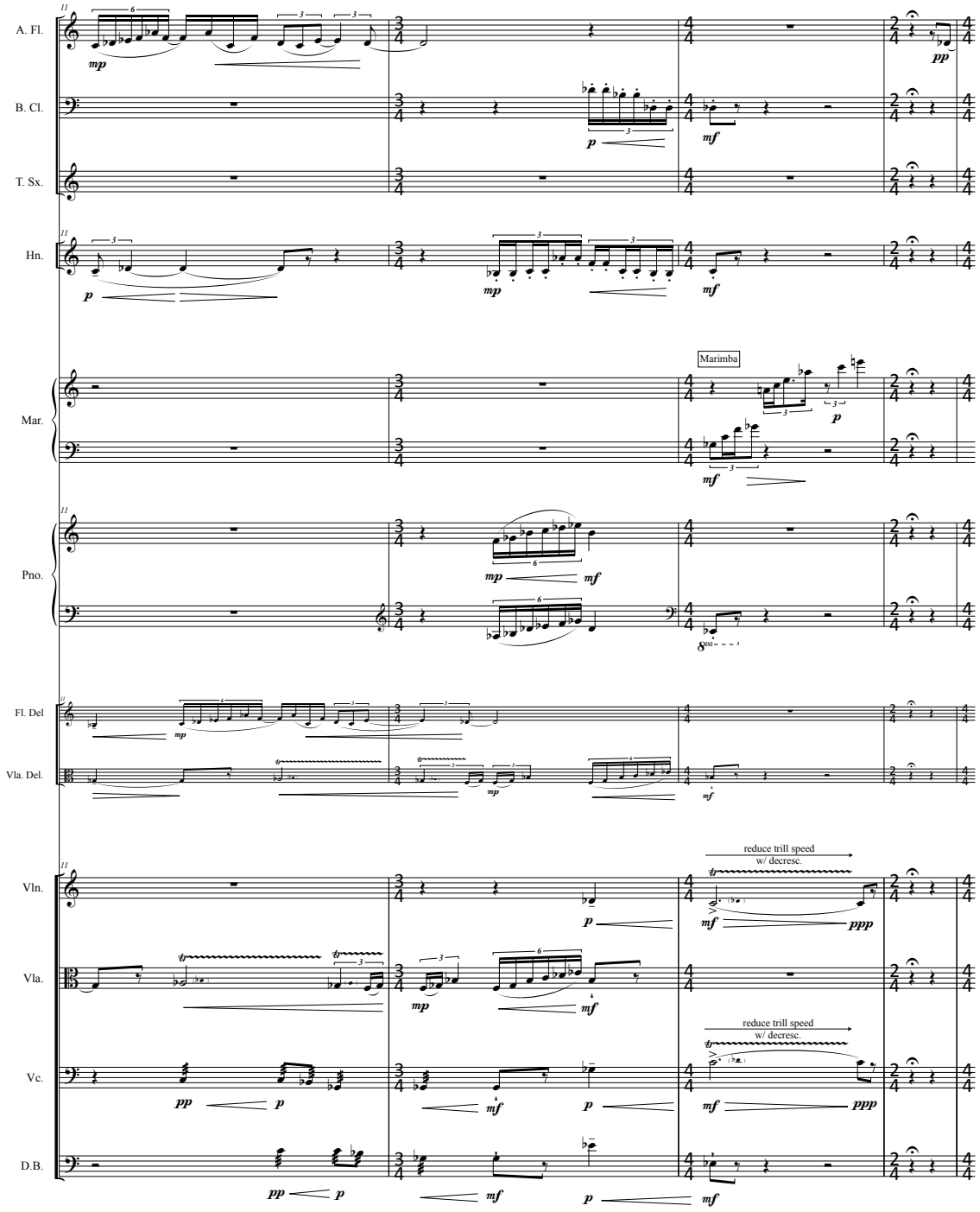
Score in C

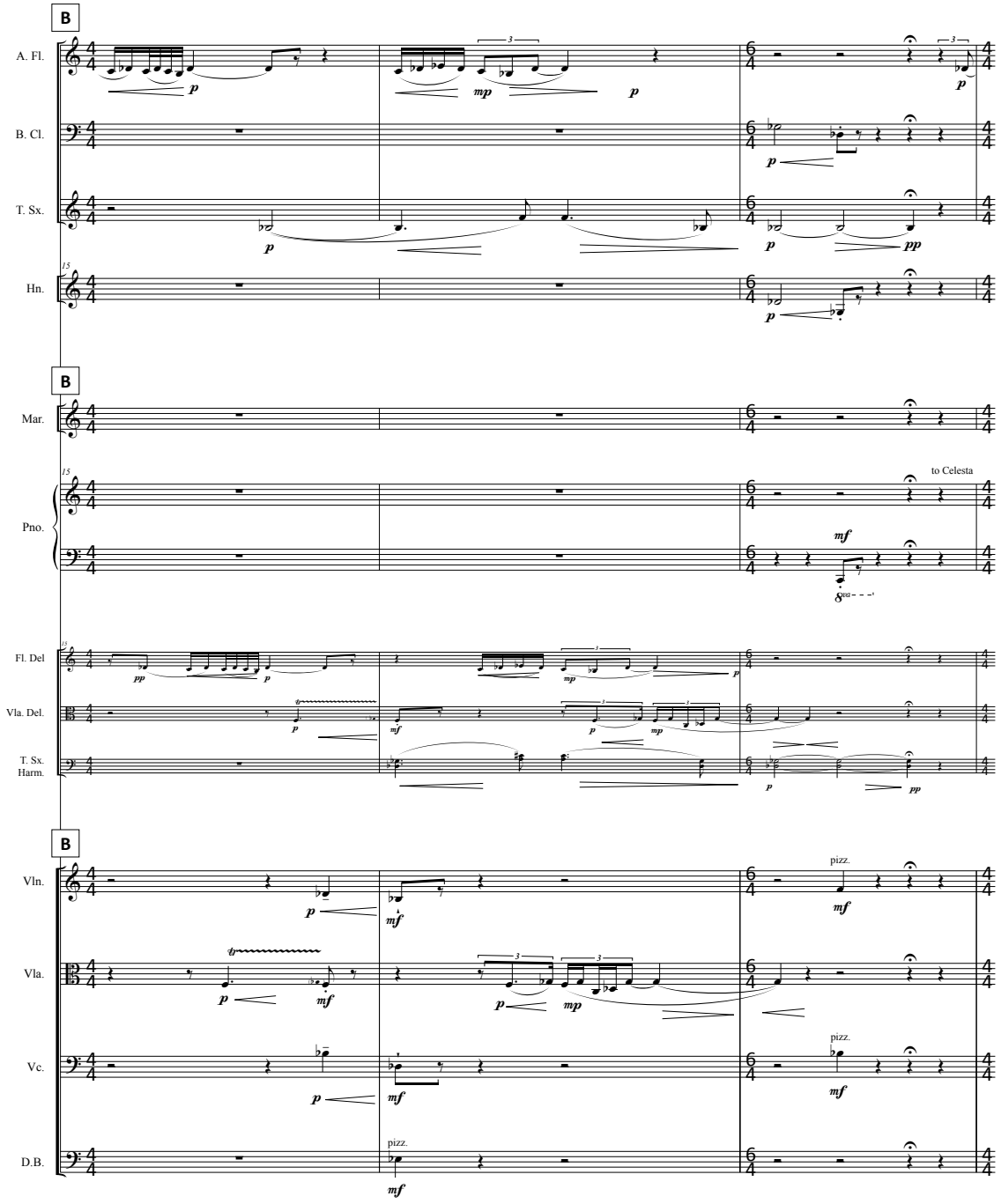
Jamie Keesecker

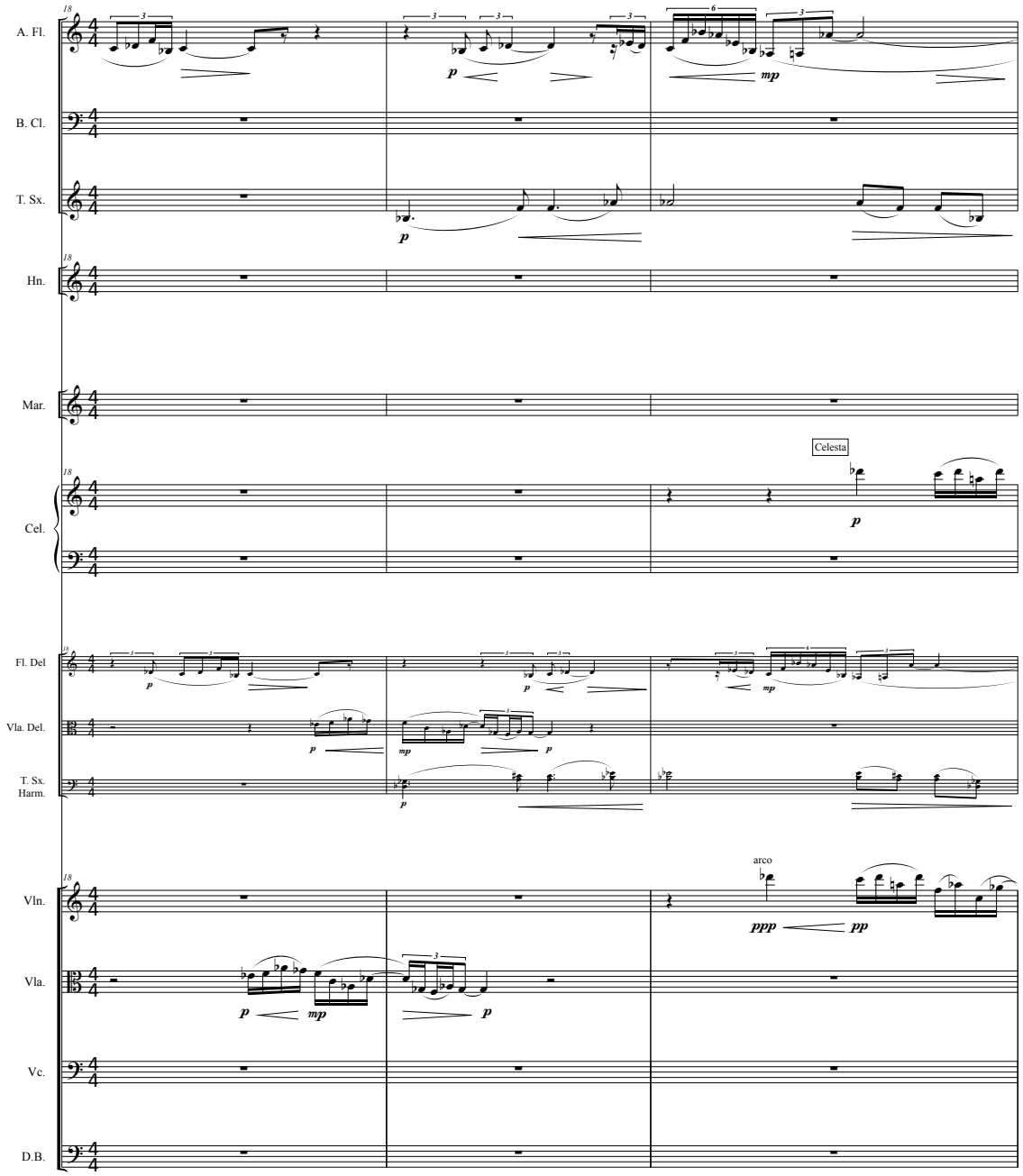


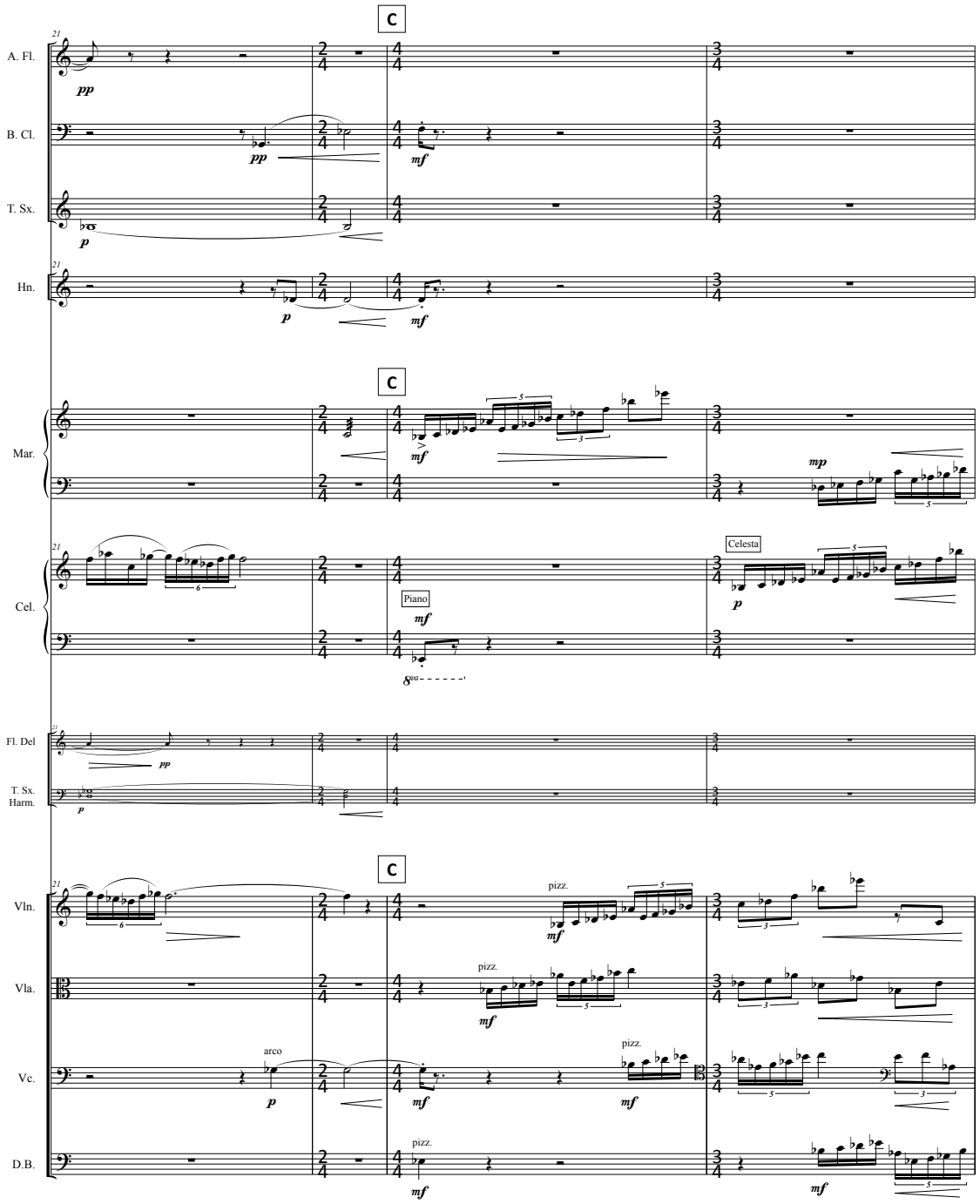

A
A. Fl.
B. Cl.
T. Sx.
Hn.
A
Perc.
Pno.
Fl. Del
Vla. Del.
A
Vln.
Vla.
Vc.
D.B.

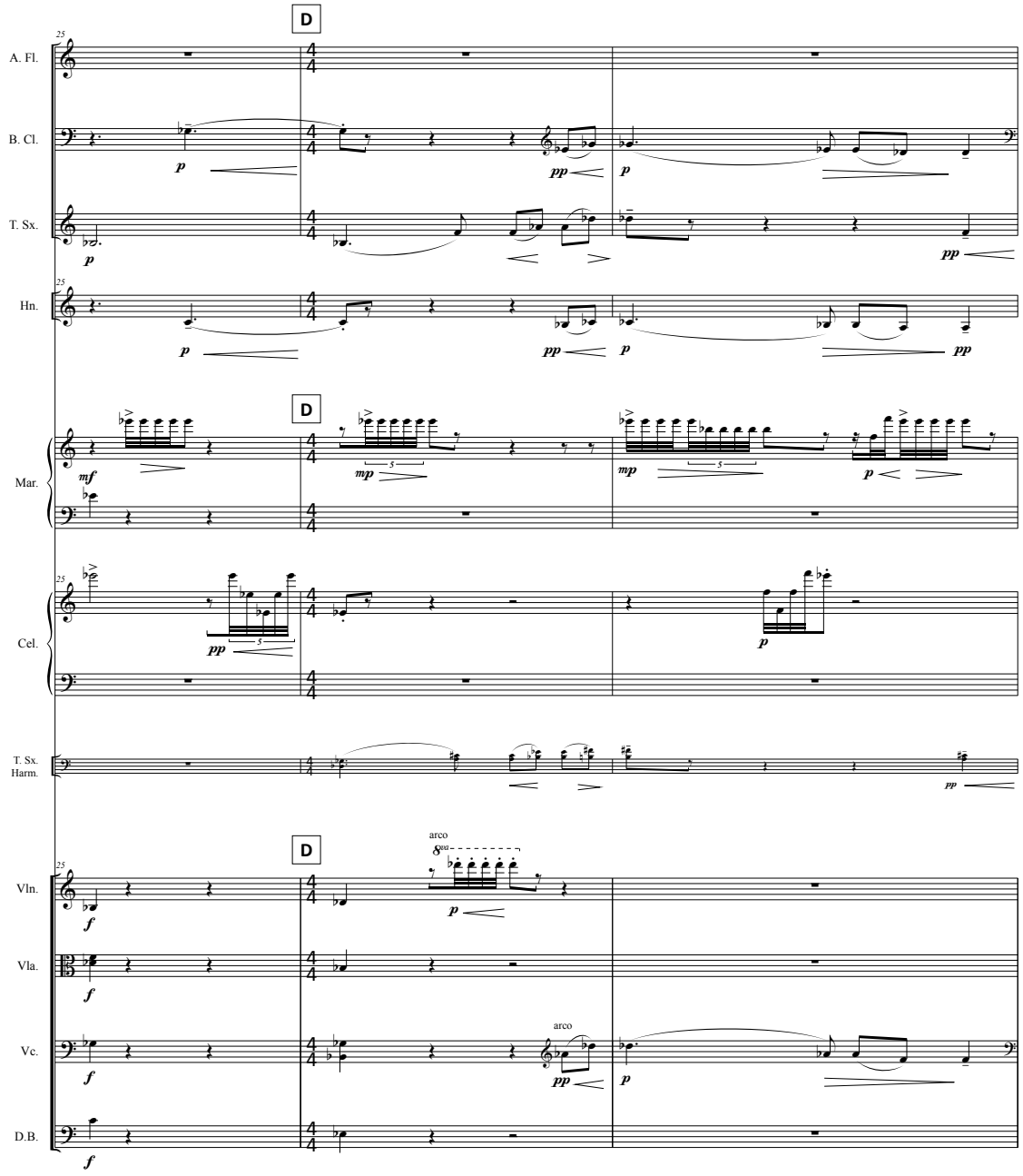

A. Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Pno.
Fl. Del
Vla. Del.
Vln.
Vla.
Vc.
D.B.
L.V.
to Marimba

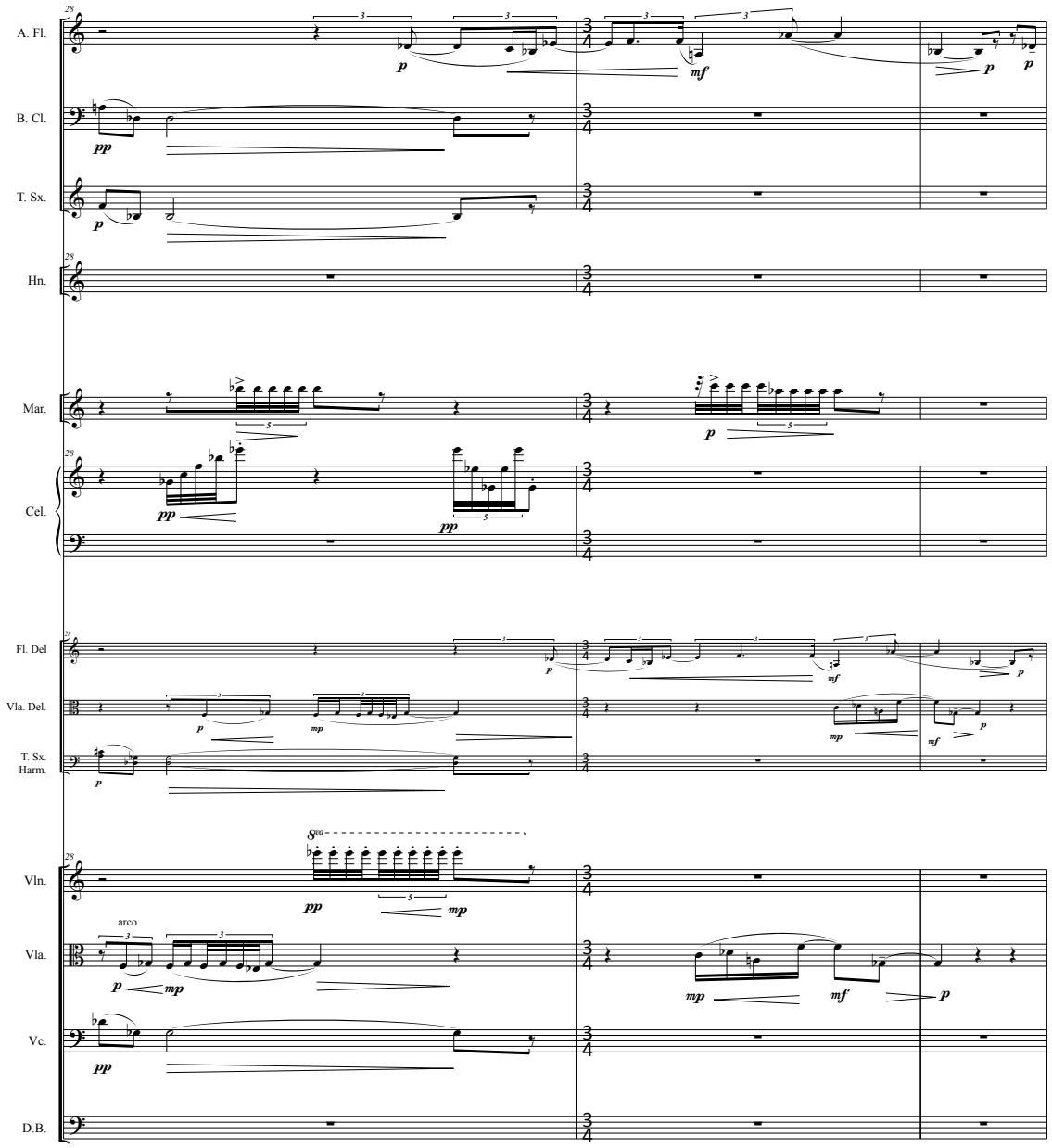

A. Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Marimba
Pno.
Fl. Del
Vla. Del.
Vln.
Vla.
Vc.
D.B.
reduce trill speed
w/ decresc.
reduce trill speed
w/ decresc.

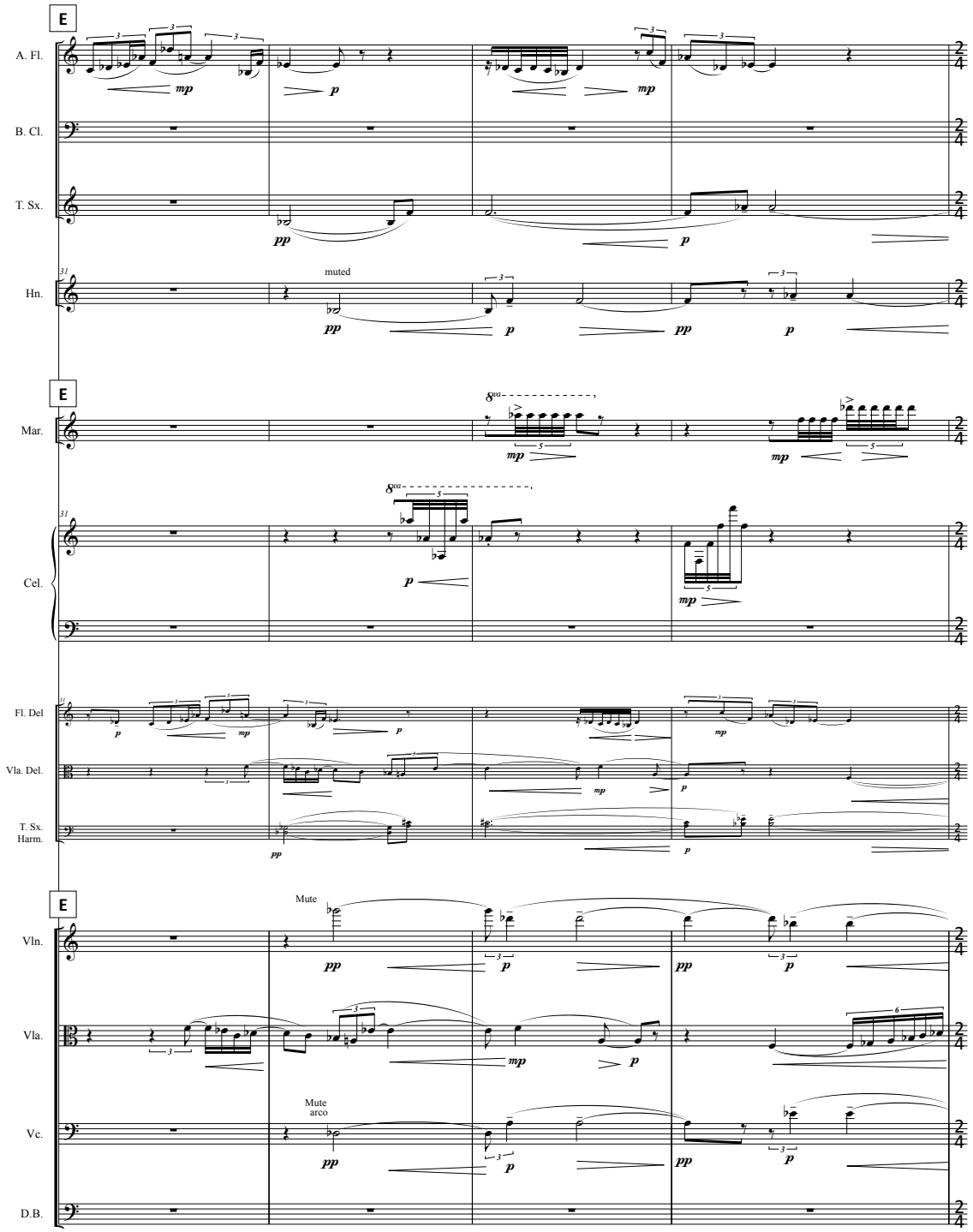

B
A. Fl.
B. Cl.
T. Sx.
Hn.
B
Mar.
Pno.
to Celesta
Fl. Del
Vla. Del.
T. Sx.
Harm.
B
Vln.
Vla.
Vc.
D.B.
pizz.

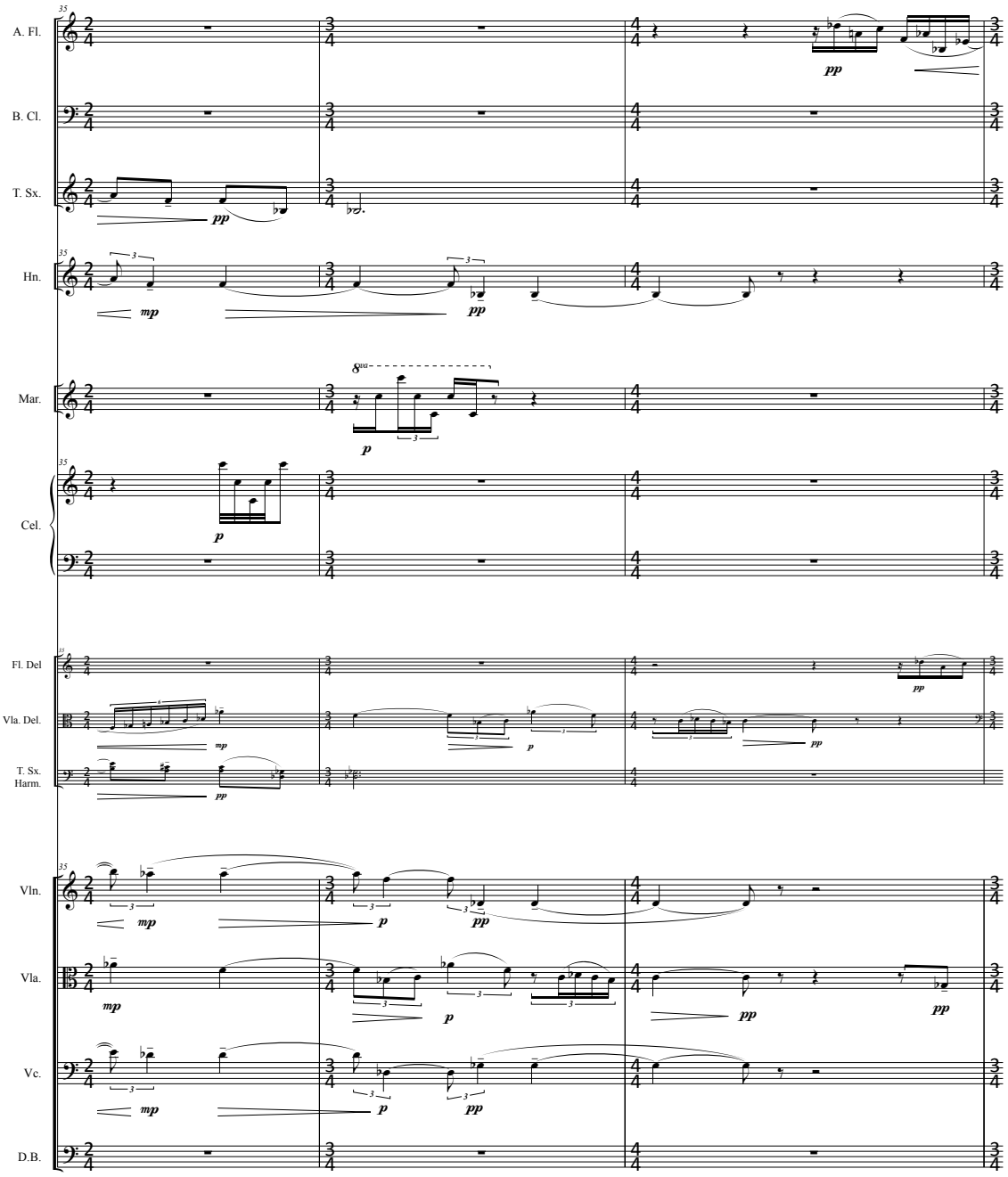

A. Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Cel.
Celesta
Fl. Del
Vla. Del.
T. Sx. Harm.
Vln.
Vla.
Vc.
D.B.
arco

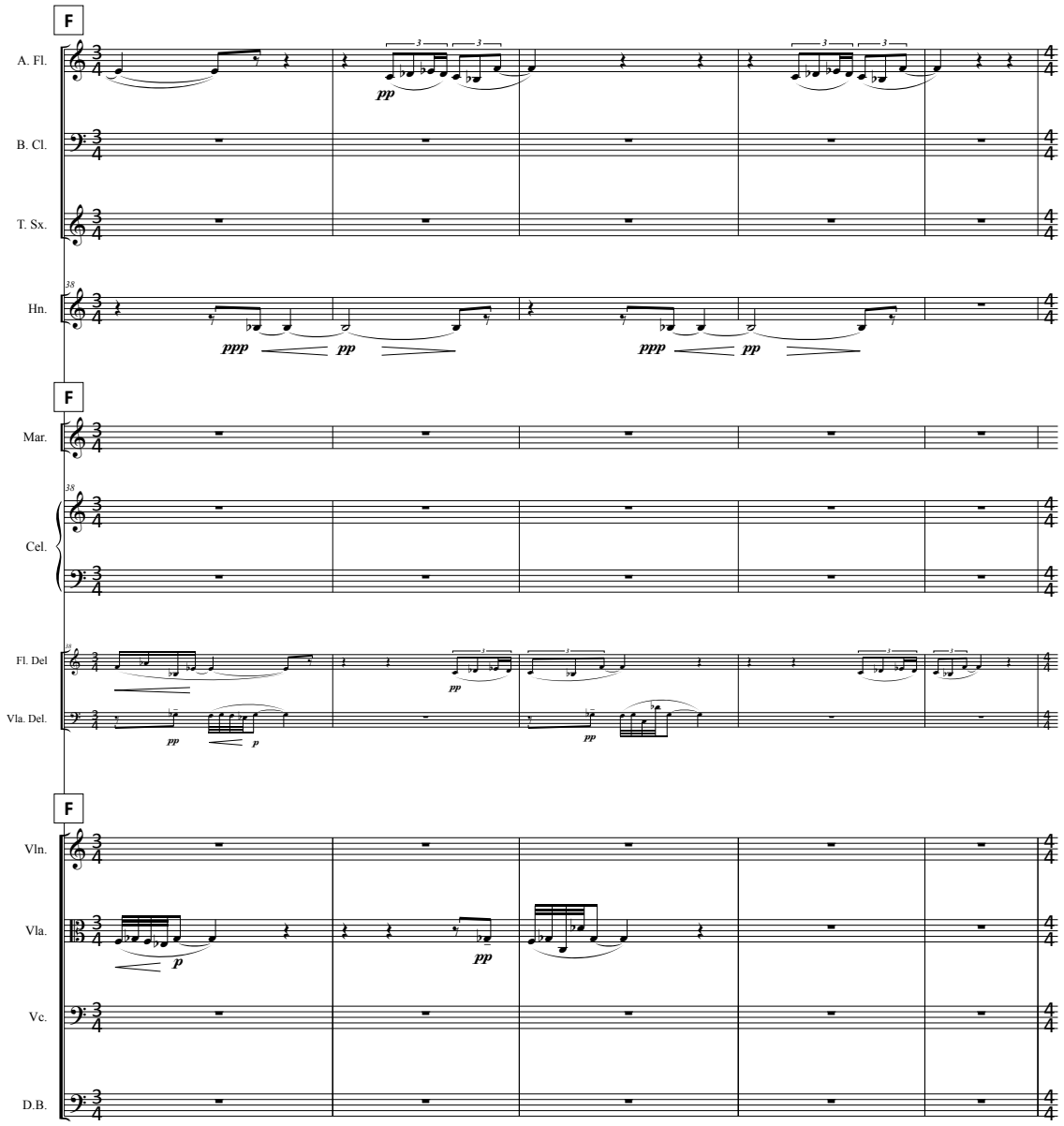

C
A. Fl.
B. Cl.
T. Sx.
Hn.
C
Mar.
Cel.
Piano
Celesta
Fl. Del
T. Sx.
Harm.
C
Vln.
Vla.
Vc.
D.B.
pizz.
arco

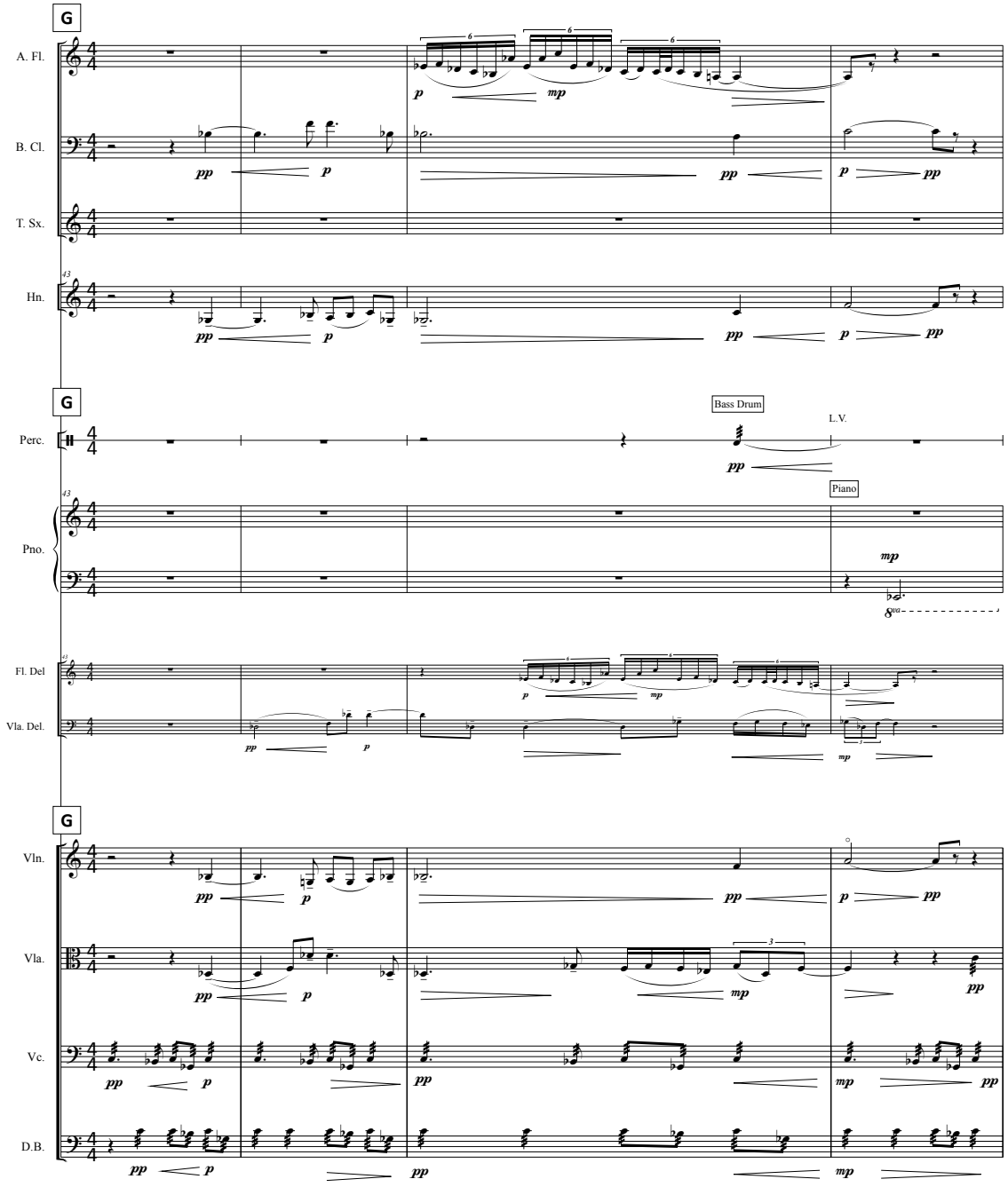

D
A. Fl.
B. Cl.
T. Sx.
Hn.
D
Mar.
Cel.
T. Sx.
Harm.
D
arco
Vln.
Vla.
arco
Vc.
D.B.

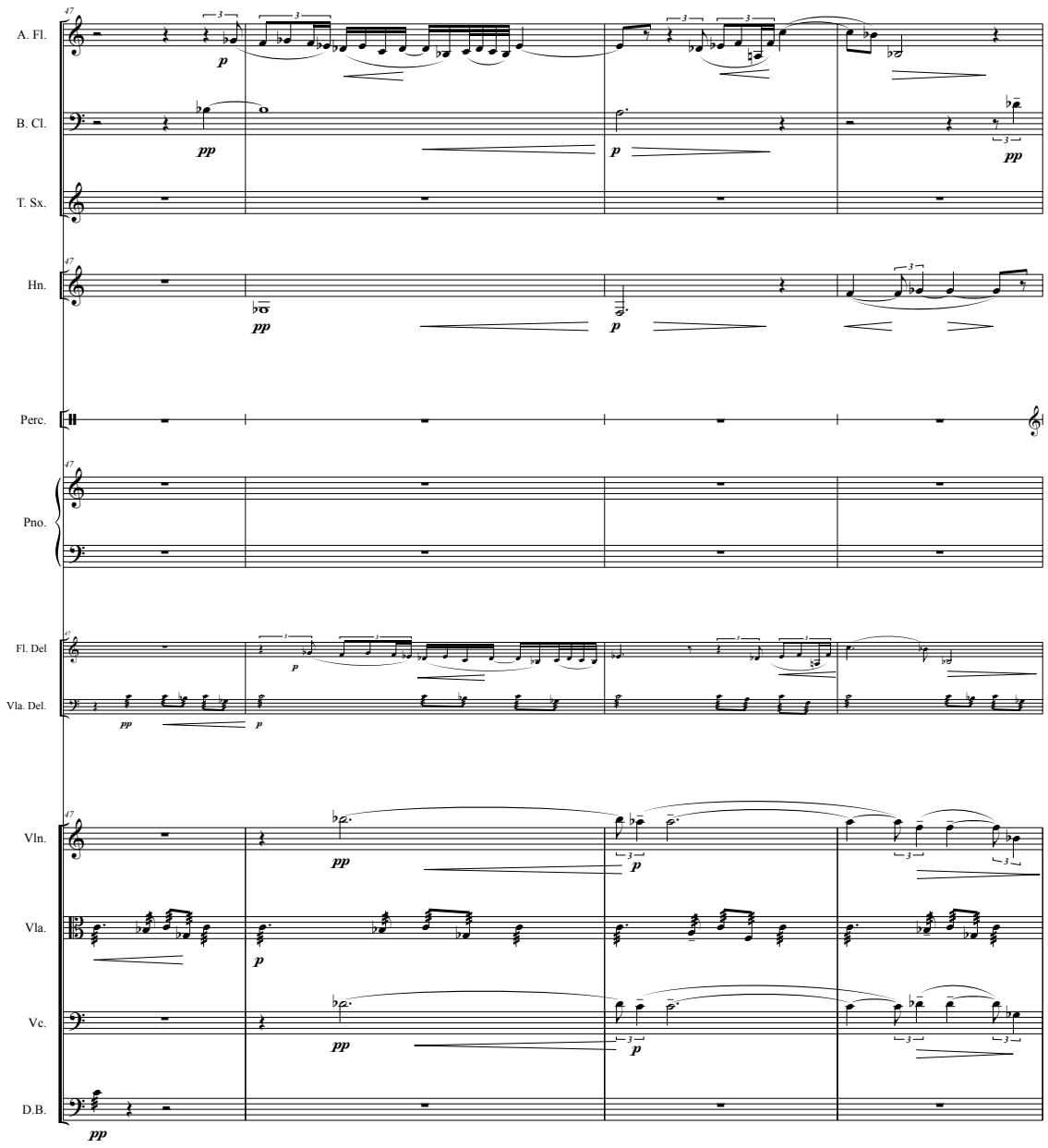

A. Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Cel.
Fl. Del
Vla. Del.
T. Sx.
Harm.
Vln.
Vla.
Vc.
D.B.
arco

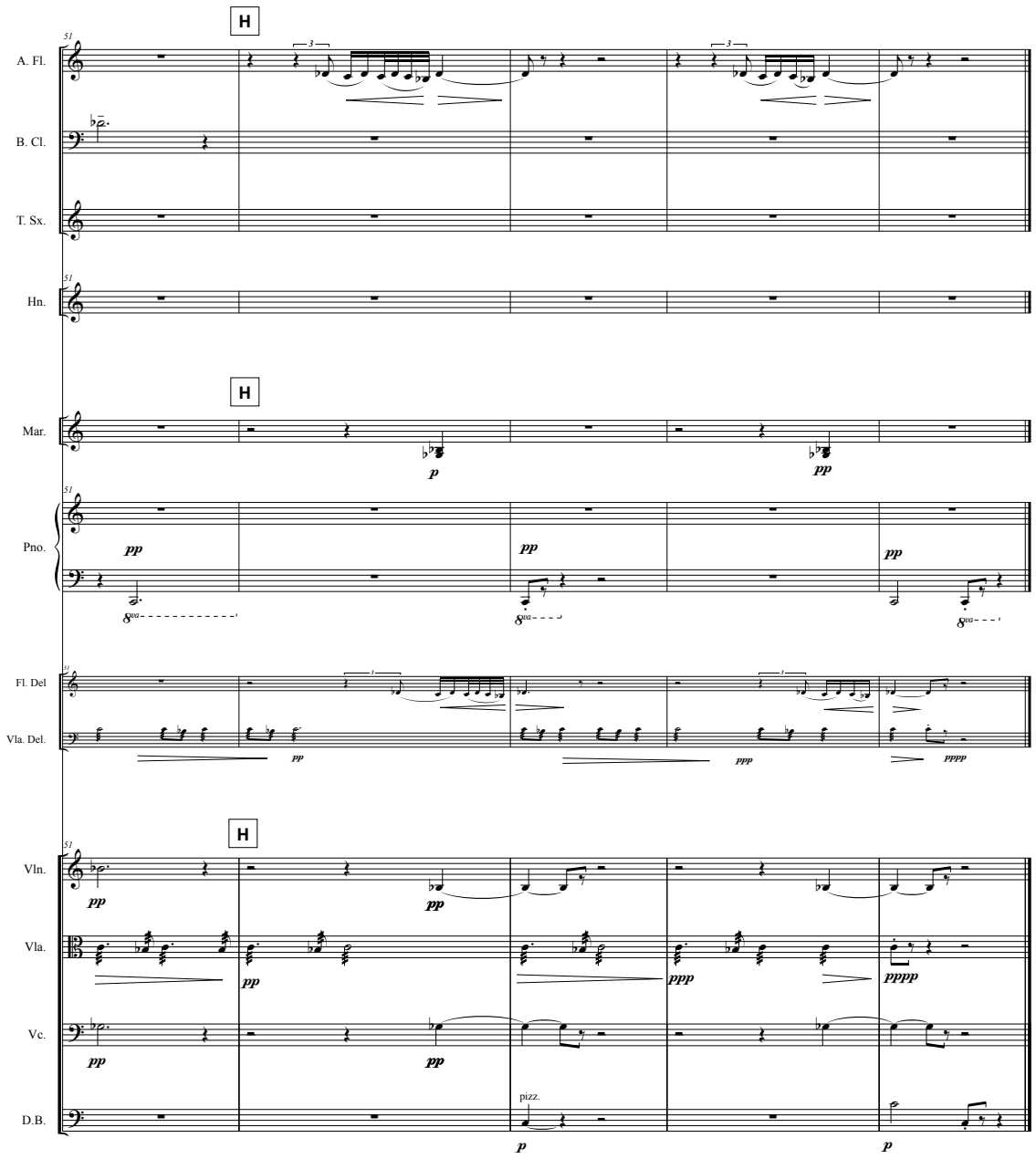

E
A. Fl.
B. Cl.
T. Sx.
Hn.
muted
E
Mar.
Cel.
Fl. Del
Vla. Del.
T. Sx.
Harm.
E
Mute
Vln.
Vla.
Mute
arco
Vc.
D.B.


A. Fl.
B. Cl.
T. Sx.
Hn.
Mar.
Cel.
Fl. Del
Vla. Del.
T. Sx.
Harm.
Vln.
Vla.
Vc.
D.B.
35
8va
pp
mp
p


F
A. Fl.
B. Cl.
T. Sx.
Hn.
38
pp
ppp
pp
ppp
pp
F
Mar.
38
Cel.
Fl. Del
Vla. Del.
pp
pp
p
pp
F
Vln.
Vla.
Vc.
D.B.
p
pp


G
A. Fl.
B. Cl.
T. Sx.
Hn.
43
G
Perc.
Bass Drum
L.V.
Piano
Pno.
Fl. Del
Vla. Del.
G
Vln.
Vla.
Vc.
D.B.

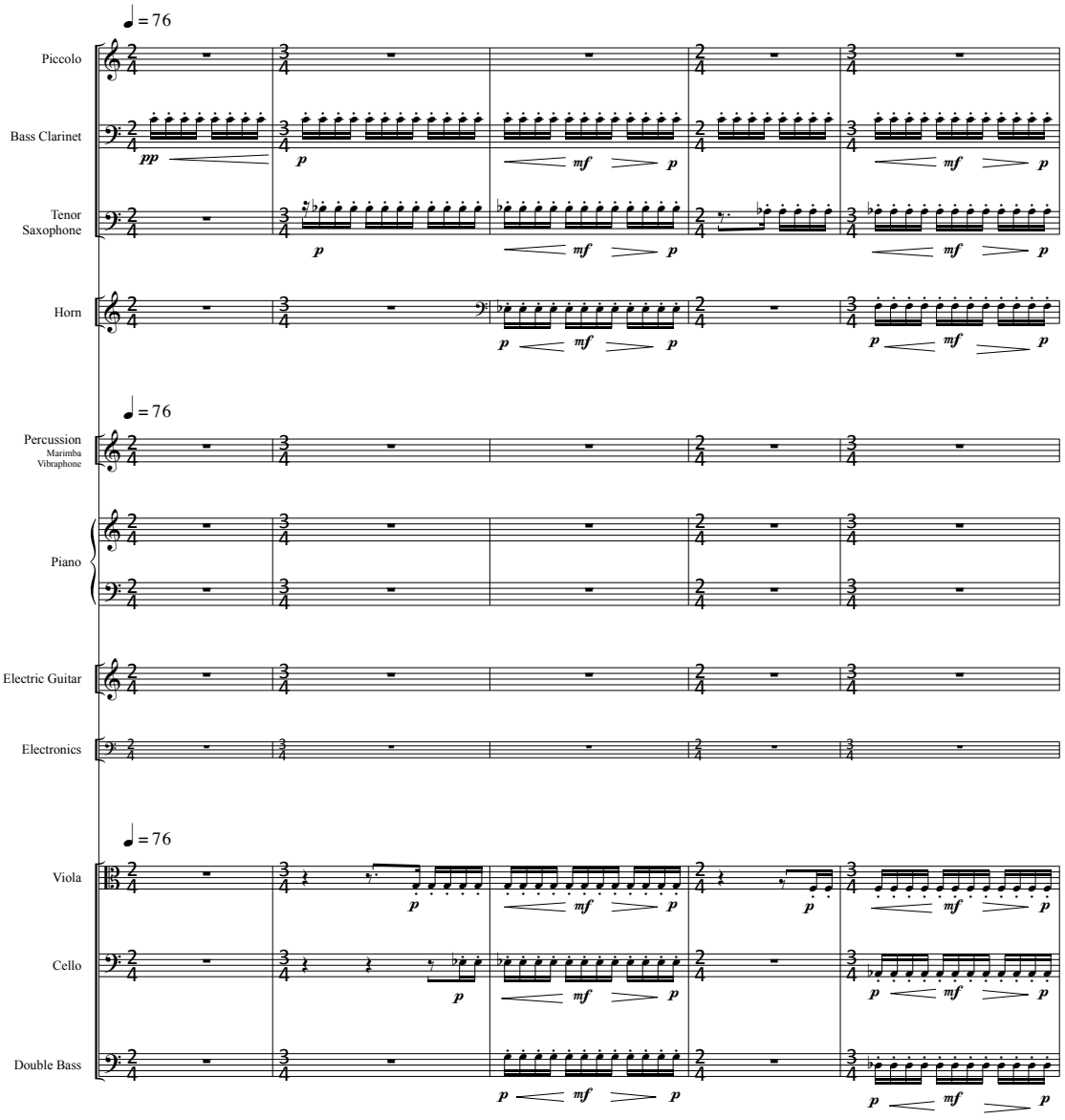

47
A. Fl.
B. Cl.
T. Sx.
Hn.
Perc.
Pno.
Fl. Del
Vla. Del.
Vln.
Vla.
Vc.
D.B.
pp
p

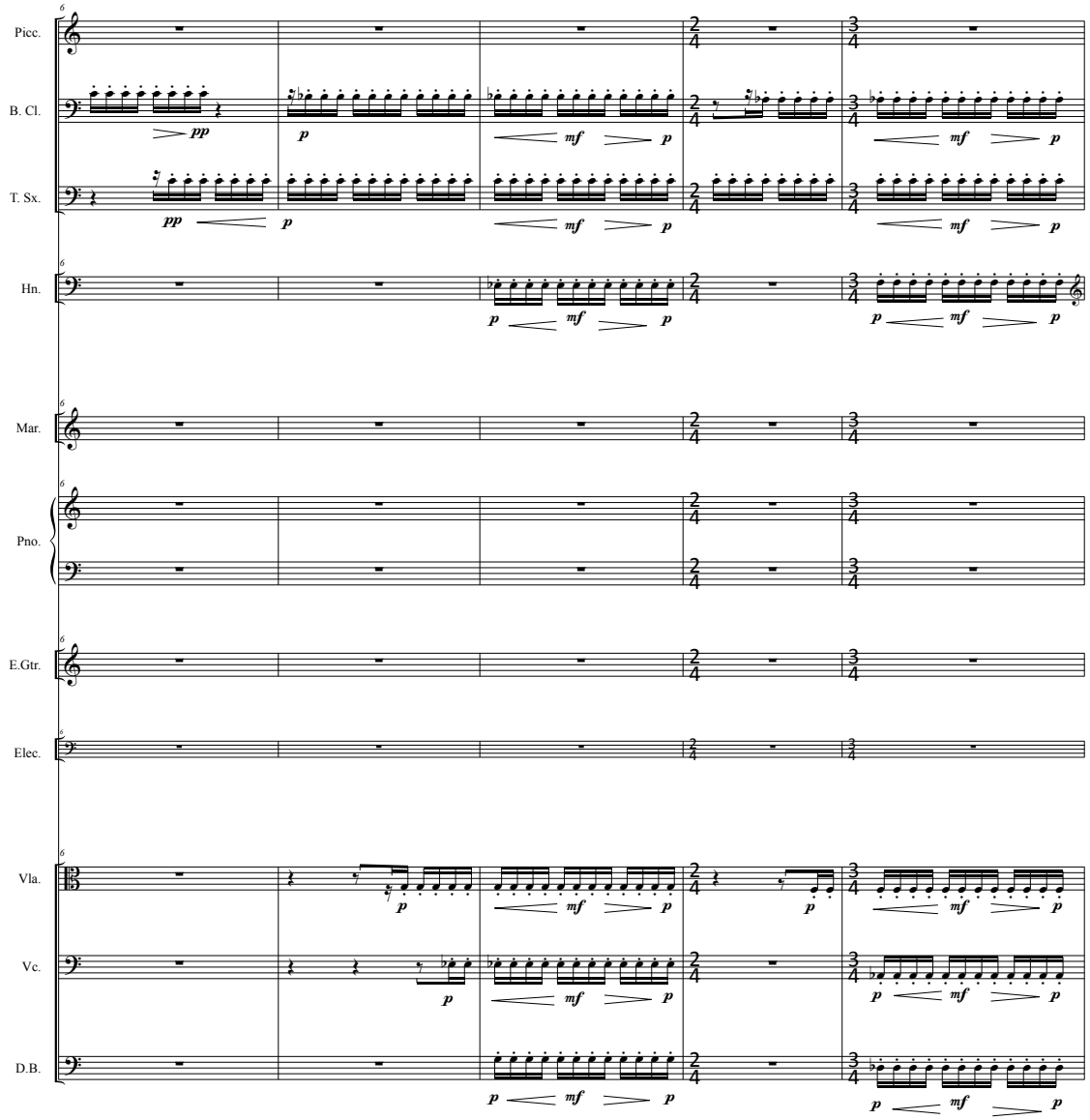

H
A. Fl.
B. Cl.
T. Sx.
Hn.
H
Mar.
p
pp
Pno.
pp
pp
pp
Fl. Del
Vla. Del.
pp
ppp
pppp
H
Vln.
pp
pp
Vla.
pp
ppp
pppp
Vc.
pp
pp
pizz.
D.B.
p
p

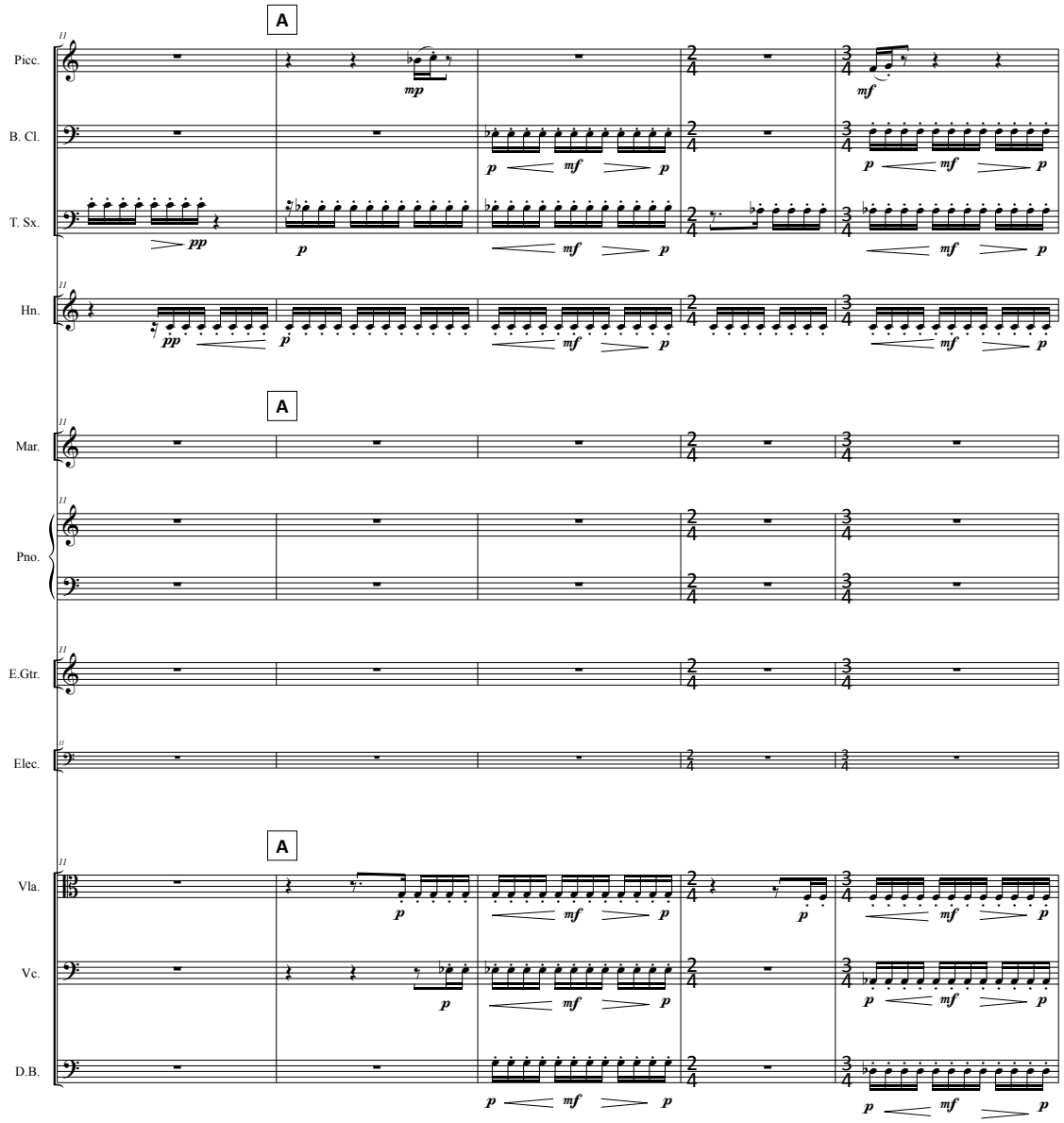
VII. Over the Long Arc

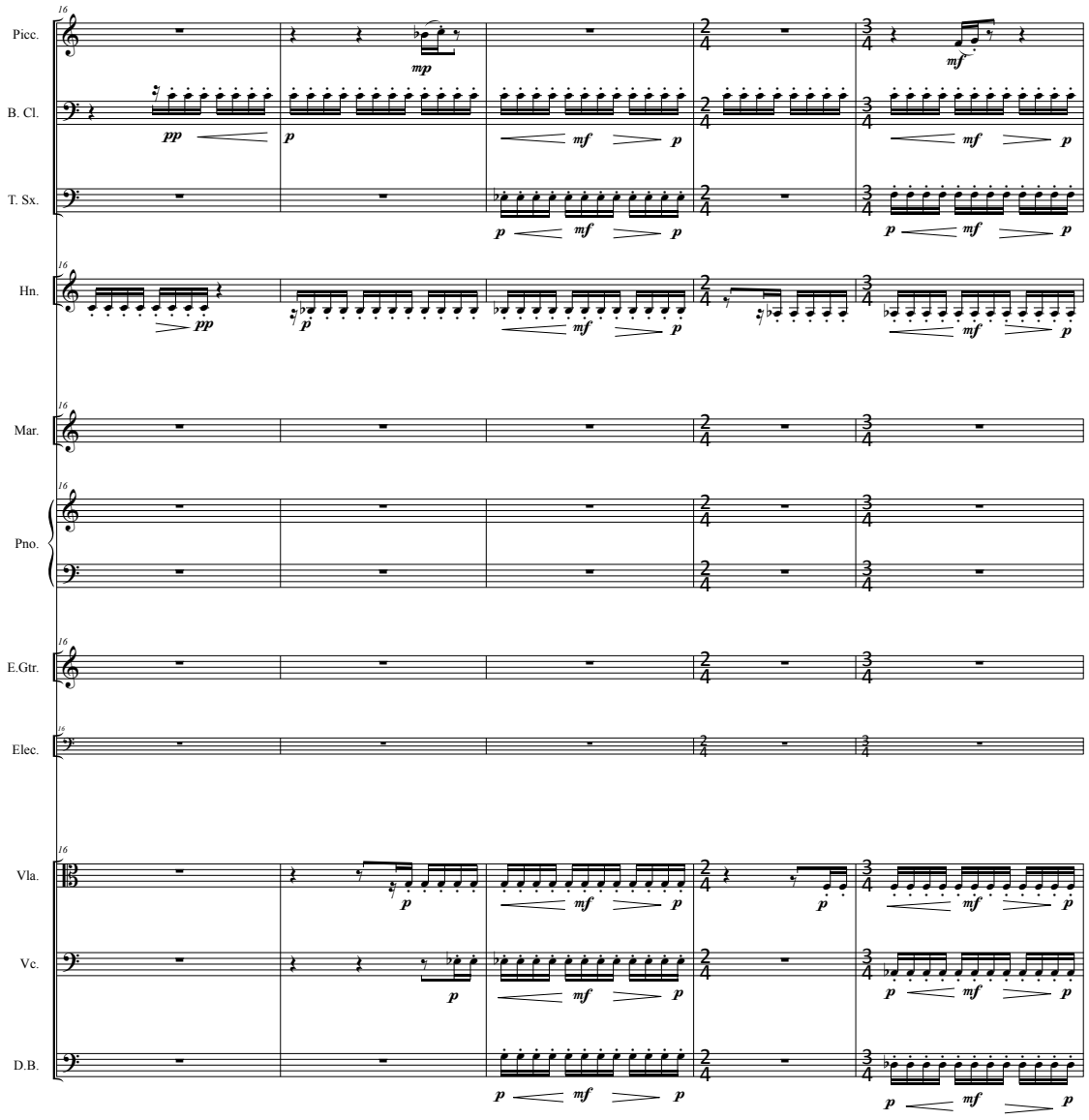
Score in C

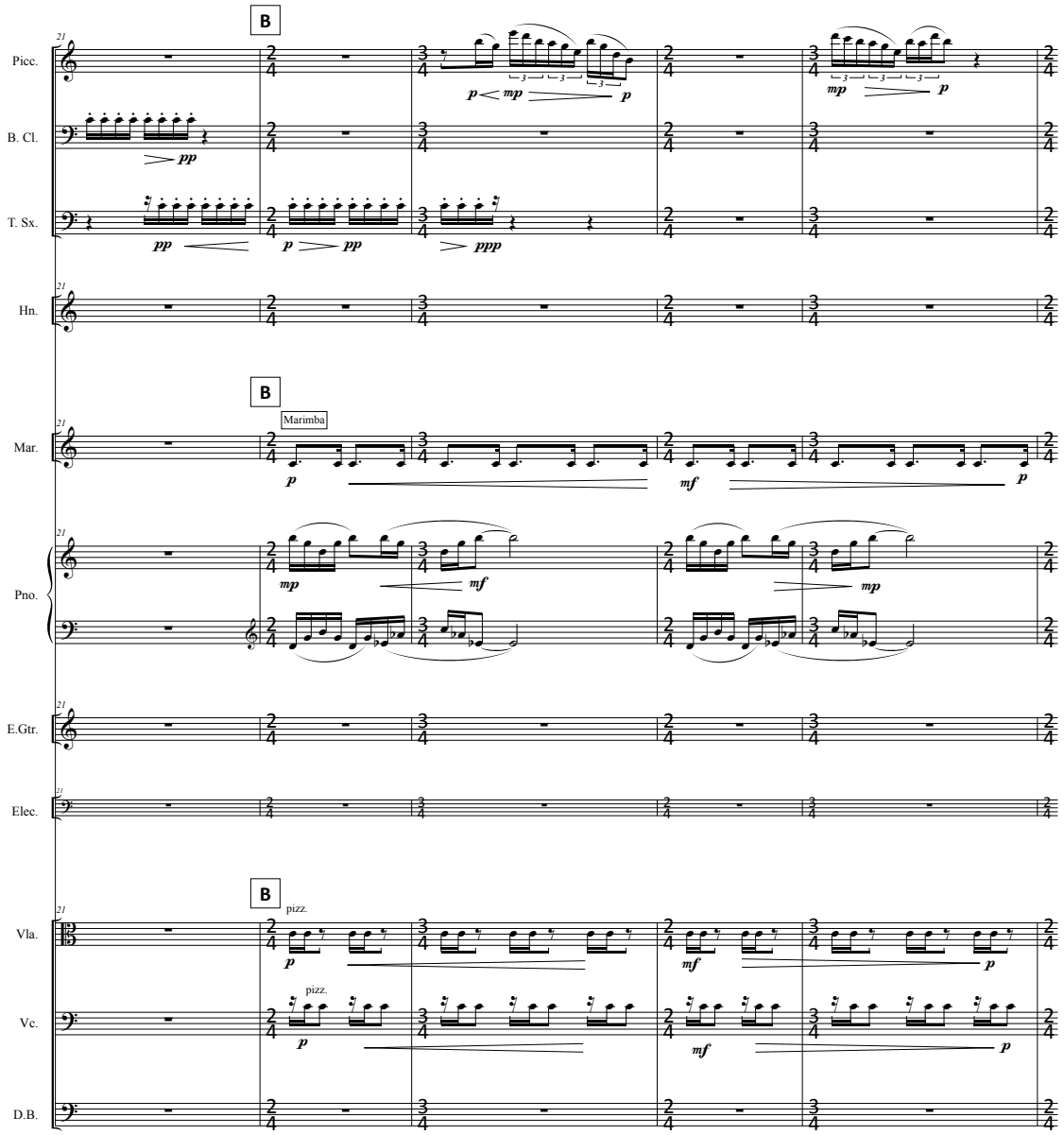
Jamie Keesecker

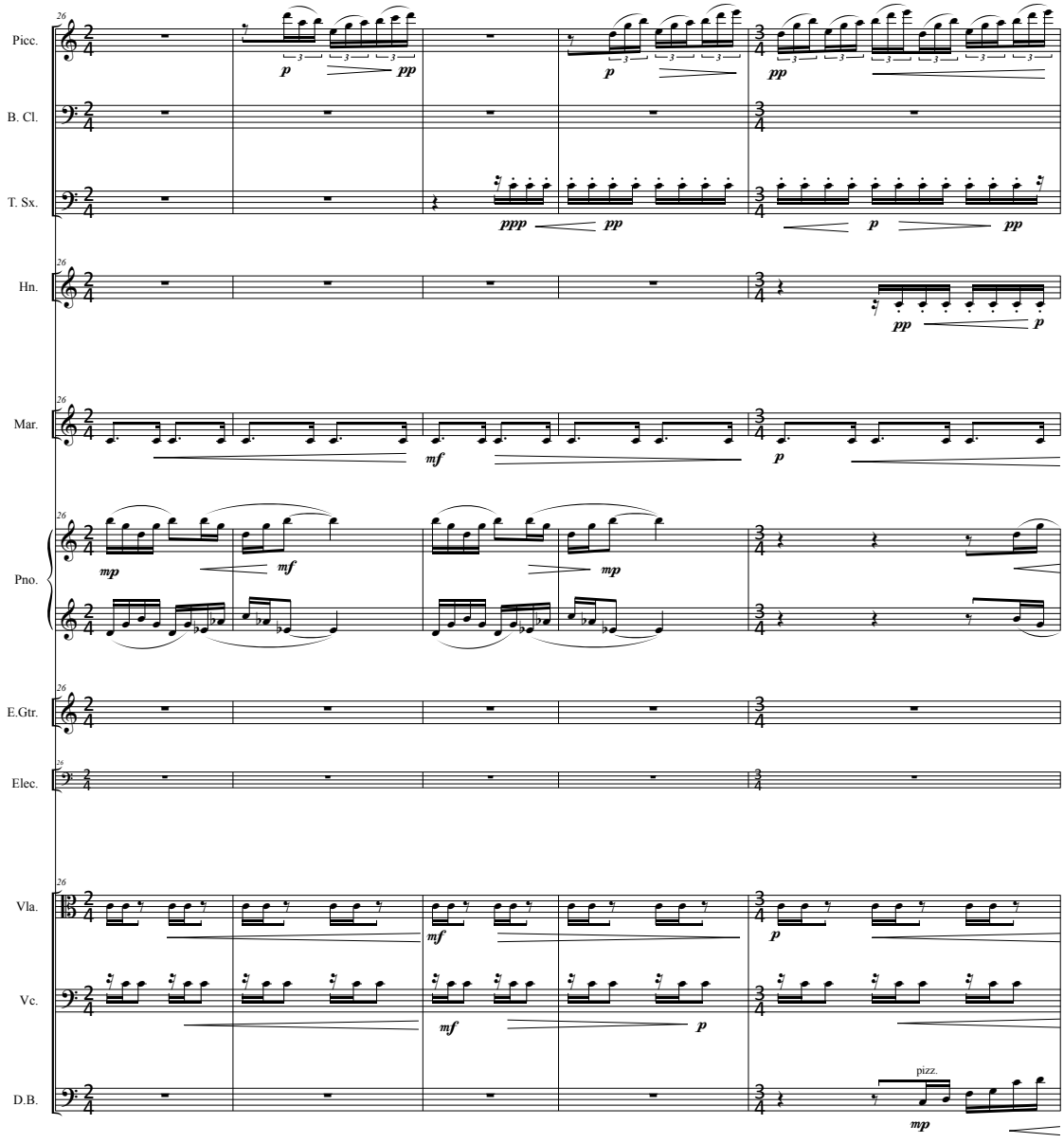


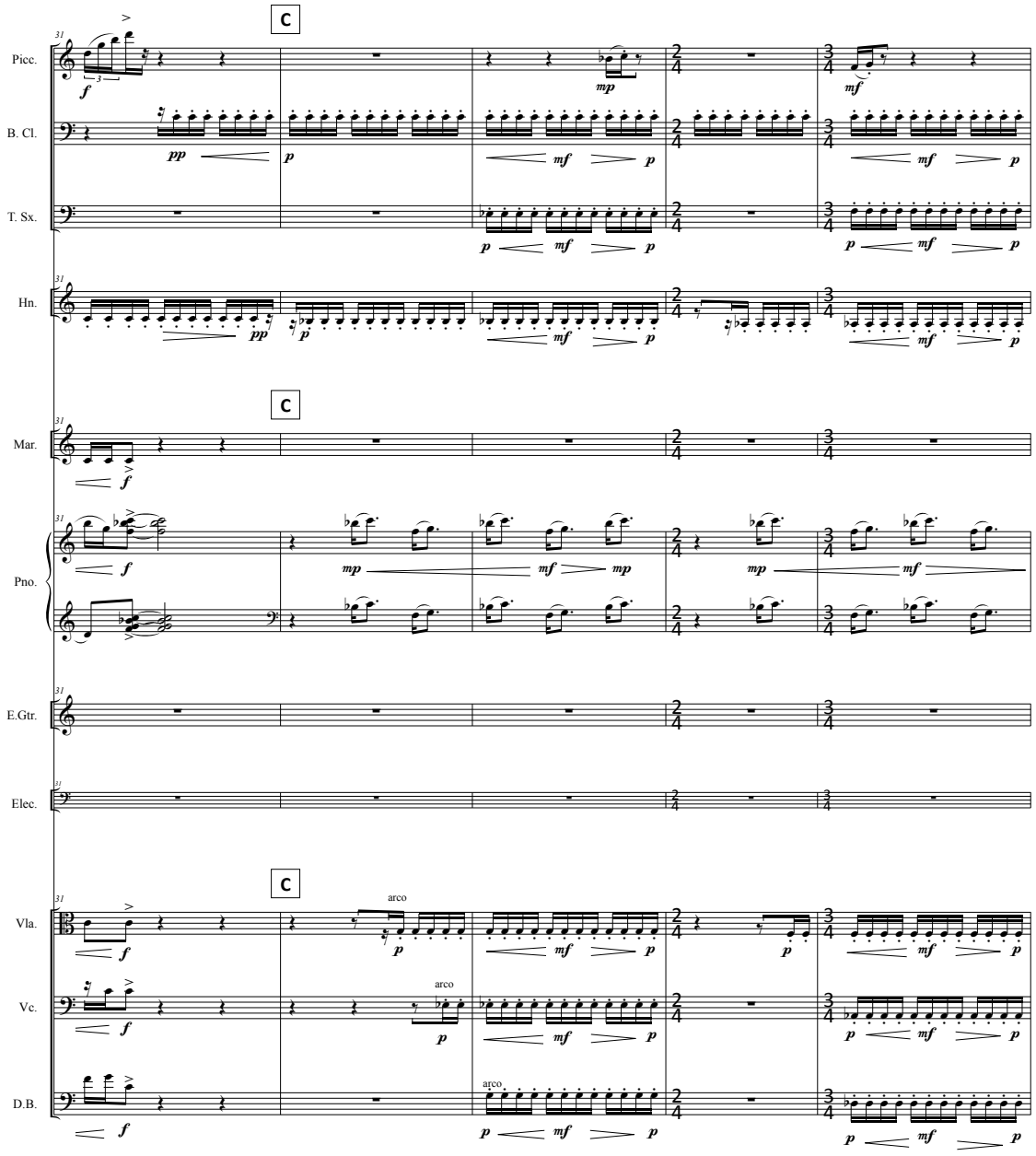

Picc.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

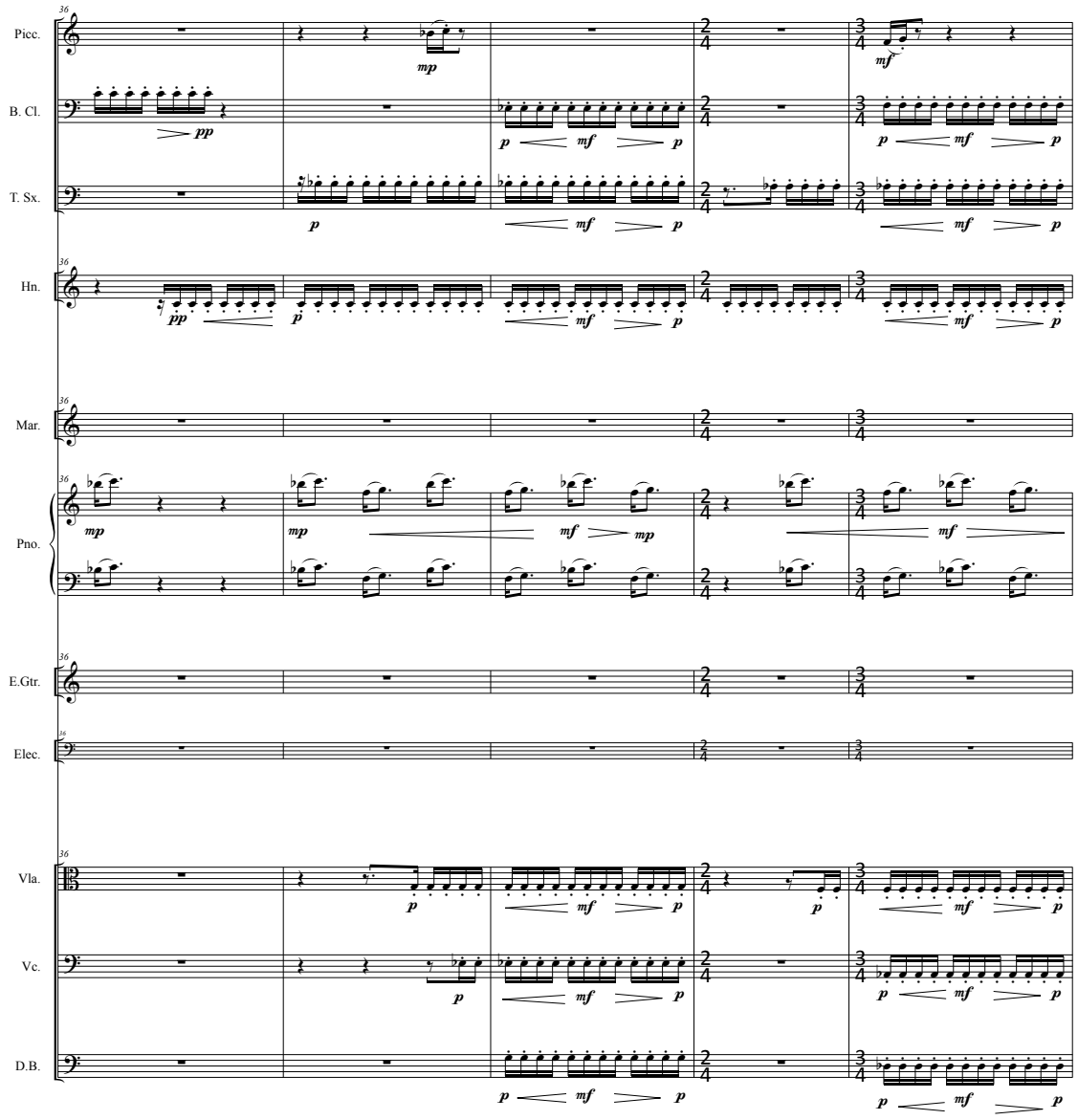

A
Picc.
B. Cl.
T. Sx.
Hn.
A
Mar.
Pno.
E.Gtr.
Elec.
A
Vla.
Vc.
D.B.

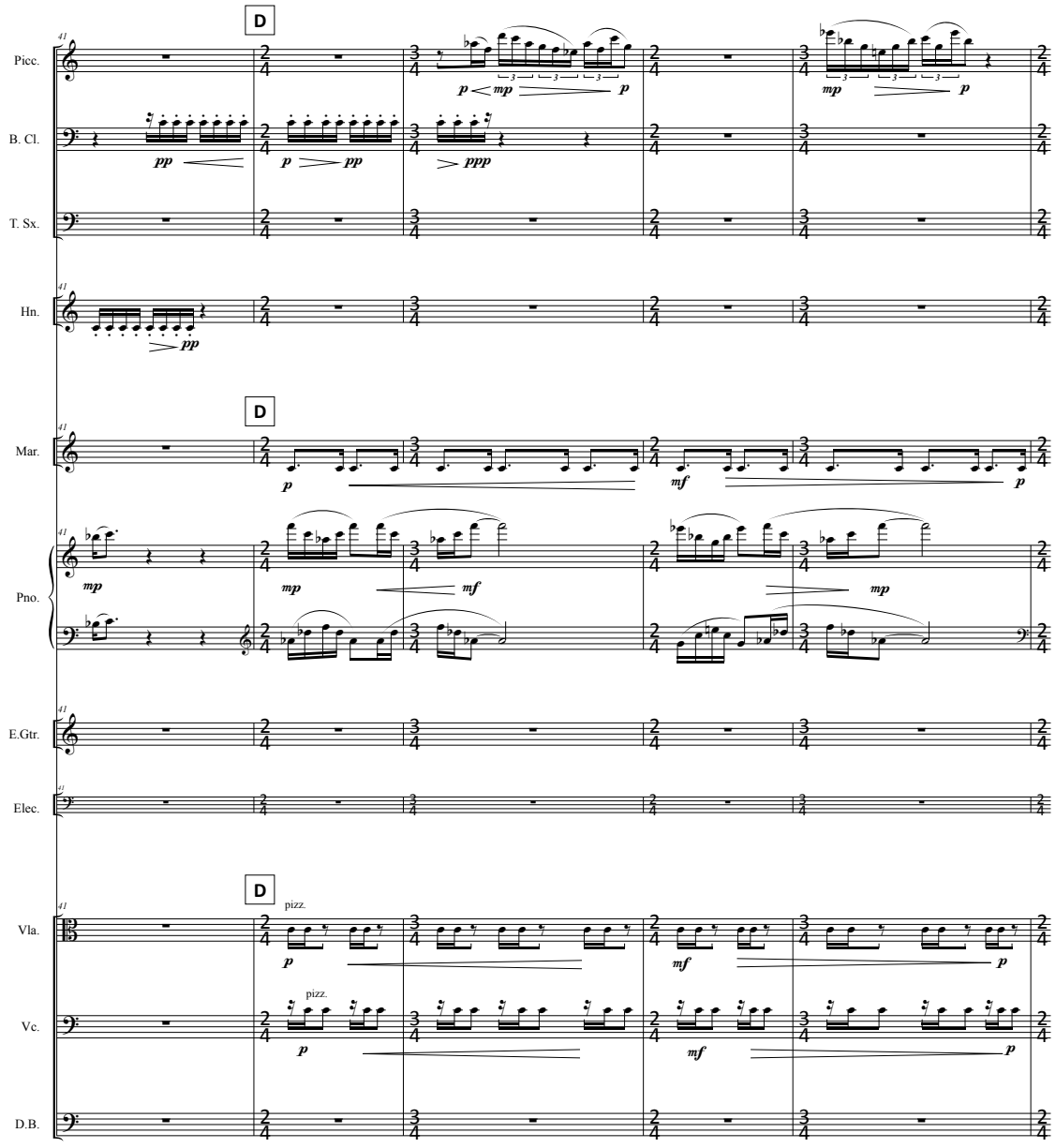

Picc.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

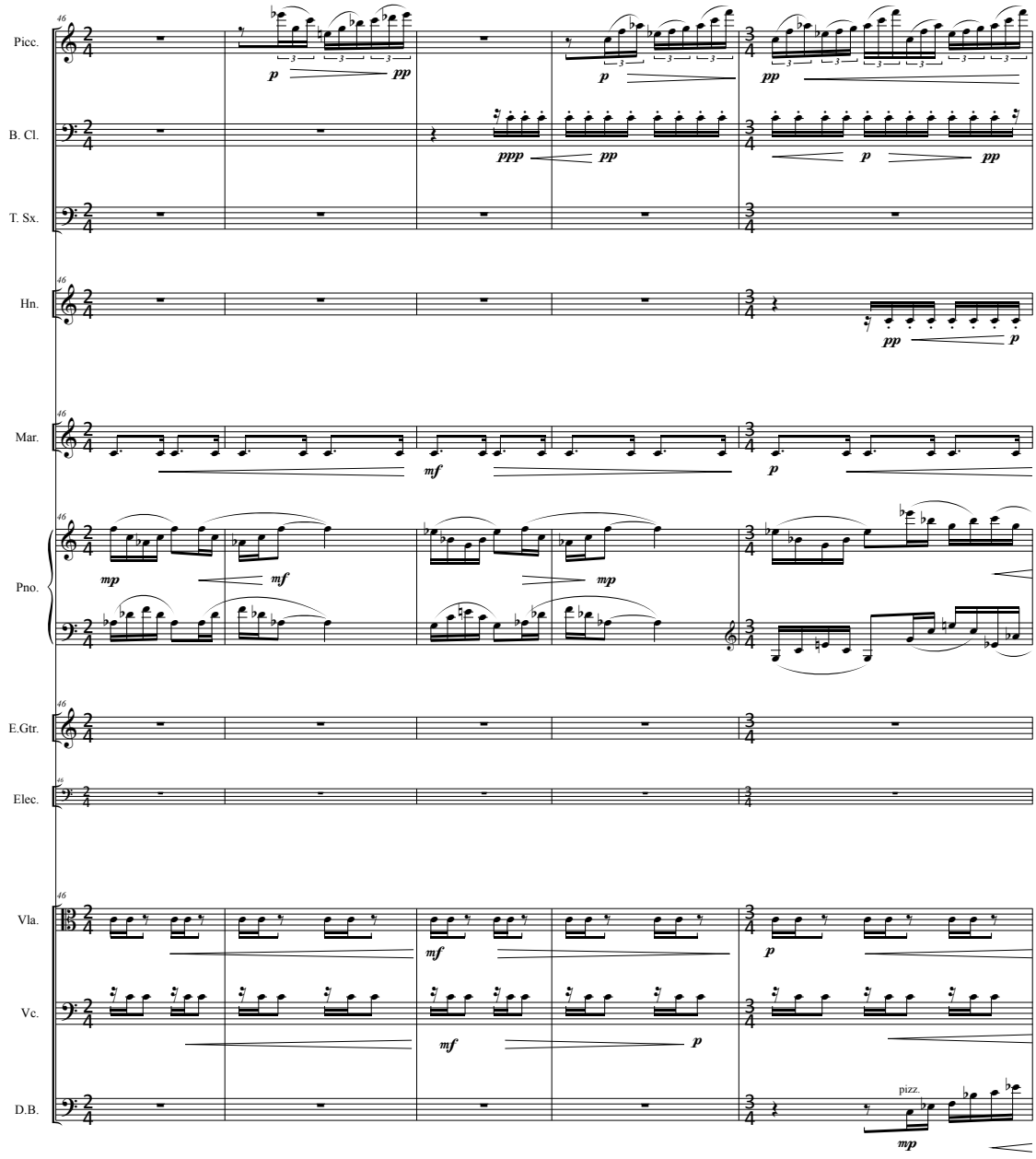

B
Picc.
B. Cl.
T. Sx.
Hn.
B
Marimba
Mar.
Pno.
E.Gtr.
Elec.
B
pizz.
Vla.
pizz.
Vc.
D.B.

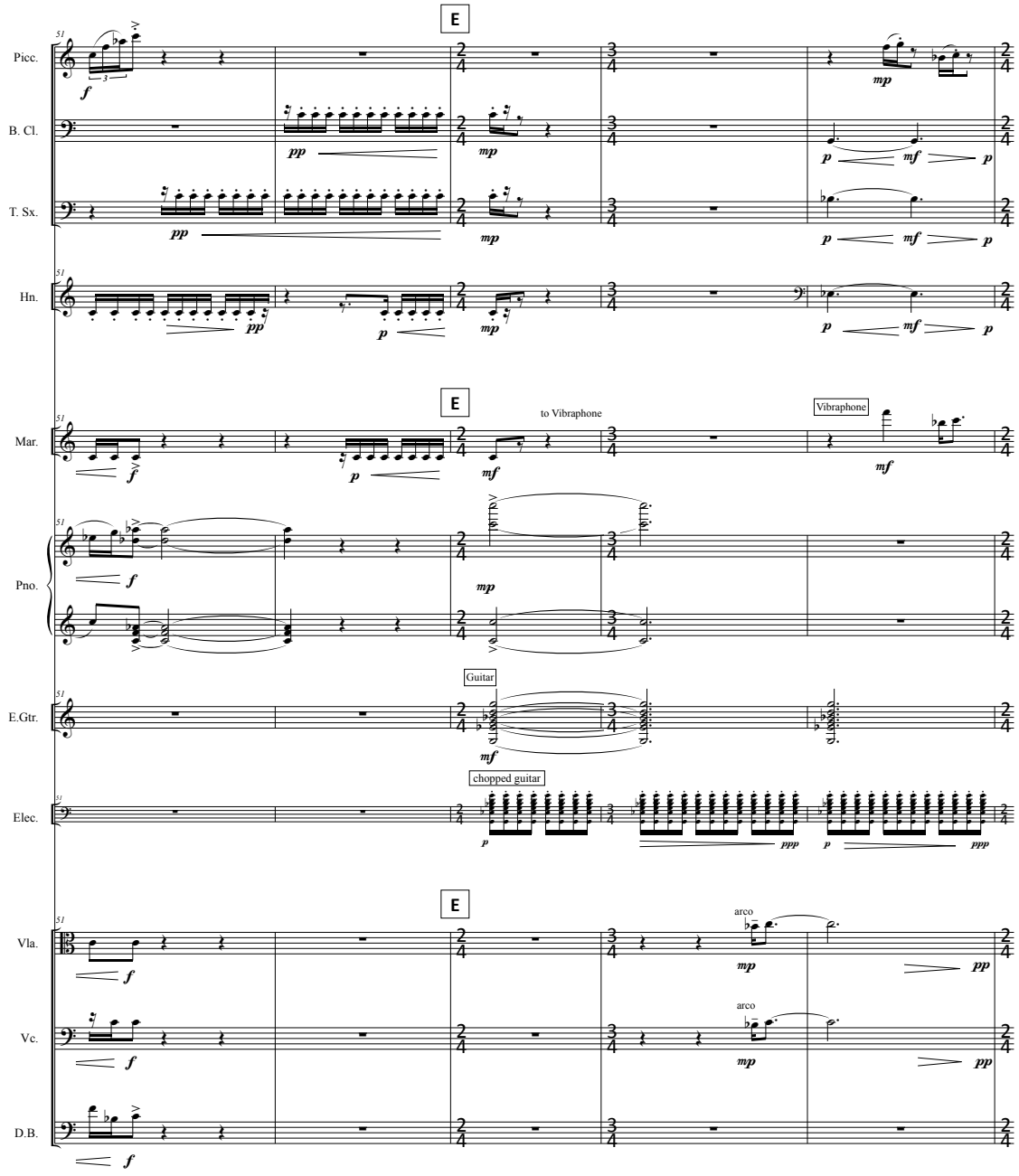

Picc.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
pizz.

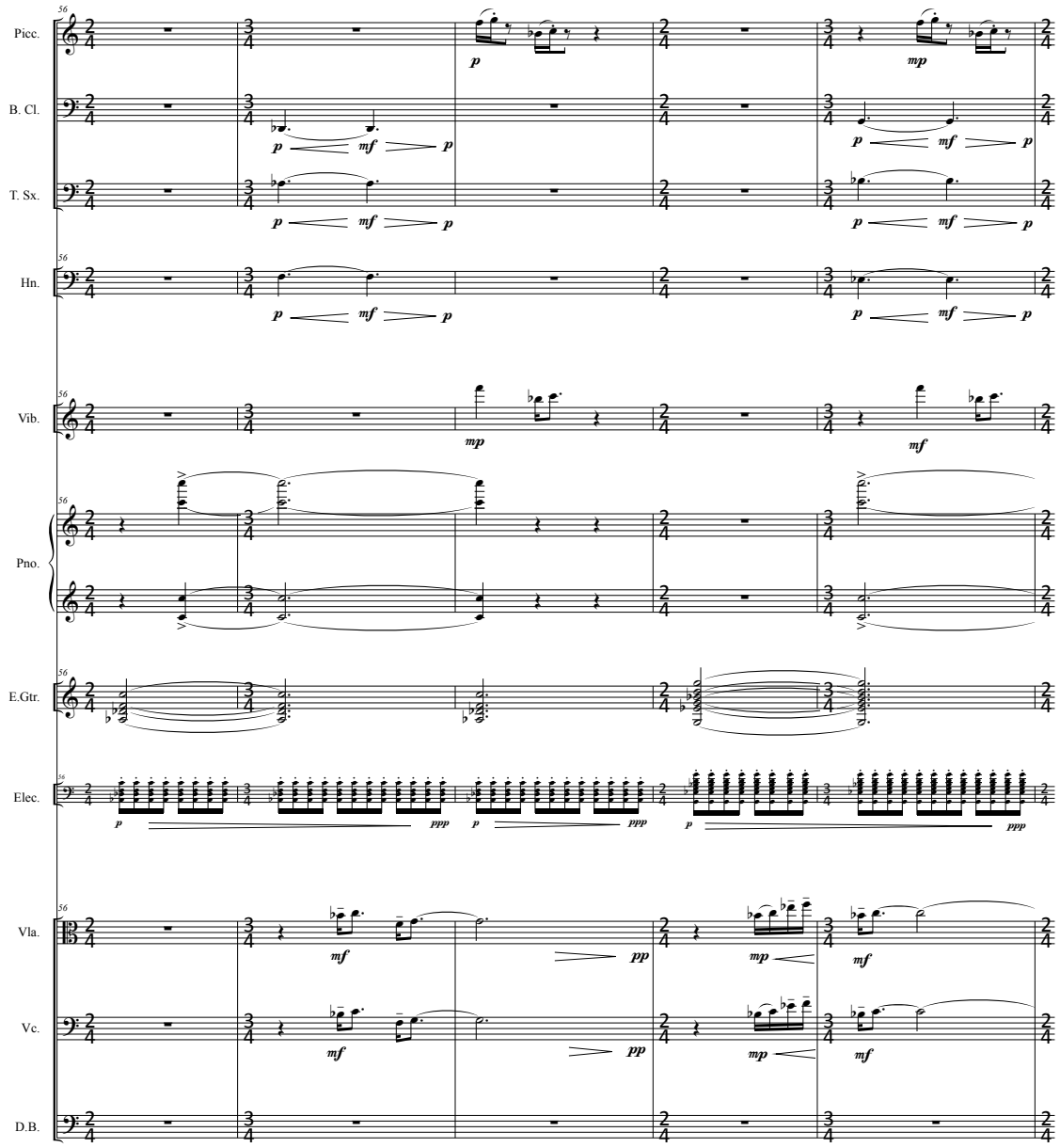

C
Picc.
B. Cl.
T. Sx.
Hn.
C
Mar.
Pno.
E.Gtr.
Elec.
C
Vla.
Vc.
D.B.
arco

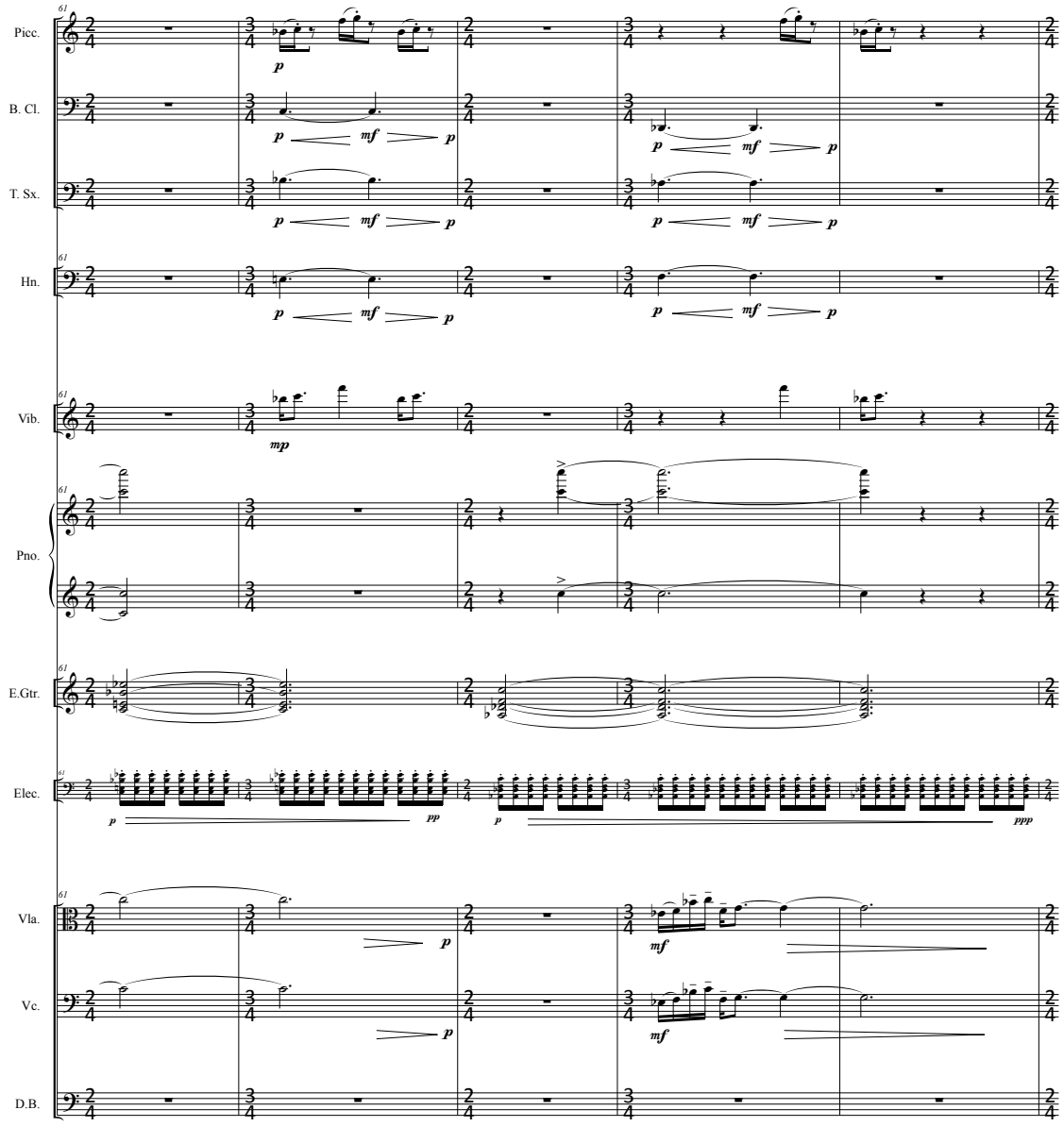

Picc.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

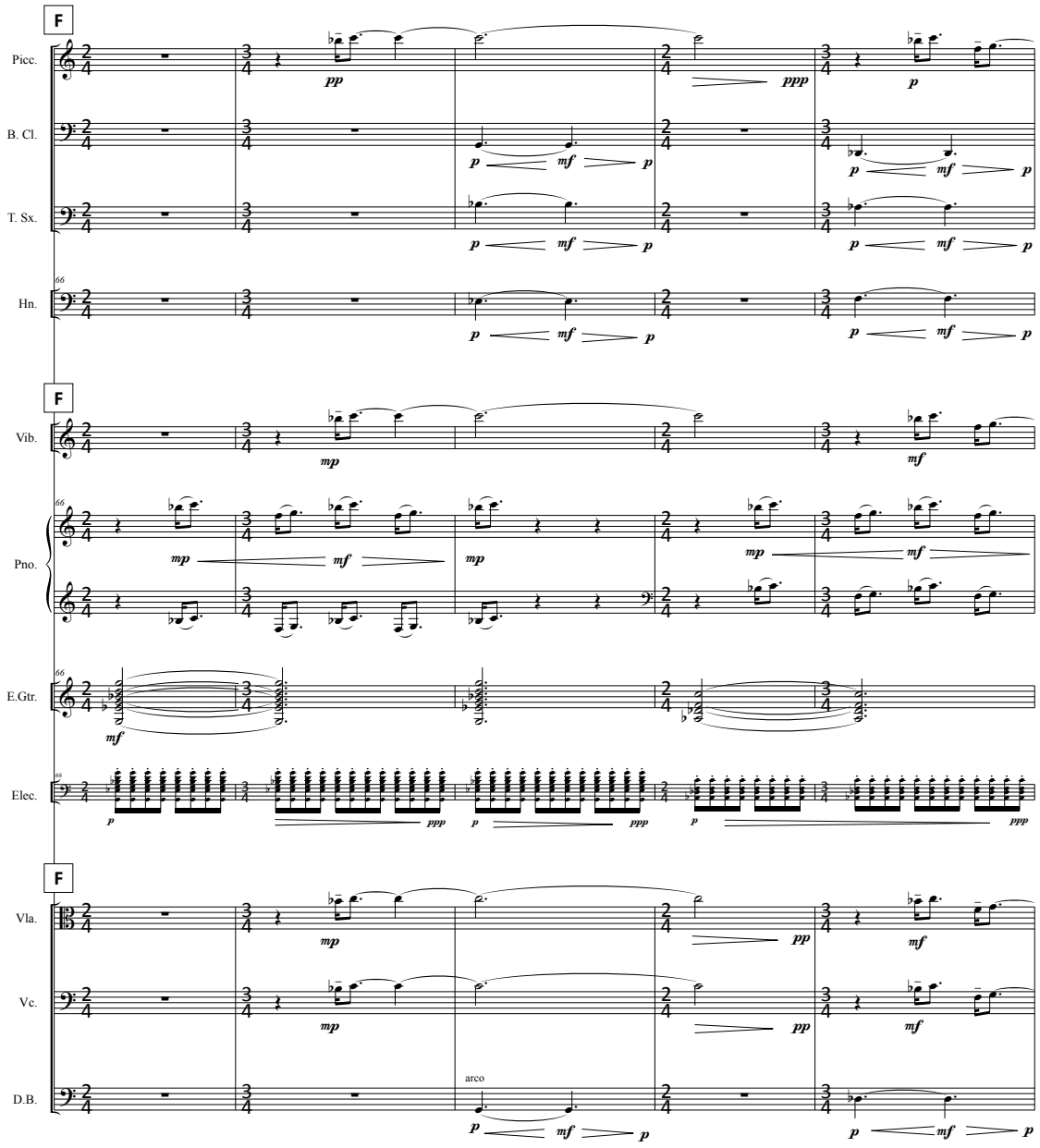

D
Picc.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
pizz.

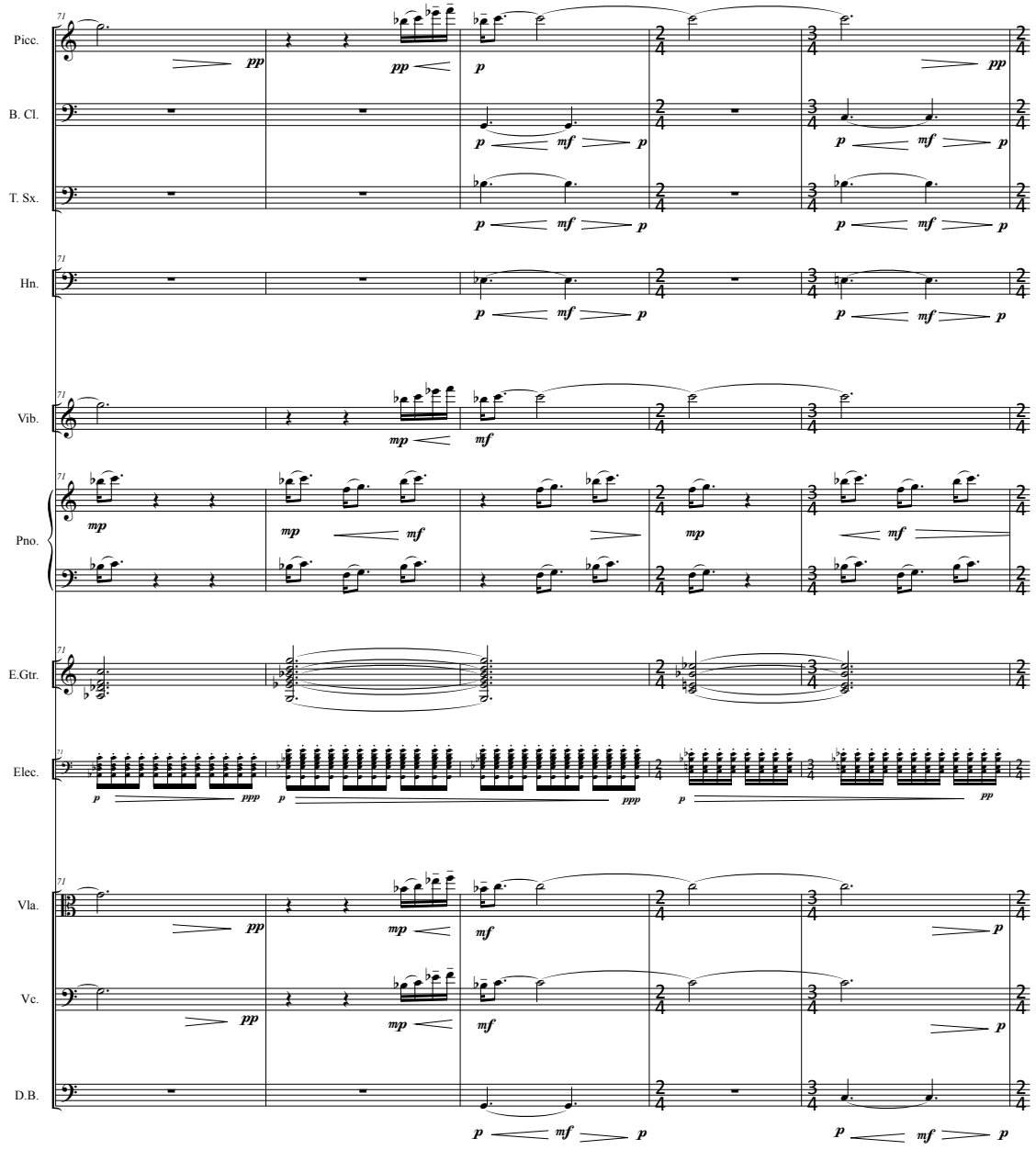

Picc.
B. Cl.
T. Sx.
Hn.
Mar.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
pizz.

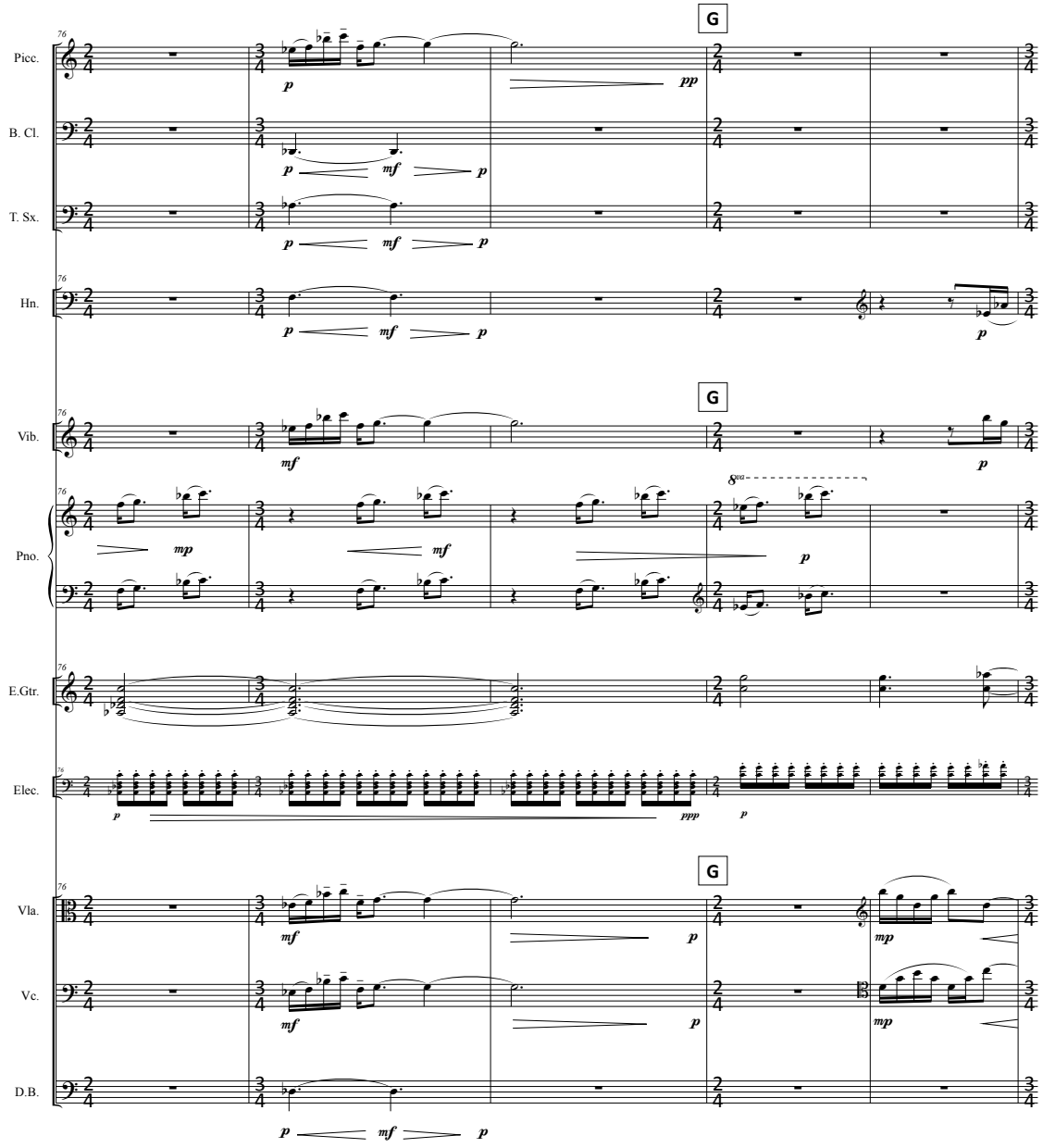

E
Picc.
B. Cl.
T. Sx.
Hn.
E
to Vibraphone
Vibraphone
Mar.
Pno.
Guitar
E.Gtr.
chopped guitar
Elec.
E
arco
Vla.
arco
Vc.
D.B.

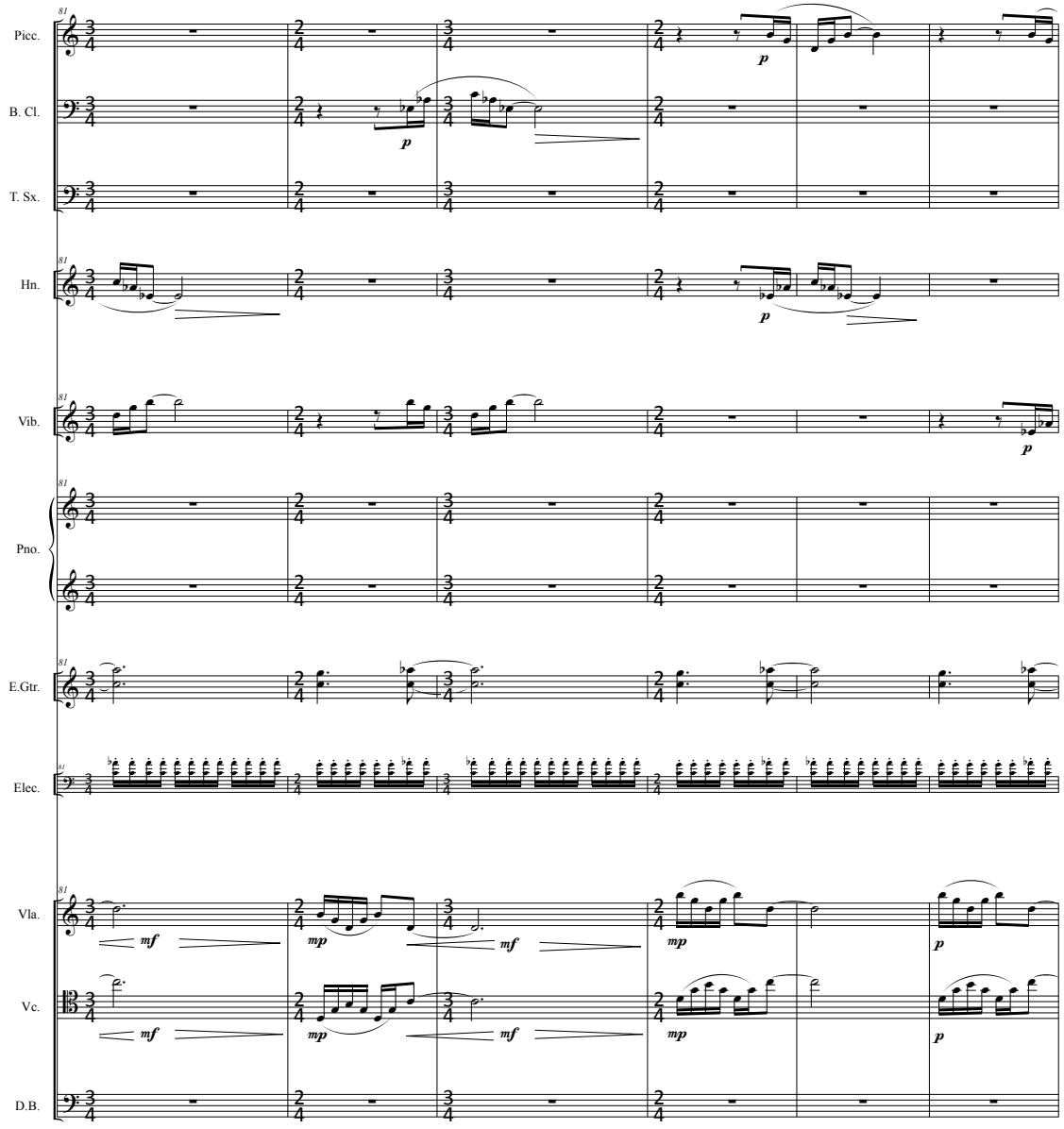

Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

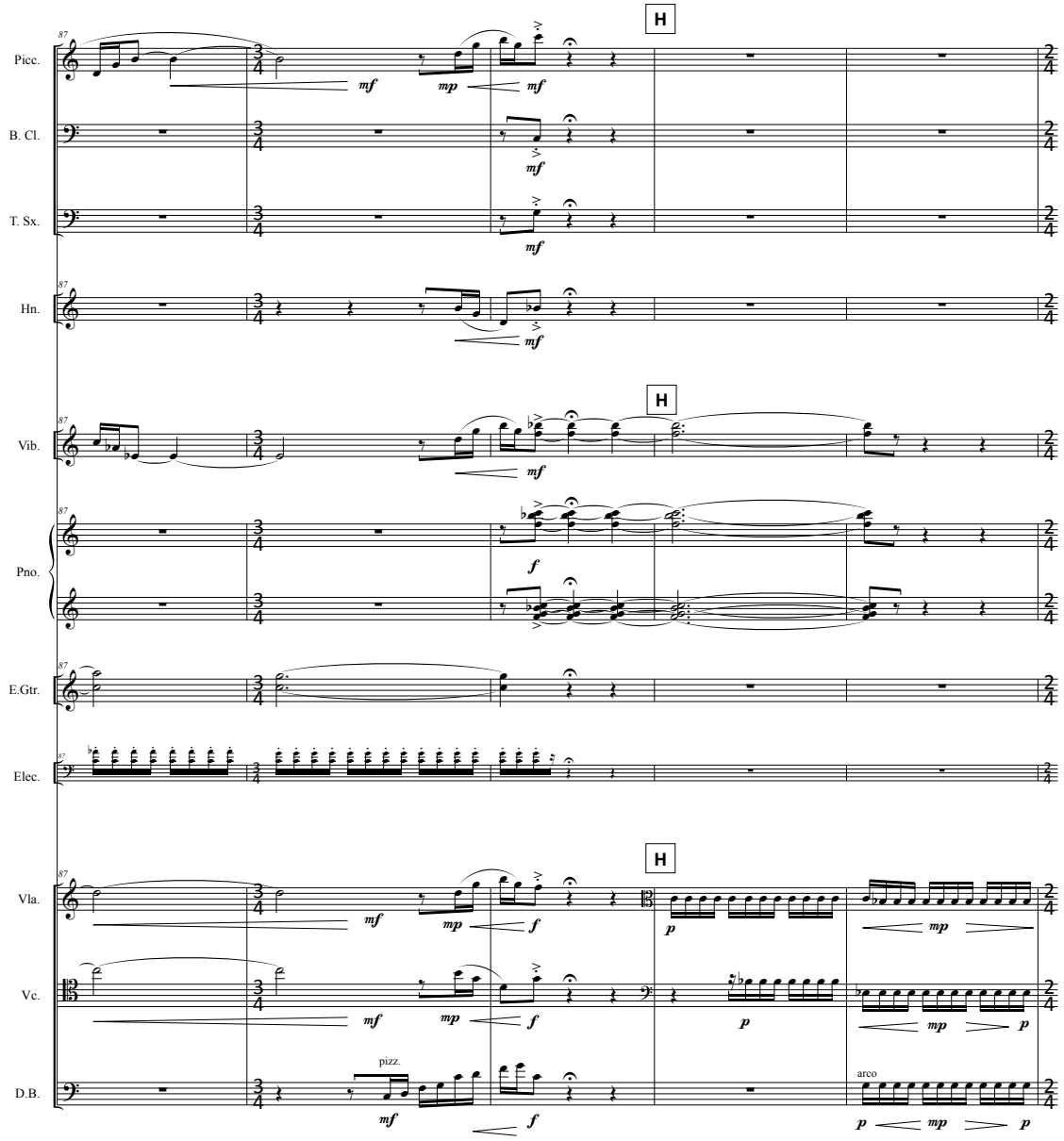

Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

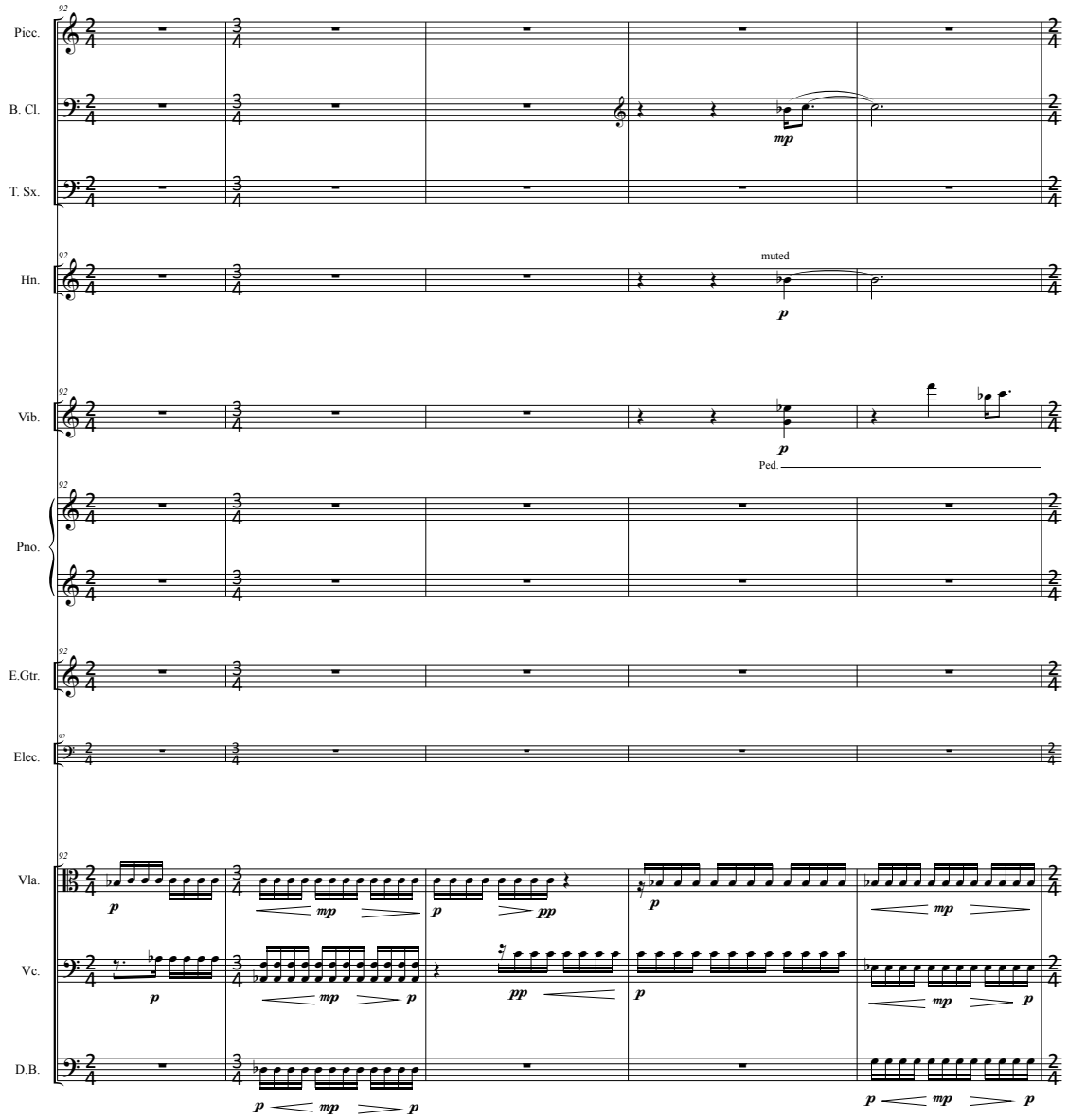

F
Picc.
B. Cl.
T. Sx.
Hn.
F
Vib.
Pno.
E.Gtr.
Elec.
F
Vla.
Vc.
D.B.
arco

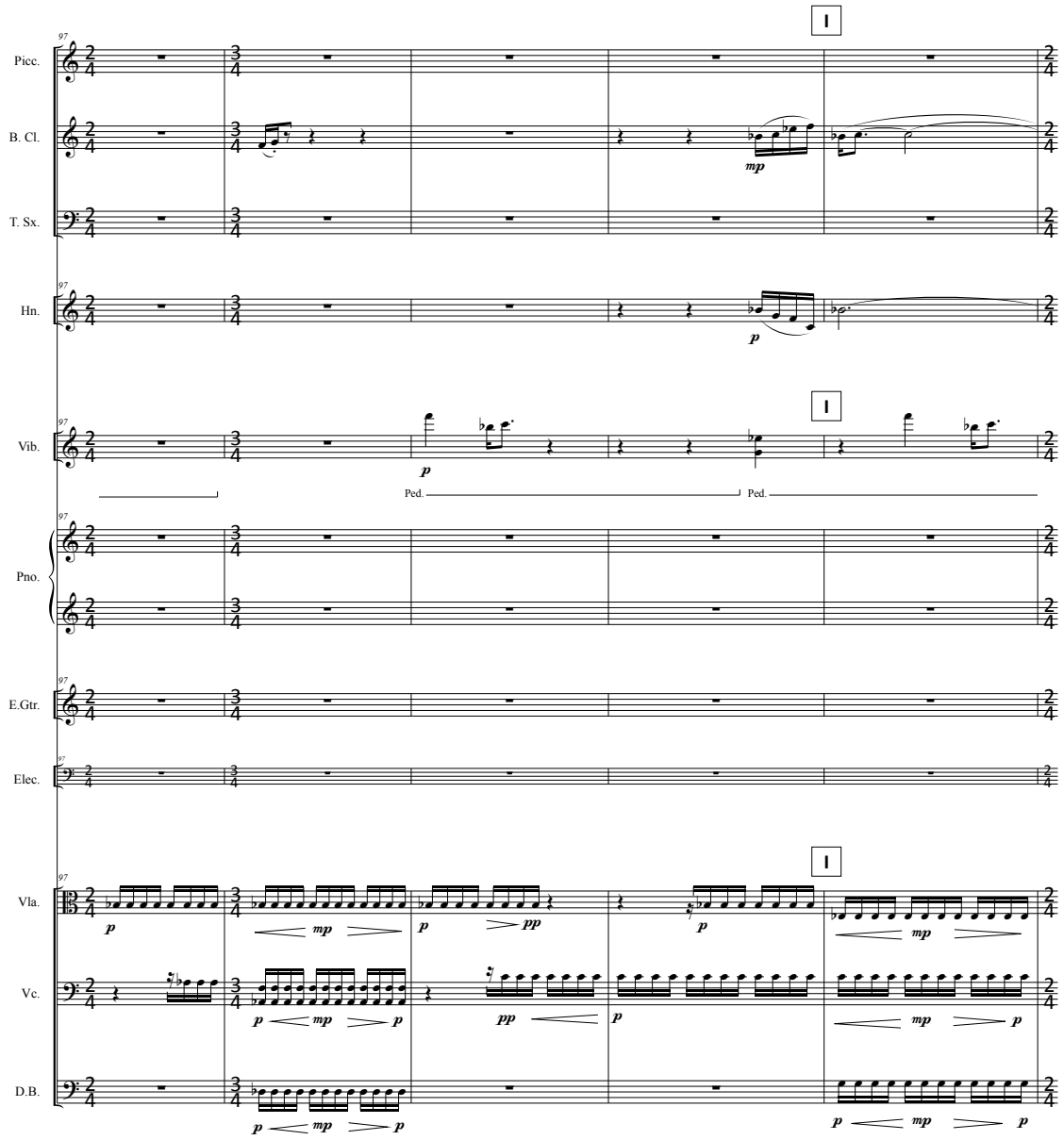

Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

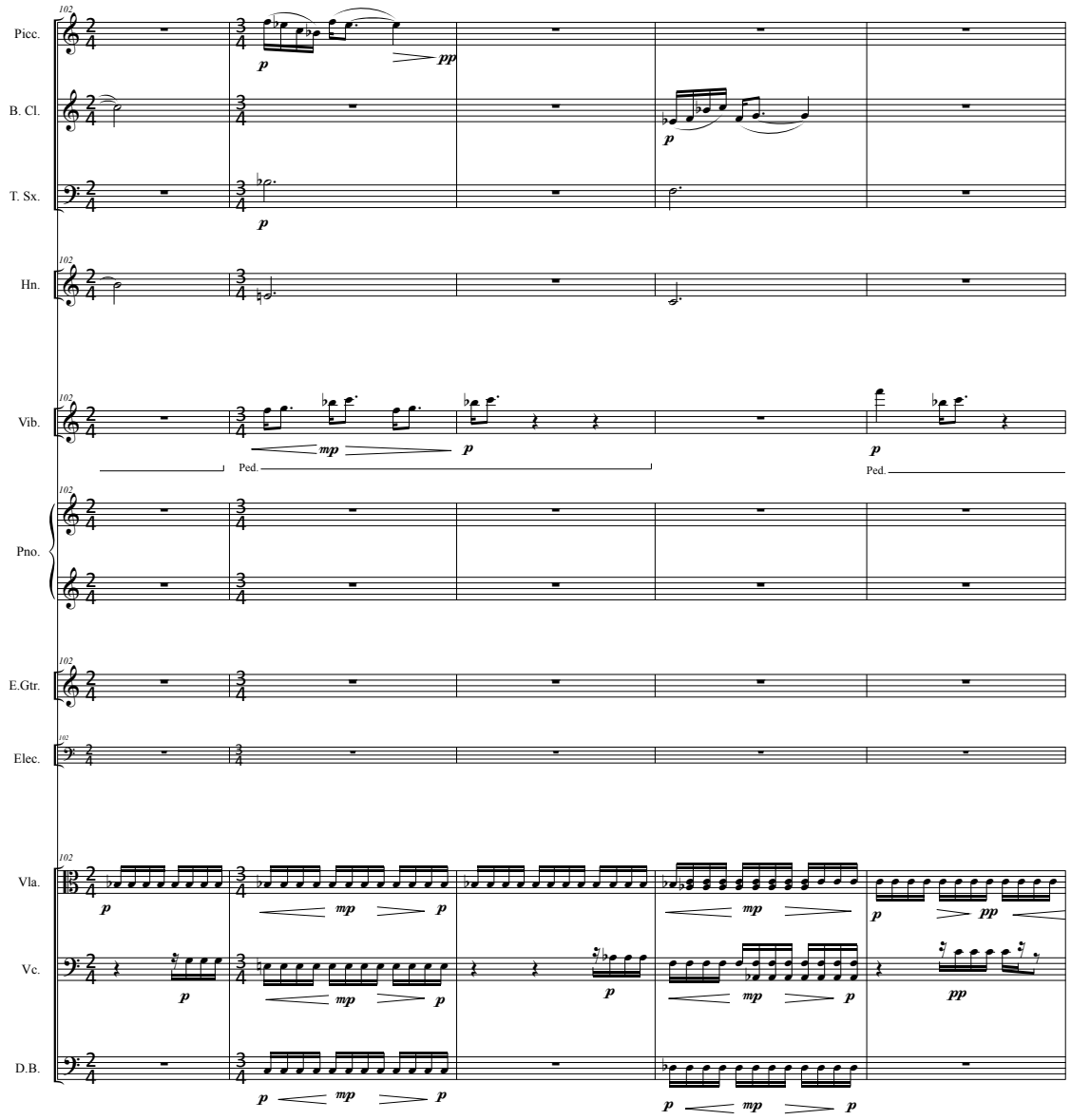

G
Picc.
B. Cl.
T. Sx.
Hn.
G
Vib.
Pno.
8va
E.Gtr.
Elec.
G
Vla.
Vc.
D.B.

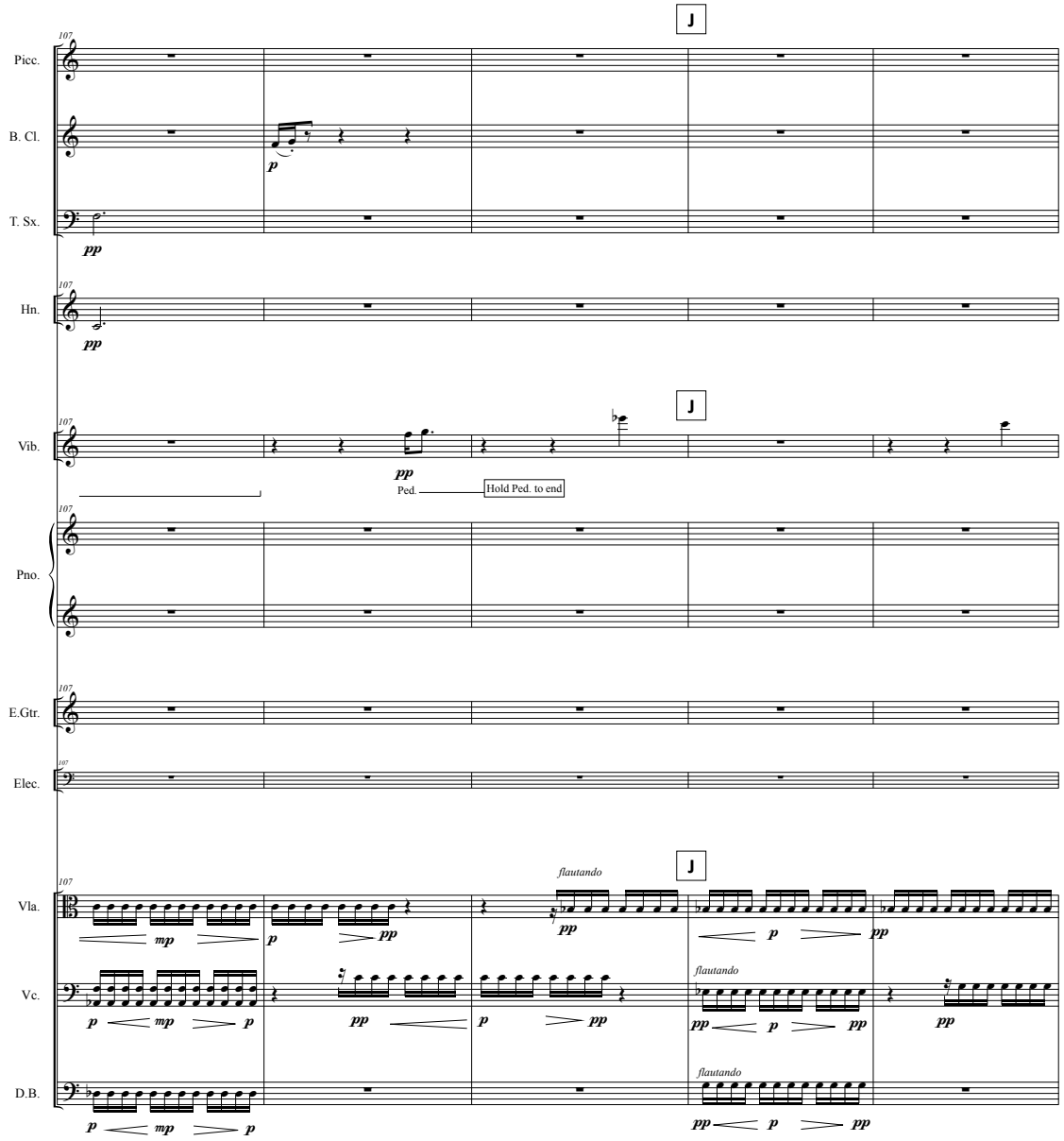

Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
81
p
mf
mp

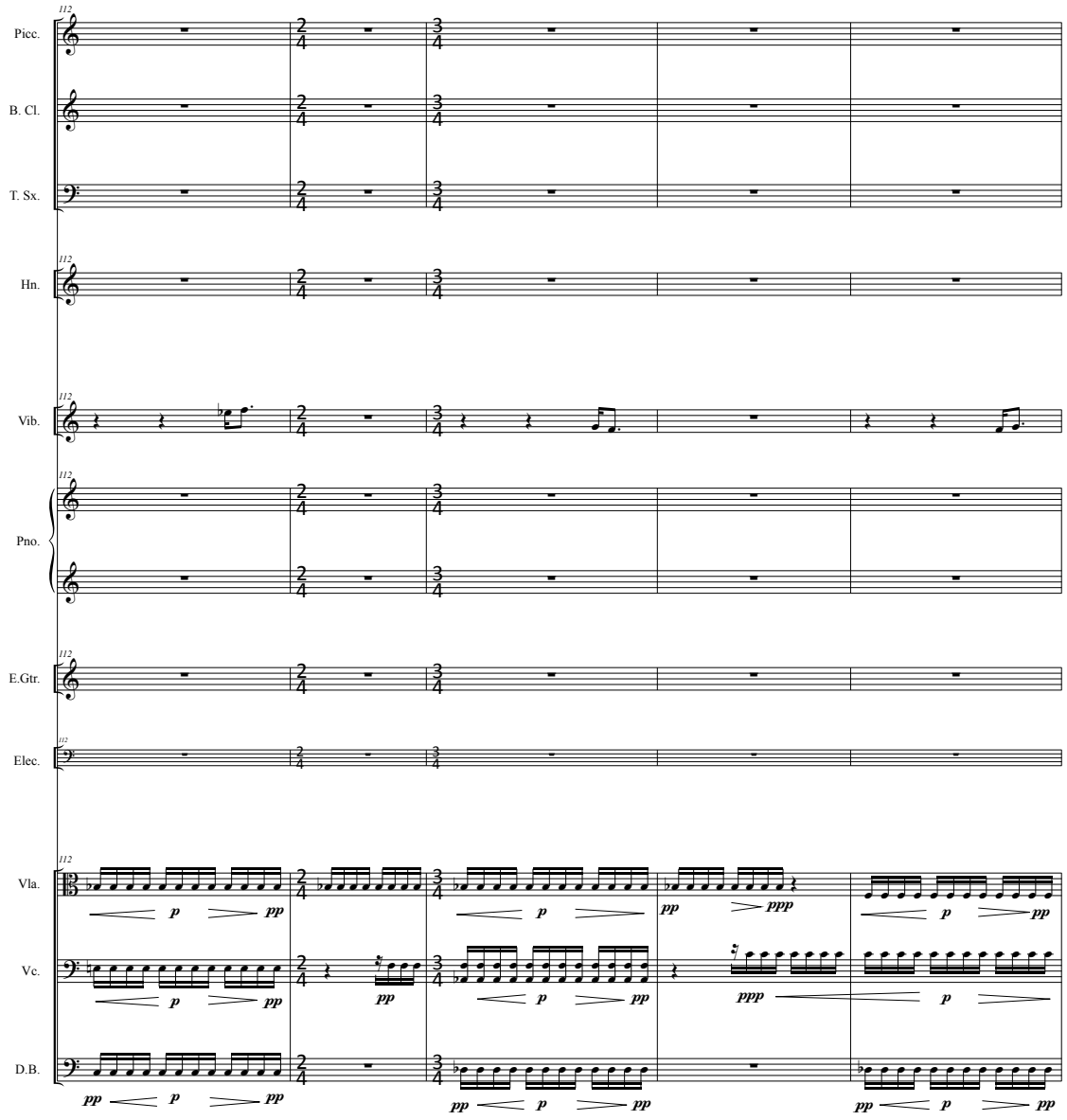

H
Picc.
B. Cl.
T. Sx.
Hn.
H
Vib.
Pno.
E.Gtr.
Elec.
H
Vla.
Vc.
D.B.
pizz.
arco

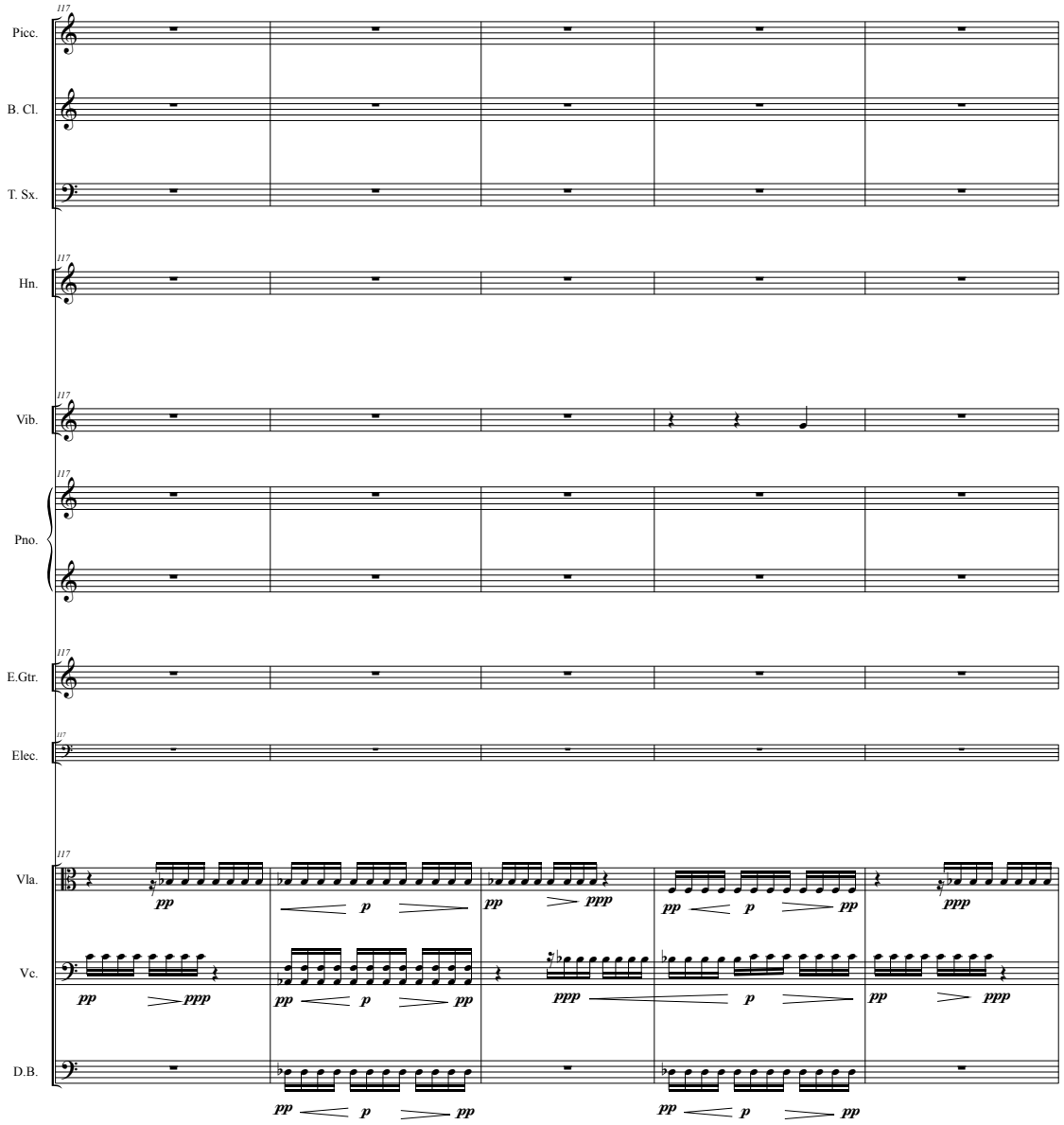

Picc.
B. Cl.
T. Sx.
Hn.
muted
Vib.
Ped.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.

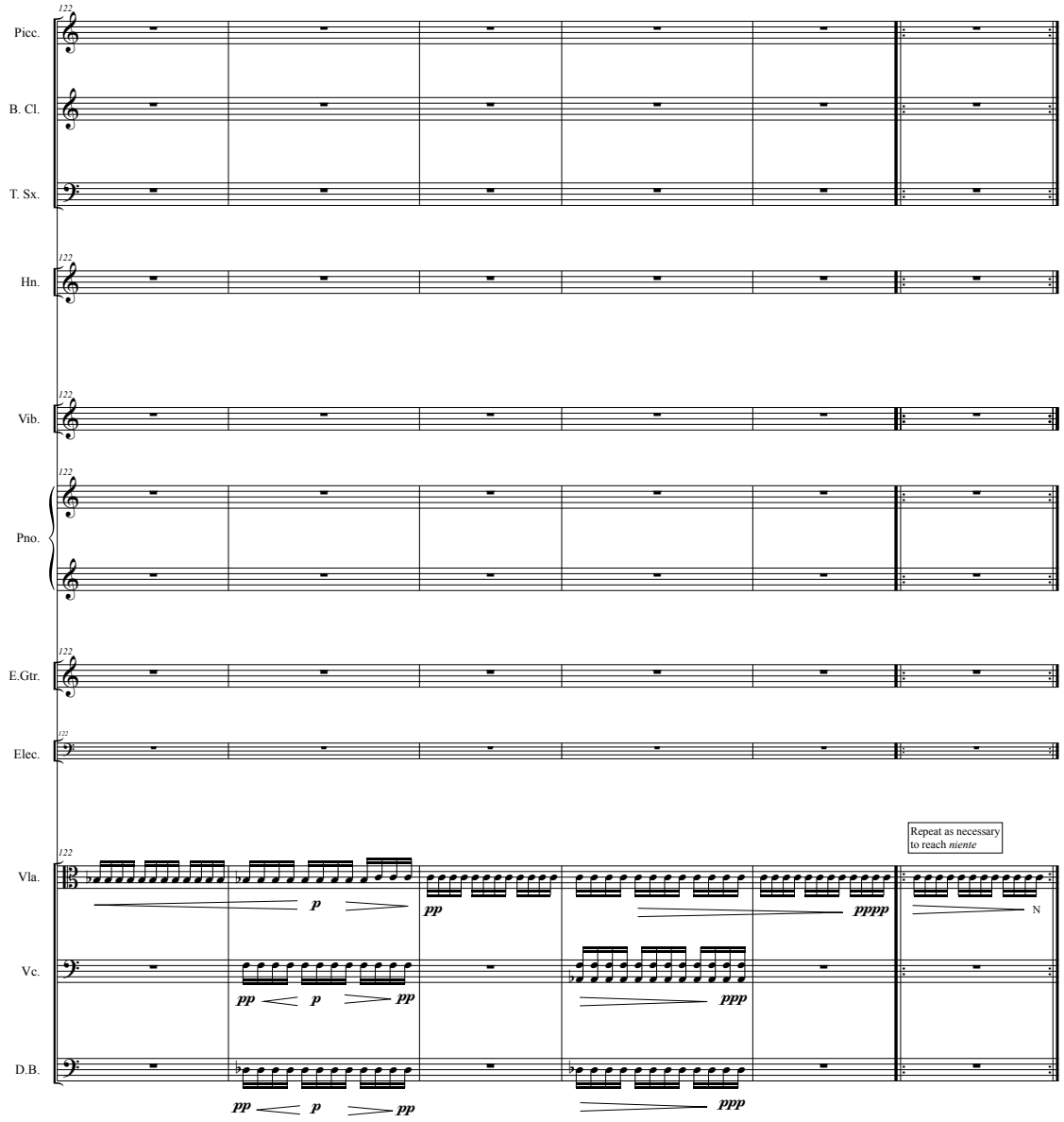

I
Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Ped.
Ped.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.


Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Ped.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.


J
Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Ped.
Hold Ped. to end
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
flautando


Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.


117
Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
pp
p
ppp


Picc.
B. Cl.
T. Sx.
Hn.
Vib.
Pno.
E.Gtr.
Elec.
Vla.
Vc.
D.B.
122
Repeat as necessary to reach niente
p
pp
pppp
N
ppp

WORKS CITED

Forte, Allen. *The Structure of Atonal Music*. New Haven: Yale University Press, 1973.

BIOGRAPHY

Jamie Keesecker was born in Toledo, Ohio. He received a Bachelor of Music degree from the University of Arizona in 2006, where he studied composition with Daniel Asia and Pamela Decker. He received a Master of Music degree from the University of Oregon in 2009, where he studied with Robert Kyr and David Crumb. In the Fall of 2009, he matriculated to Duke University as a James B. Duke fellow, studying composition with Stephen Jaffe, Scott Lindroth, and John Supko. In 2011 he received a Master of Arts from Duke University.