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UNIVERSITY OF CALIFORNIA
SANTA CRUZ

***EBB'S EMBRACE, FULFILLING FLOW*: THREE MOVEMENTS FOR STRINGS, WINDS, AND PERCUSSION**

A dissertation submitted in partial satisfaction
of the requirements for the degree of

DOCTOR OF MUSICAL ARTS

in

MUSIC COMPOSITION

by

Ed Garcia

September 2023

The dissertation of Ed Garcia is approved:

Professor Hi Kyung Kim, chair

Professor Matthew Schumaker

Professor Dard Neuman

Peter Biehl
Vice Provost and Dean of Graduate Studies

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2023

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DISSERTATION ABSTRACT

Ebb’s Embrace, Fulfilling Flow: Three Movements For Strings, Winds, And Percussion

by

Ed Garcia

The musical composition *Ebb's Embrace, Fulfilling Flow* is a three-movement piece that explores the concept of ebb and flow through rhythmic, harmonic, and performance technique variation. Each movement is developed from solo sketches composed by the author and were further inspired by works from Ligeti, Lutosławski, and Xenakis, and from traditional Sundanese presentational dance concepts and related drumming notation styles. The first movement, "Rippling Riffles," focuses on managing various rhythmic subdivisions and note density, while the second movement, "Pulling on Heartstrings," explores different levels of rhythmic and textural consonance and dissonance through the use of string techniques and bow placements. The final movement, "Bounds on the Crest," imitates the structure of ocean waves, using arpeggiation, glissandi, and long note decay to create intricate melodies. The composition demonstrates the author’s ability to develop thematic material and integrate diverse musical elements into a cohesive whole. In the following essay, the author reflects on their inspirations for each movement and discusses their usage of various musical concepts and techniques.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude and appreciation to my wife Cia, whose unwavering love and support have been invaluable to me throughout this journey. I am also deeply grateful to my family and parents, Sam and Ann, for always believing in my musical path.

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Lastly, I dedicate this project in loving memory to my father Samuel Juan Garcia who would be so proud of my education and my accomplishments, and to my daughter Alina Putri Garcia who I would like to show the importance of setting and achieving challenging goals.

PART ONE: COMPOSITION

Ebb's Embrace, Fulfilling Flow

Three Movements for Strings, Winds, and Percussion

I. **Rippling Riffles**
II. **Pulling on Heartstrings**
III. **Bounds on the Crest**

duration 21'

Ed Garcia

August 2022 - March 2023
Santa Cruz, CA

Instrumentation

Strings
- Harp
- Two violins
- Viola
- Cello
- Contrabass

Winds
- Flute
- Bb Clarinet

Pitched Percussion
- Crotales (2 octaves)
- Marimba 1 (5-octave recommended, 4.3-octave required)
- Marimba 2 (5-octave required)

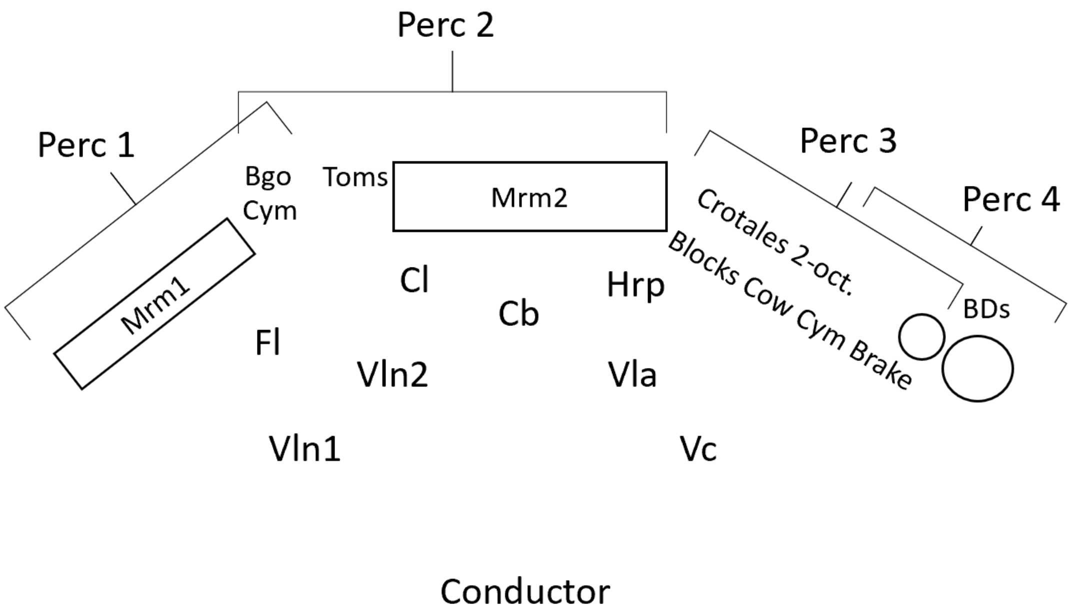
Cymbals
- High Crash Cymbal
- Low Crash Cymbal
- Ride Cymbal
- Suspended Cymbal

Drums
- Bongos
- 3 Toms (high, medium, low)
- Medium-sounding, Medium-sized Resonant Bass Drum
- Low-sounding, Large-sized Resonant Bass Drum

Assorted Percussion
- Cowbell (slightly muffled)
- Brake Drum (slightly muffled)
- Temple Blocks (or 5 wide-ranging wood blocks)

Percussion Instrumentation by Movement
- I. Rippling Riffles
    - Perc. 1: Marimba 1
    - Perc. 2: Marimba 2
    - Perc. 3: Cowbell, Low Crash Cymbal, Shared Ride Cymbal
    - Perc. 4: Brake Drum, High Crash Cymbal, Shared Ride Cymbal
- II. Pulling on Heartstrings
    - Perc. 1: Marimba 1
    - Perc. 2: Marimba 2
    - Perc. 3: High Bass Drum
    - Perc. 4: Low Bass Drum
- III. Bounds on the Crest
    - Perc. 1: Suspended Cymbal, Shared Bongos, Marimba 1
    - Perc. 2: Toms, Bongos, Marimba 2
    - Perc. 3: Temple Blocks, Lower Crotales, Marimba 1
    - Perc. 4: High Bass Drum, Low Bass Drum, Higher Crotales, Marimba 2

Stage Arrangement

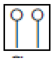
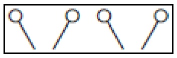
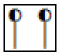
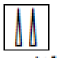
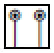
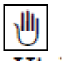

Perc 2
Perc 1
Bgo
Cym
Toms
Mrm2
Perc 3
Perc 4
Crotales 2-oct.
Blocks Cow Cym Brake
BDs
Mrm1
Cl
Cb
Hrp
Fl
Vln2
Vla
Vln1
Vc
Conductor

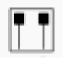
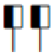
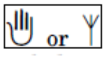
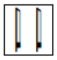
Performance Notes

General

- Tempo increases and decreases are bracketed with text “speed up” and “slow down,” respectively, Max and min tempi are specified at the start or end of brackets.
- Trills are marked with a trill line, and the upper neighbor is provided in parentheses.
- “>o” or “o<”: indicates a crescendo starting from nothing or a diminuendo down to nothing.

Percussion Implements

Soft yarn mallets	 or 
Medium-hard yarn mallets	
Drumsticks (wood tip and nylon tip are specified in the score)	
Rubber mallets	
Hand	

Hard felt mallets	
Medium-hard bass drum beater	
Hand or wire brush	
Bows	

Cymbal notation

- Cymbals are notated with letter noteheads to denote the cymbal striking area (“S” for surface, “B” for bell, and “E” for edge). Markings are placed above the notehead to denote specific striking instructions (e.g., “v” above “B” denotes playing on the bottom of the bell, and “^” above “B” denotes playing on the top of the bell). Aside from the text noteheads, cymbal notes use traditionally notated stems, beams, and dots.

I. Rippling Riffles

- Courtesy tempo markers are provided in parentheses for part entrances and for each instrument group.
- Rhythms are through-notated.
- M. 16-17: trill speed is determined by performer, but speed

approximations are provided in parentheses.

- Percussion 3 and Percussion 4 may share the same ride cymbal.
- Section C: String numbers are suggested in Roman numerals. Numerals in parentheses followed by dashes indicate a repeated pattern until a new numeral appears. For example, "(II - I)" followed by dashes indicate that the first note will be played on the second string, the second will be played on the first string. All subsequent notes will be played on the second and first strings in this manner until a new string is specified. Notes without Roman numerals are meant to be played on the same string that was specified by the previous Roman numeral. Dashed slurs represent grouped notes, they are not bow markings.
- Section D: Beat lines (vertical, dotted lines) indicate the subdivisions of time signatures at the instrument level. Beat lines do not indicate a musical pause.

II. Pulling on Heartstrings

- Time-bracketed measures are marked with a time duration in seconds, followed by a bracket. Time-bracketed measures are not marked with time signatures, and do not contain stemmed noteheads. Notes that are connected by a vertical dashed line are played in rhythmic unison.

- Time-signatured measures are marked with a time signature. Transitions from time-signatured measures to time-bracketed measures are marked with a double bar line (“||”). Double bar lines do not indicate a musical pause.
- Stemmed notation is read according to normal rhythmic conventions. Stemless notes are found in both time-signatured and time-bracketed measures, and their rhythm and durations should be realized according to their spatial and proportional relationship to the measure’s bar lines, beat lines, and other notes present. Measures with stemless notes do not contain rests, unless specifically indicated.
- Sul ponticello should sound breathy but tonally stable.
- Sul tasto should not contain vibrato.
- Ordinario should have normal vibrato.
- Tremolo speeds are unmeasured, but speed ranges are instructed throughout.
- Section B - End: Stemless tremolo notes sustain until the next written note.
- Section B - End: Beat lines (vertical, dotted lines) are found at quarter-note intervals for measures that contain stemless notation. Beat lines do not indicate a musical pause.
- Section C - End: Winds sustain until the end of the slur mark. Harp sustains until the muffle marking.

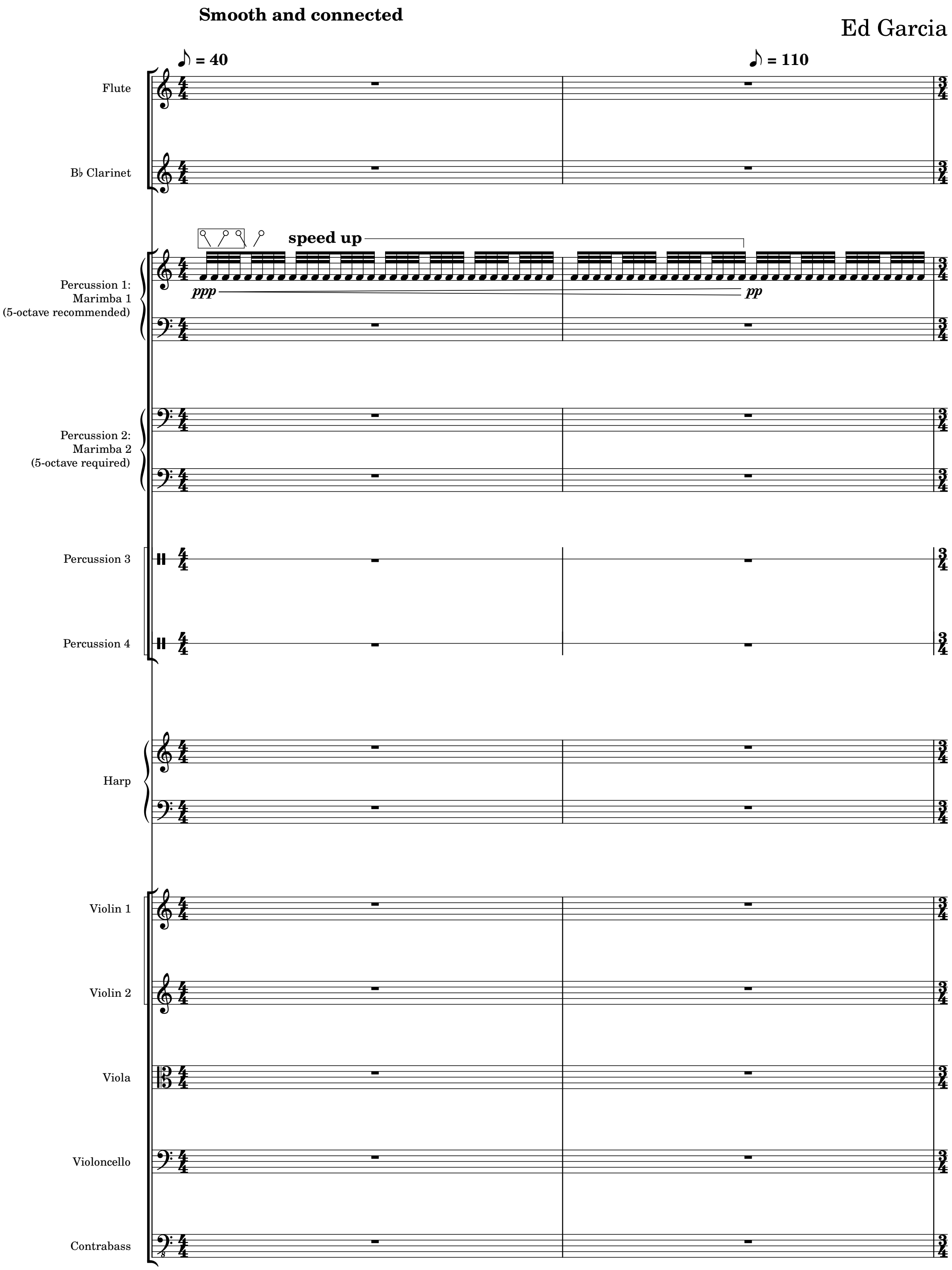
- Section D, Percussion 2 & Harp: Stemmed grace notes appear within the context of stemless principal notes. The grace note stems are used as contrast to their principal notes (not to denote rhythm).
- Section D, Harp: Harp does not muffle in this section. Slur markings are provided for phrasing only.
- M. 65, Cello & Contrabass: Rests are provided to indicate the end of the final note.

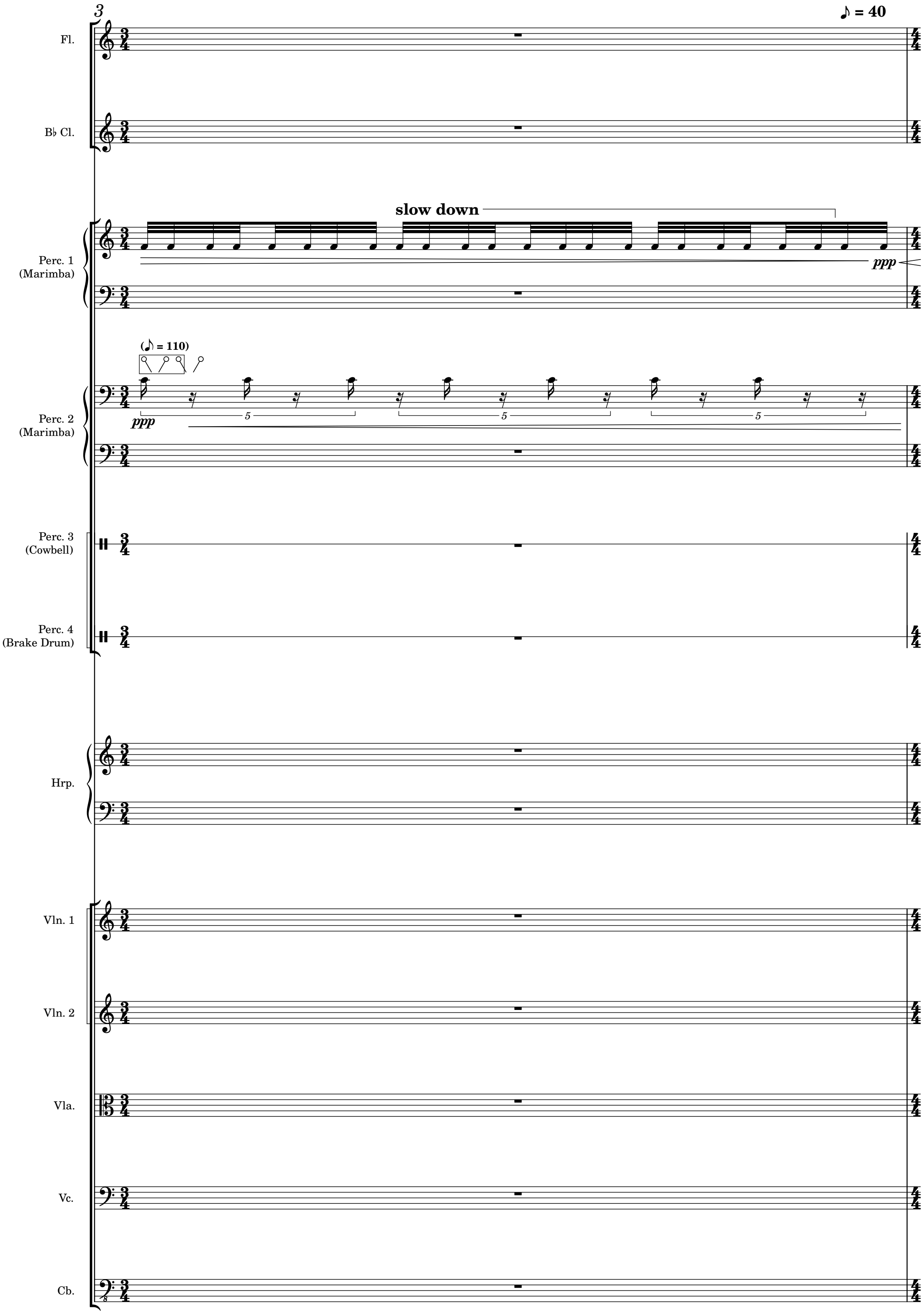
III. Bounds on the Crest

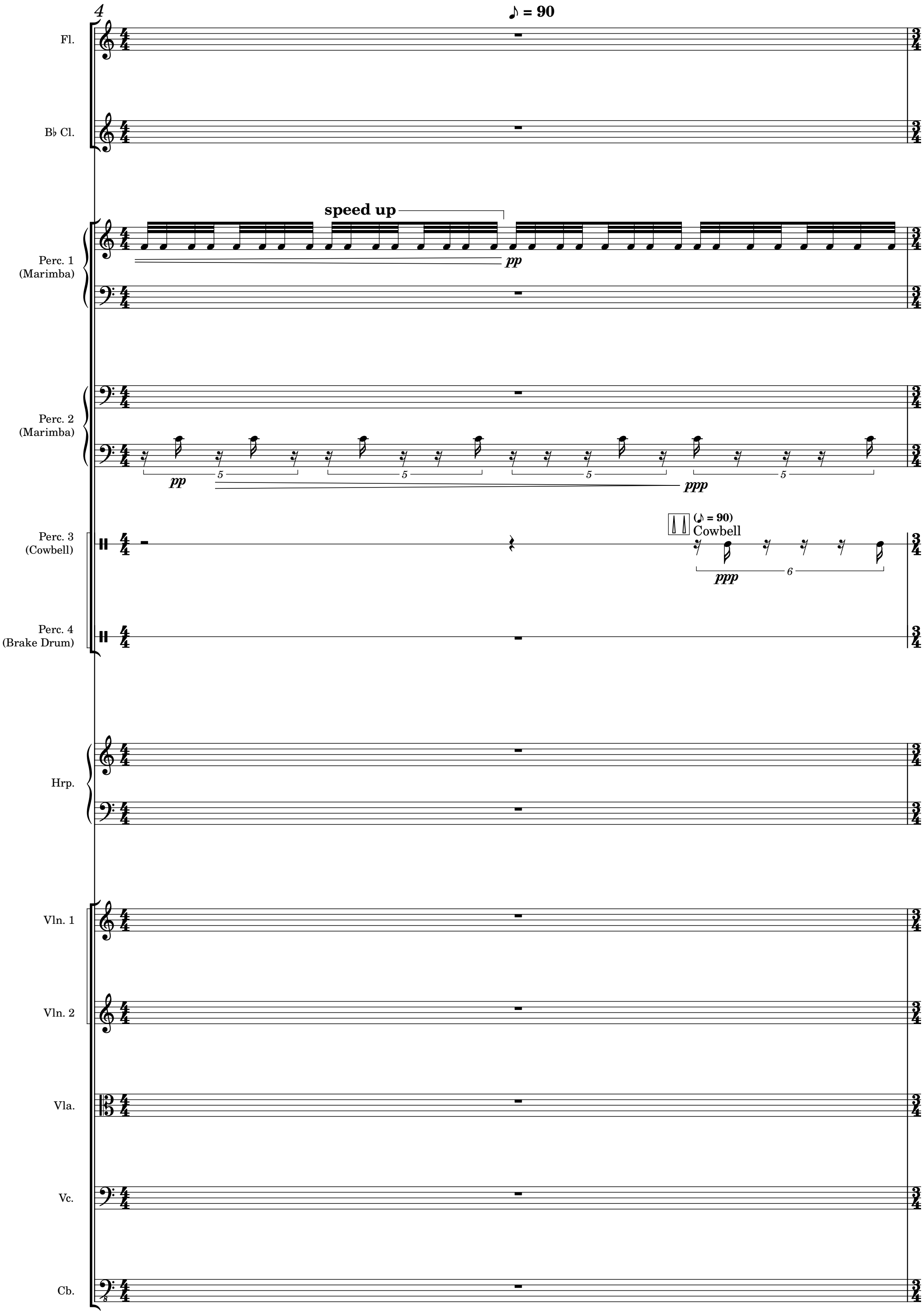
- Cymbal tremolo is measured. It is marked with a continuous beam with a right arrow above it. The tremolo continues without pause as long as the beam and arrow are present.
- Winds: triangle noteheads denote an air sound produced in normal playing position.
- M. 89 - End, Marimbas: all rolls are unmeasured, but rolls with two slashes should generally be played slower than rolls with three slashes. Both marimbas should be rolling at the same speed, especially for rolls with two slashes and for the tempo decrease at m. 96-99.

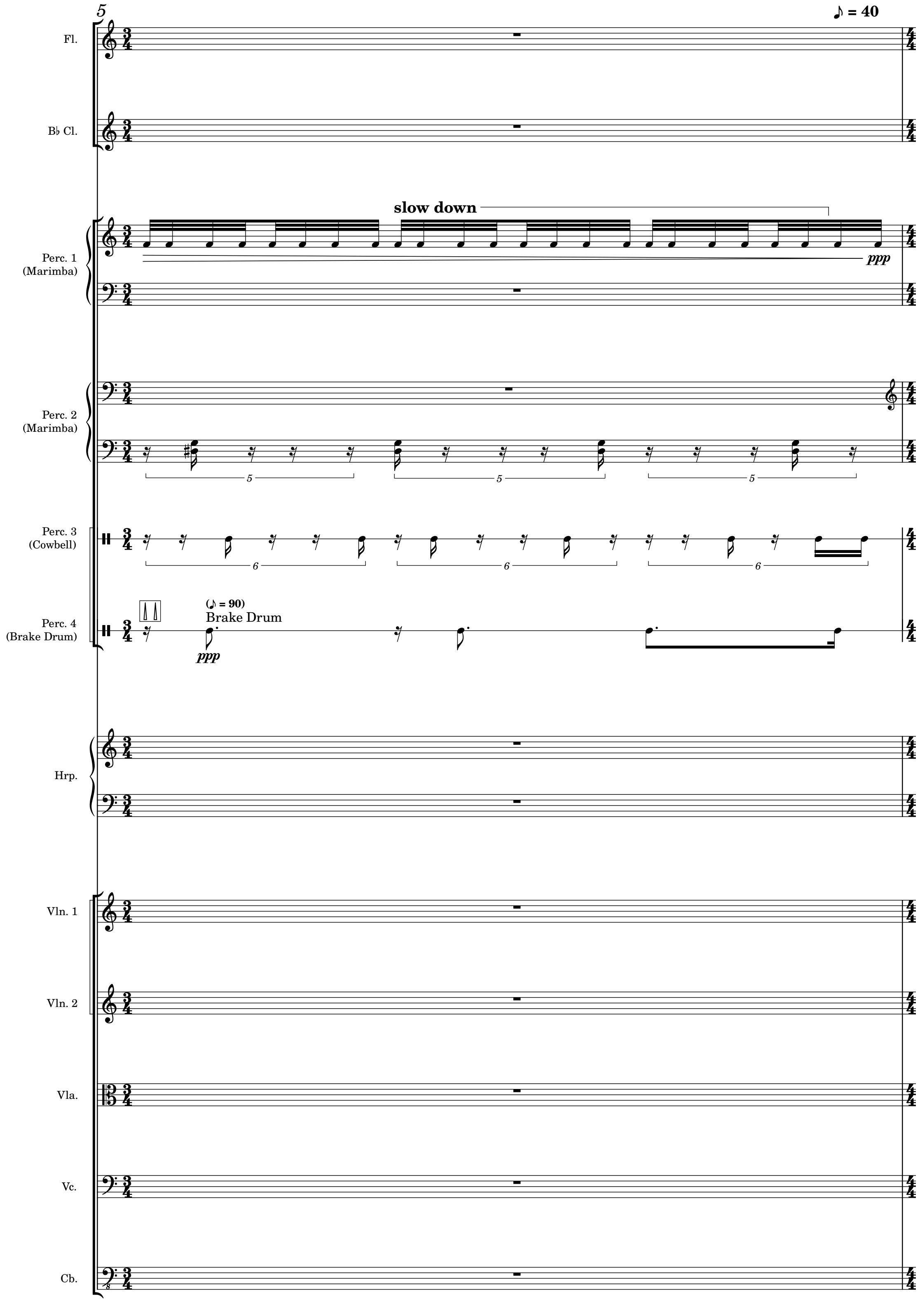
I. Rippling Riffles

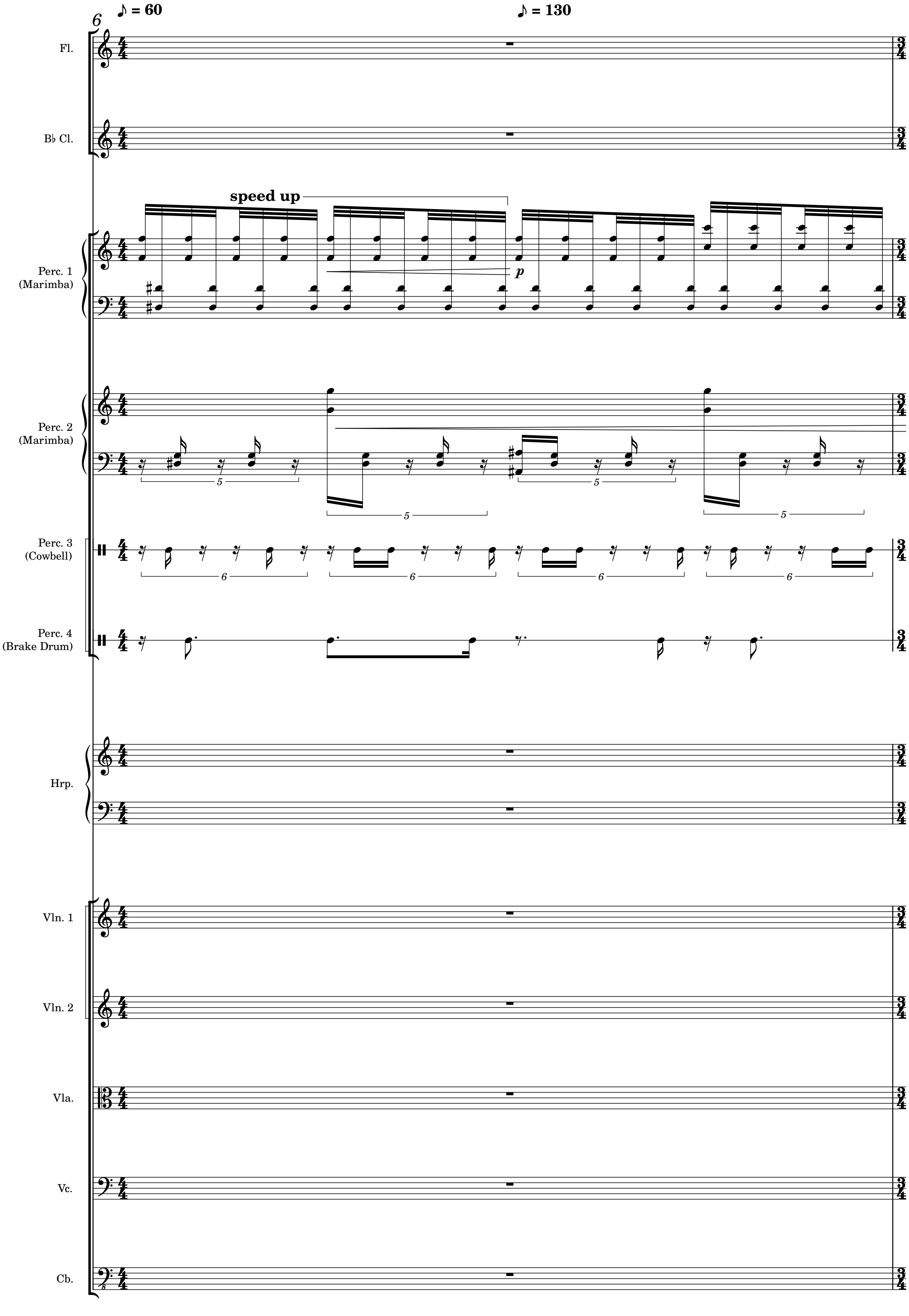
Ed Garcia

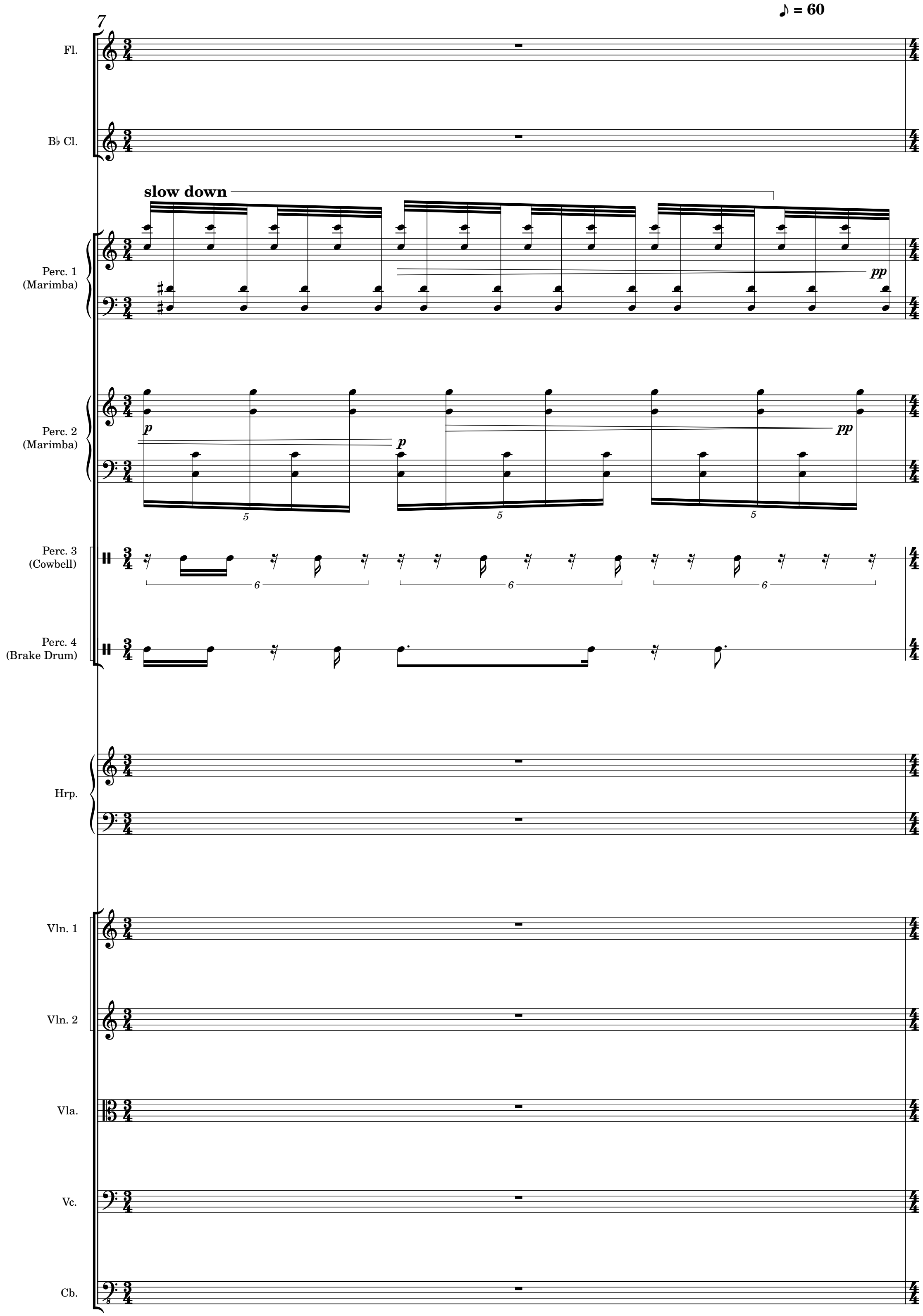

Smooth and connected
♪ = 40
♪ = 110
Flute
B♭ Clarinet
speed up
ppp
pp
Percussion 1:
Marimba 1
(5-octave recommended)
Percussion 2:
Marimba 2
(5-octave required)
Percussion 3
Percussion 4
Harp
Violin 1
Violin 2
Viola
Violoncello
Contrabass

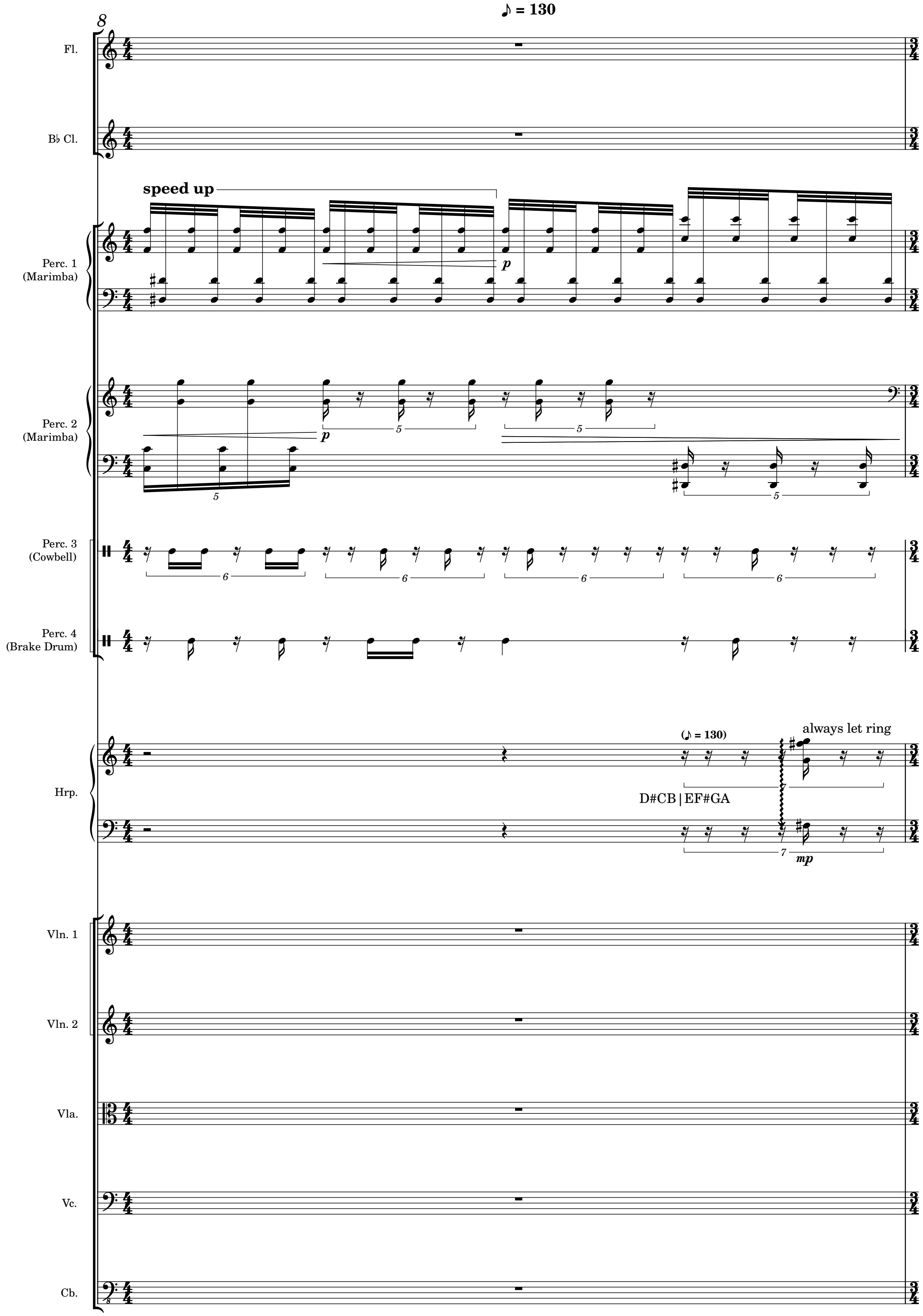

3
♪ = 40
Fl.
B♭ Cl.
slow down
Perc. 1
(Marimba)
ppp
(♪ = 110)
Perc. 2
(Marimba)
ppp
5
5
5
Perc. 3
(Cowbell)
Perc. 4
(Brake Drum)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

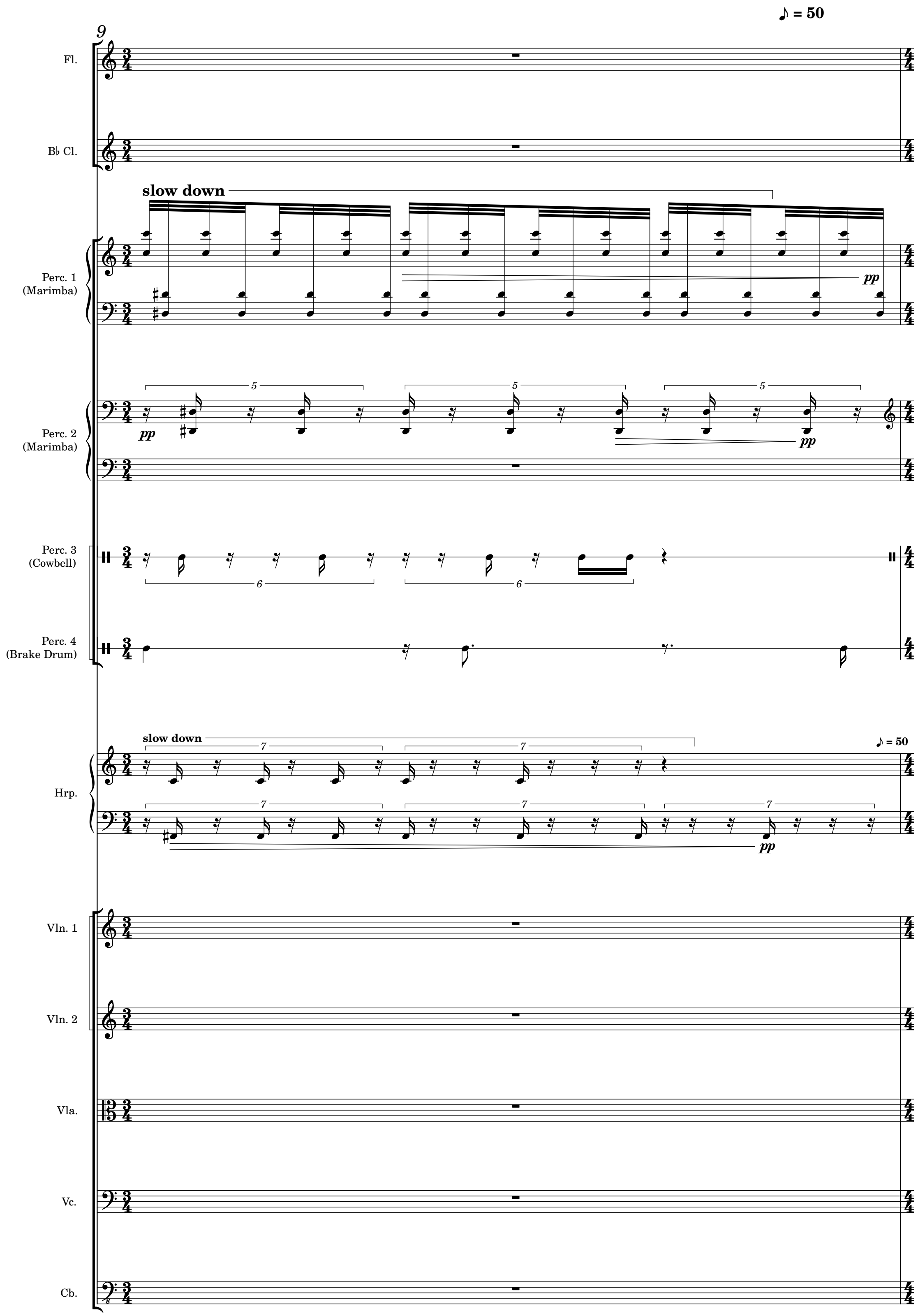

4
♪ = 90
Fl.
B♭ Cl.
speed up
pp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
pp
5
5
5
5
ppp
(♪ = 90)
Cowbell
Perc. 3
(Cowbell)
ppp
6
Perc. 4
(Brake Drum)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

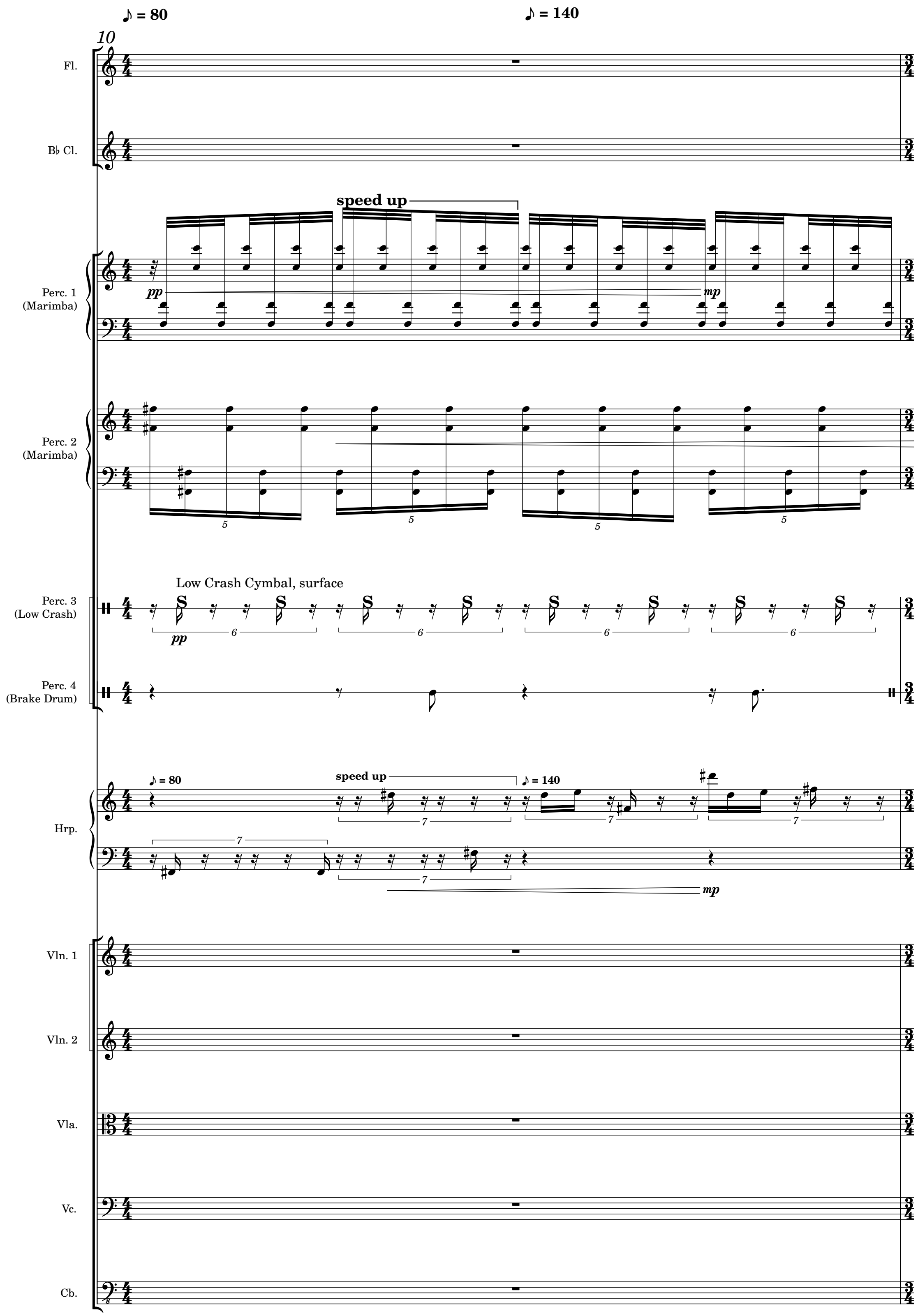

5
♪ = 40
Fl.
B♭ Cl.
slow down
ppp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
5
5
5
Perc. 3
(Cowbell)
6
6
6
Perc. 4
(Brake Drum)
(♪ = 90)
Brake Drum
ppp
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

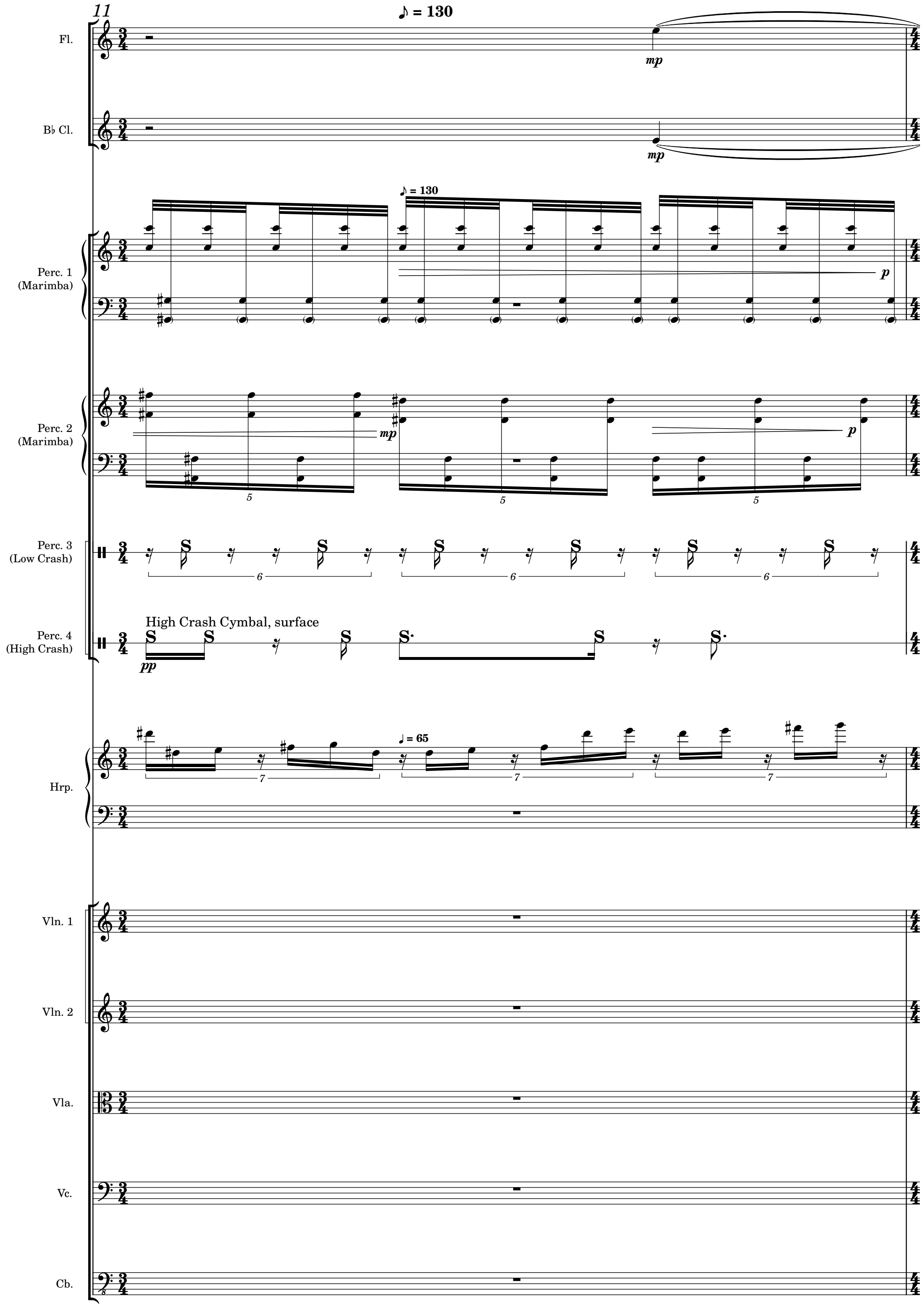

6
♪ = 60
♪ = 130
speed up
p
5
6
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Cowbell)
Perc. 4 (Brake Drum)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

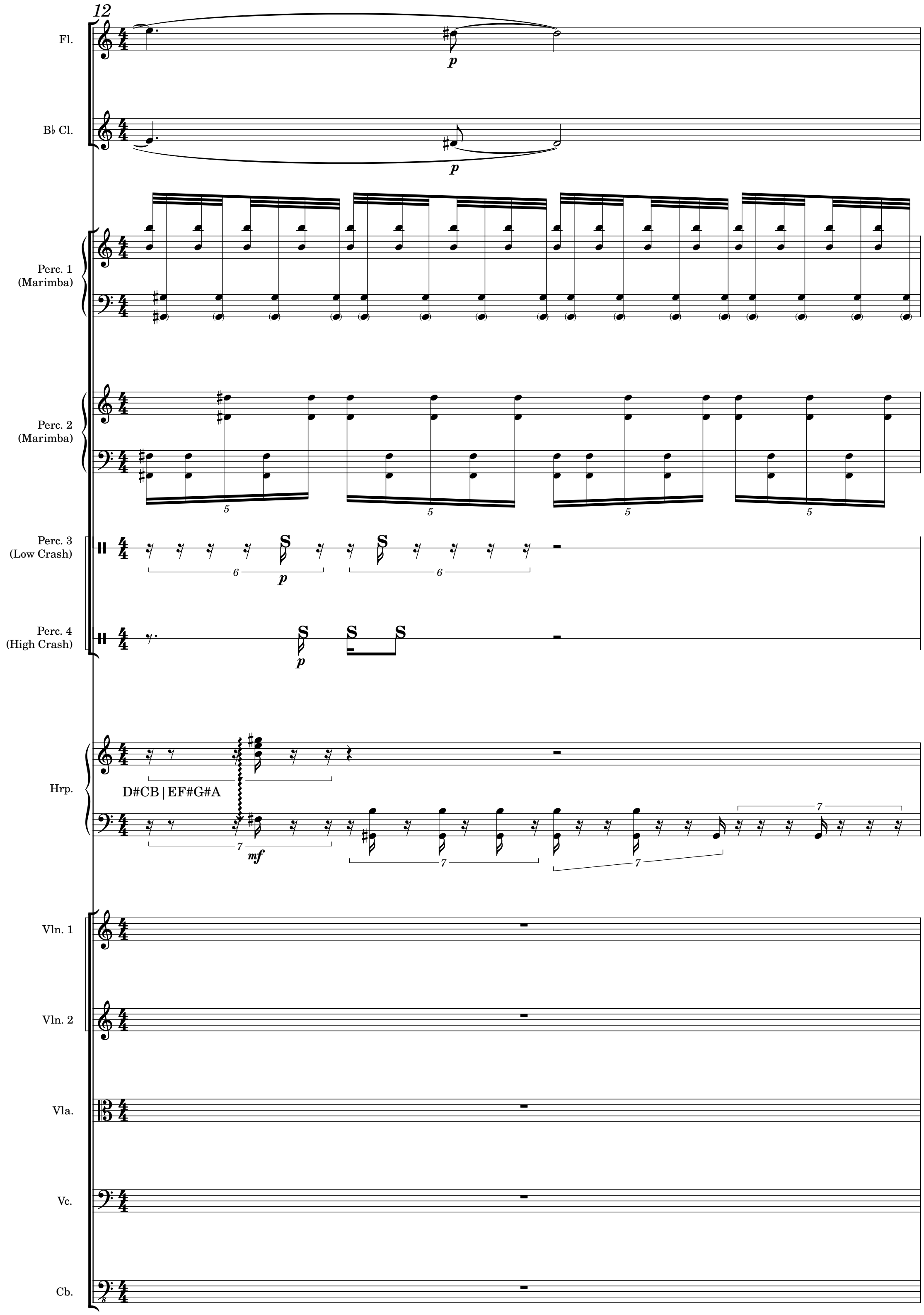

7
♪ = 60
Fl.
B♭ Cl.
slow down
Perc. 1
(Marimba)
pp
Perc. 2
(Marimba)
p
p
pp
5
5
5
Perc. 3
(Cowbell)
6
6
6
Perc. 4
(Brake Drum)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

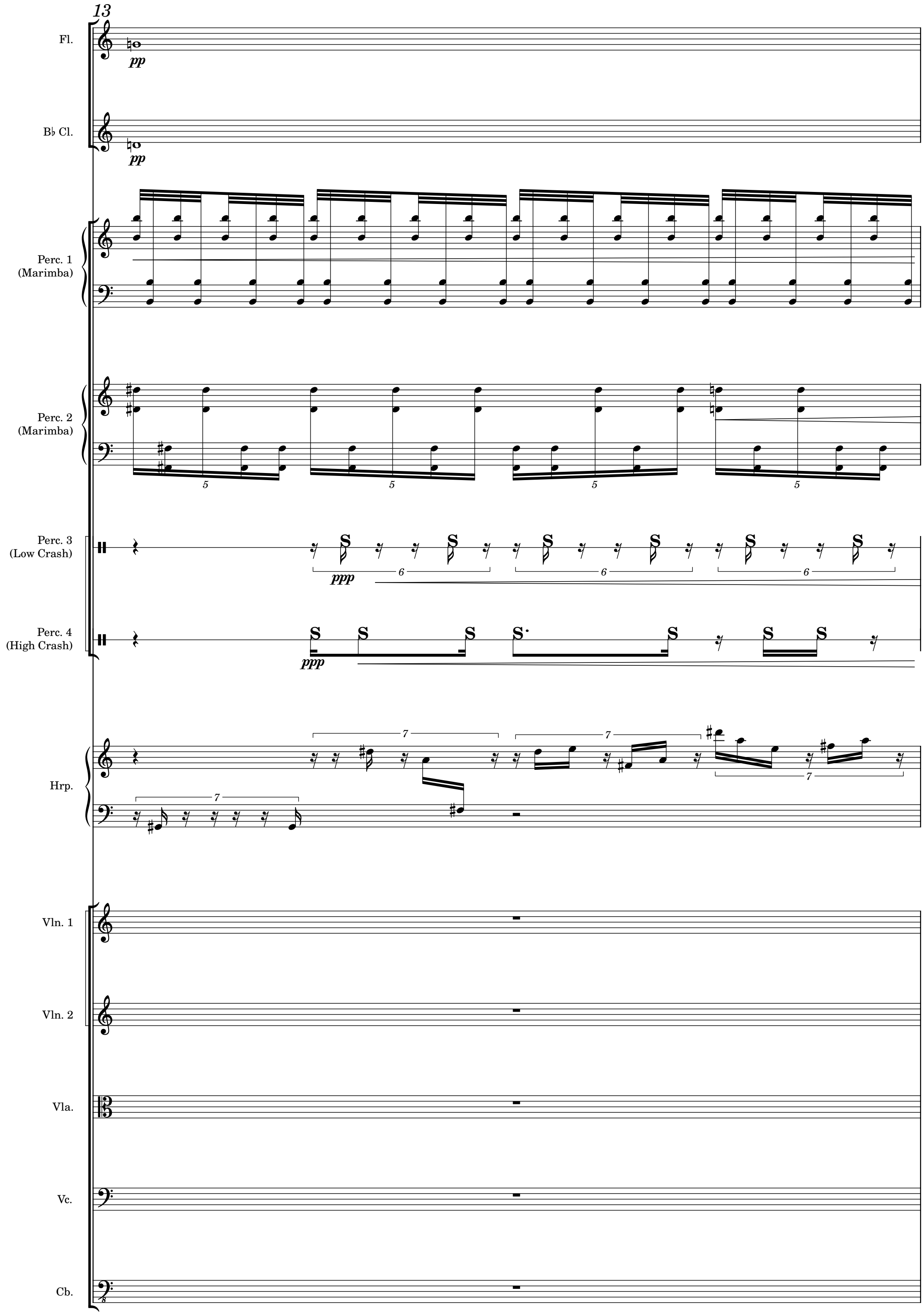

8
♪ = 130
Fl.
B♭ Cl.
speed up
Perc. 1
(Marimba)
p
Perc. 2
(Marimba)
p
5
Perc. 3
(Cowbell)
6
Perc. 4
(Brake Drum)
(♪ = 130)
always let ring
Hrp.
D#CB|EF#GA
7
mp
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

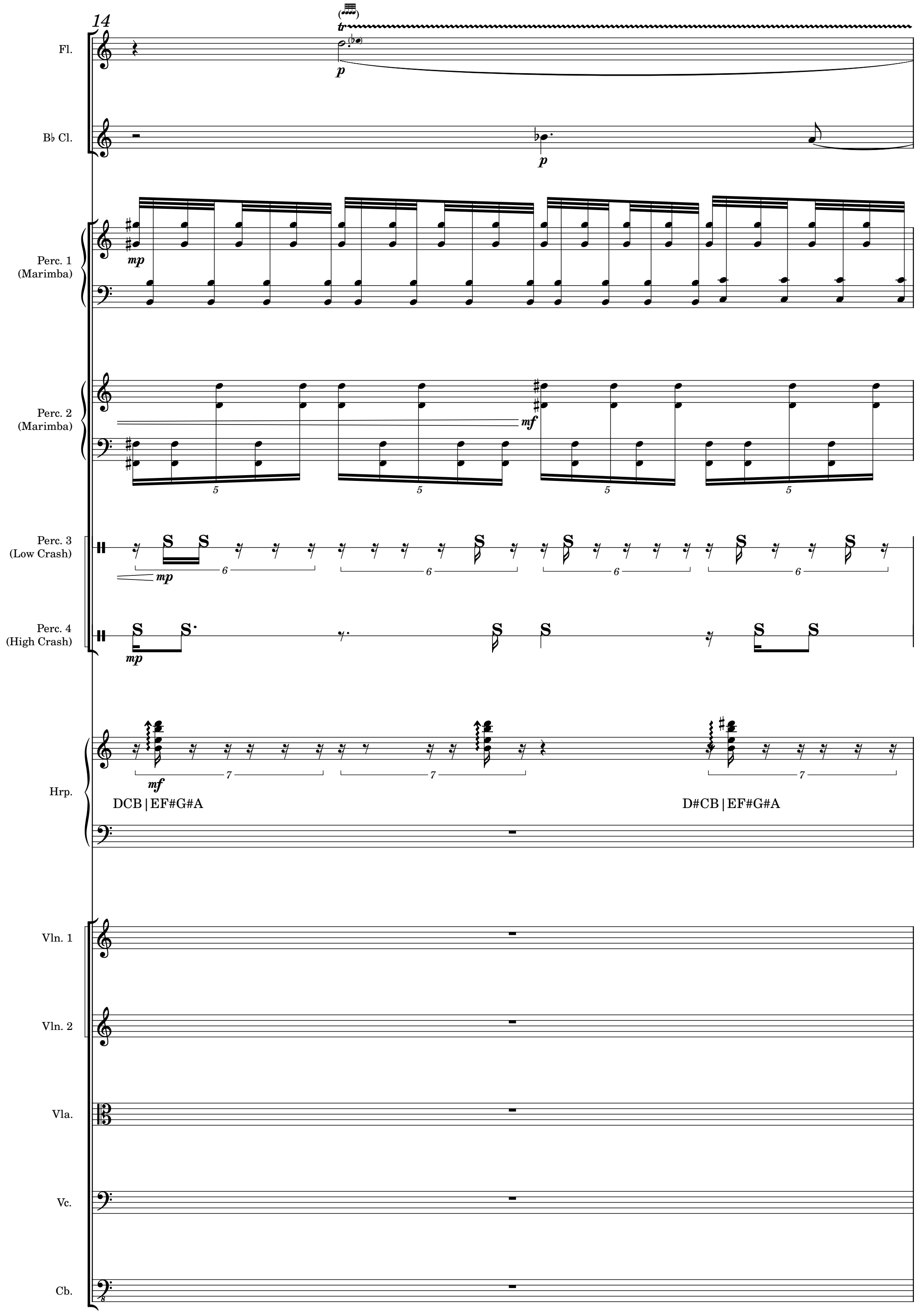

9
♪ = 50
Fl.
B♭ Cl.
slow down
pp
Perc. 1
(Marimba)
5
pp
Perc. 2
(Marimba)
6
Perc. 3
(Cowbell)
Perc. 4
(Brake Drum)
slow down
7
♪ = 50
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

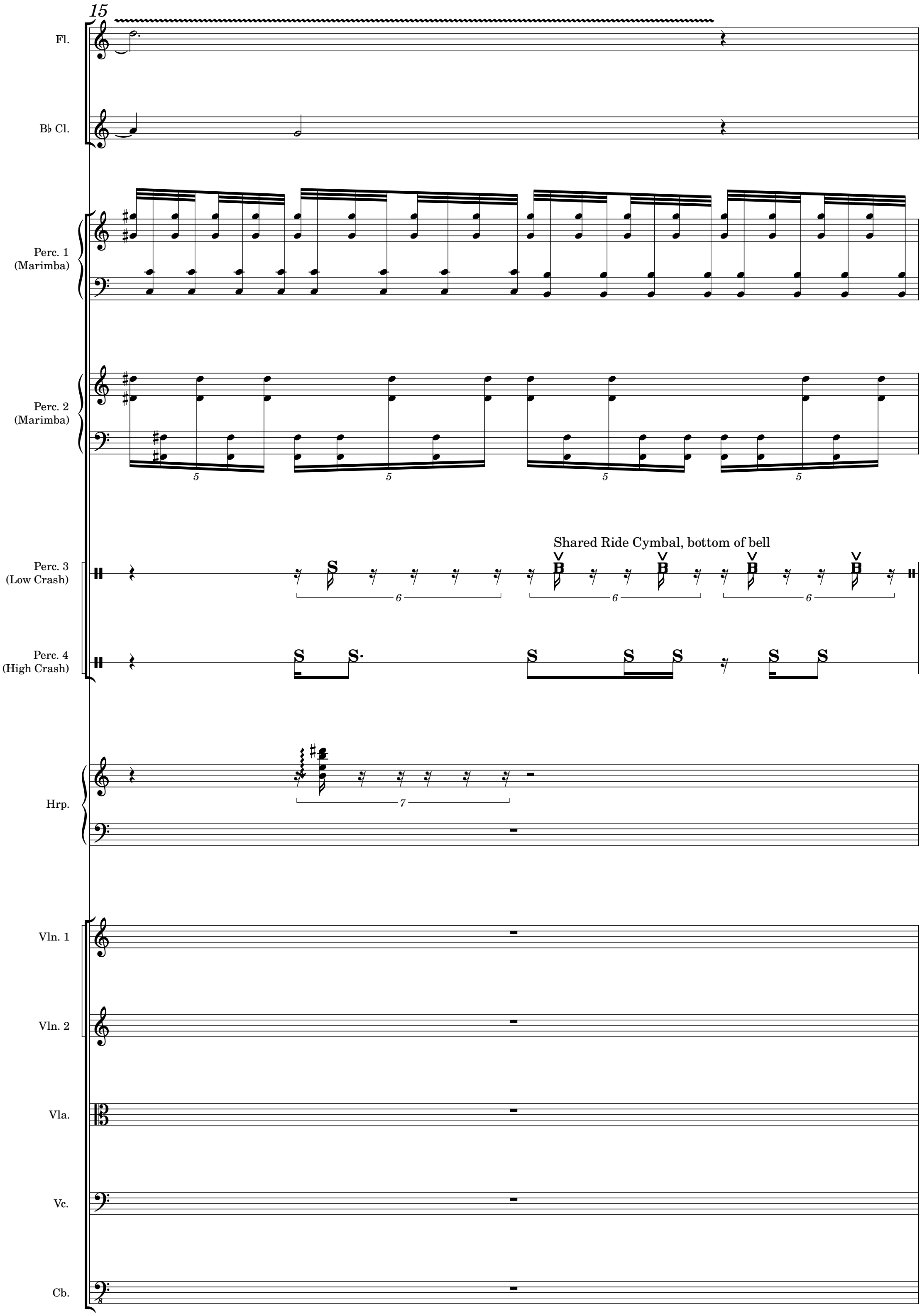

♪ = 80
♪ = 140
10
Fl.
B♭ Cl.
speed up
Perc. 1 (Marimba)
pp
mp
Perc. 2 (Marimba)
5
Low Crash Cymbal, surface
Perc. 3 (Low Crash)
6
Perc. 4 (Brake Drum)
♪ = 80
speed up
♪ = 140
7
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

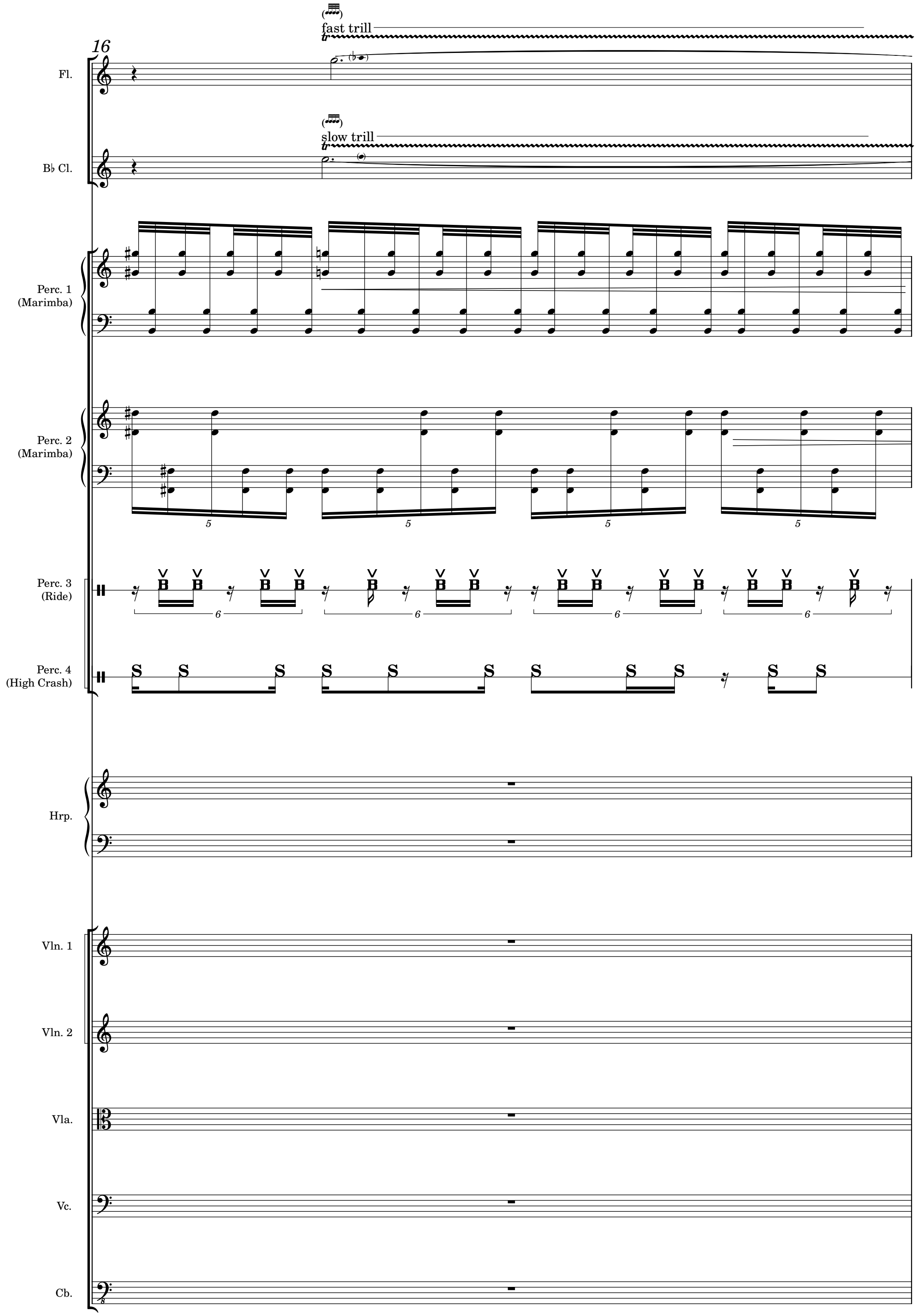

11
♪ = 130
Fl.
mp
B♭ Cl.
mp
♪ = 130
Perc. 1
(Marimba)
p
Perc. 2
(Marimba)
mp
p
5
5
5
Perc. 3
(Low Crash)
6
6
6
High Crash Cymbal, surface
Perc. 4
(High Crash)
pp
♩ = 65
Hrp.
7
7
7
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

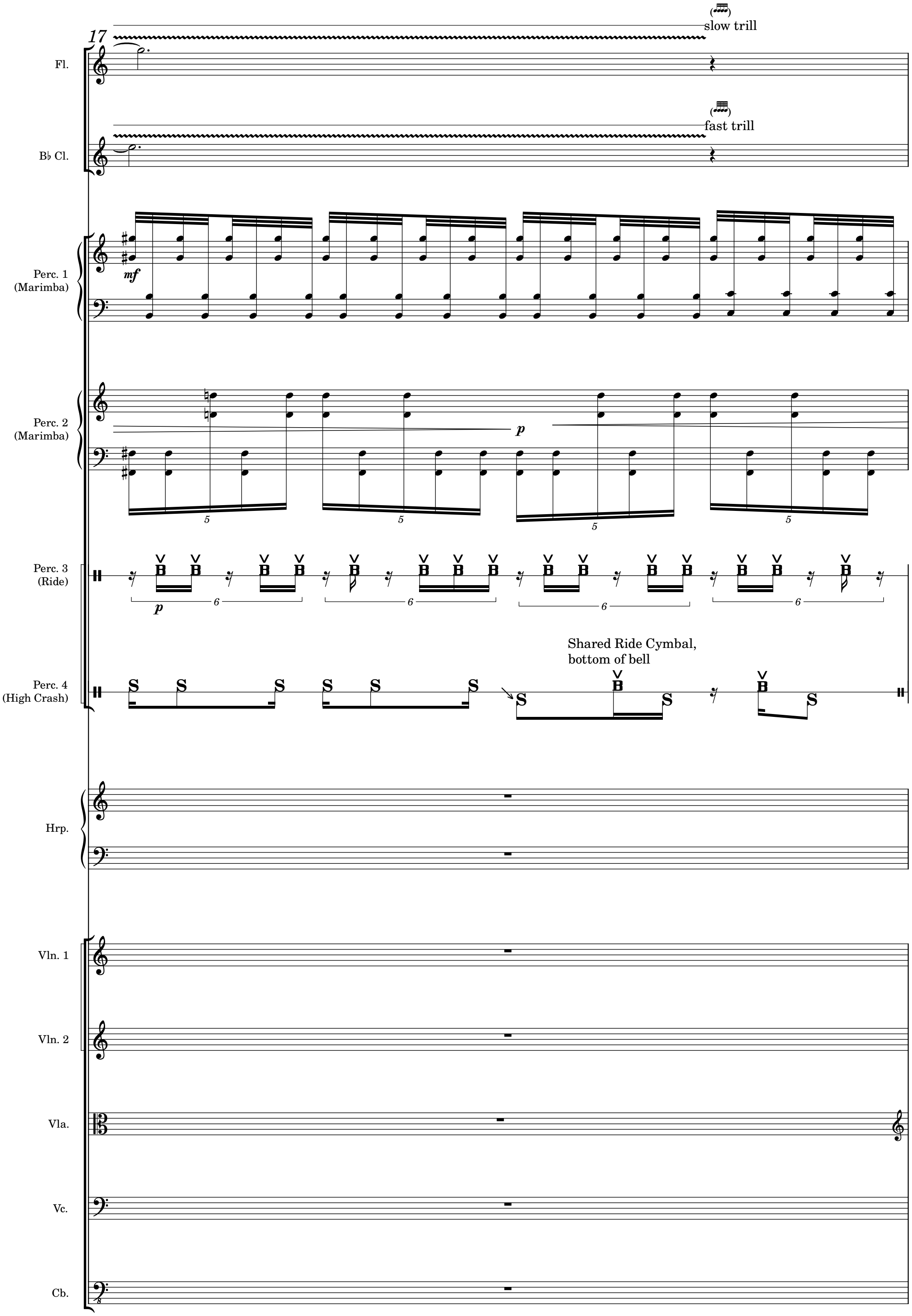

12
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Low Crash)
Perc. 4
(High Crash)
Hrp.
D#CB|EF#G#A
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
mf
5
6
7
S

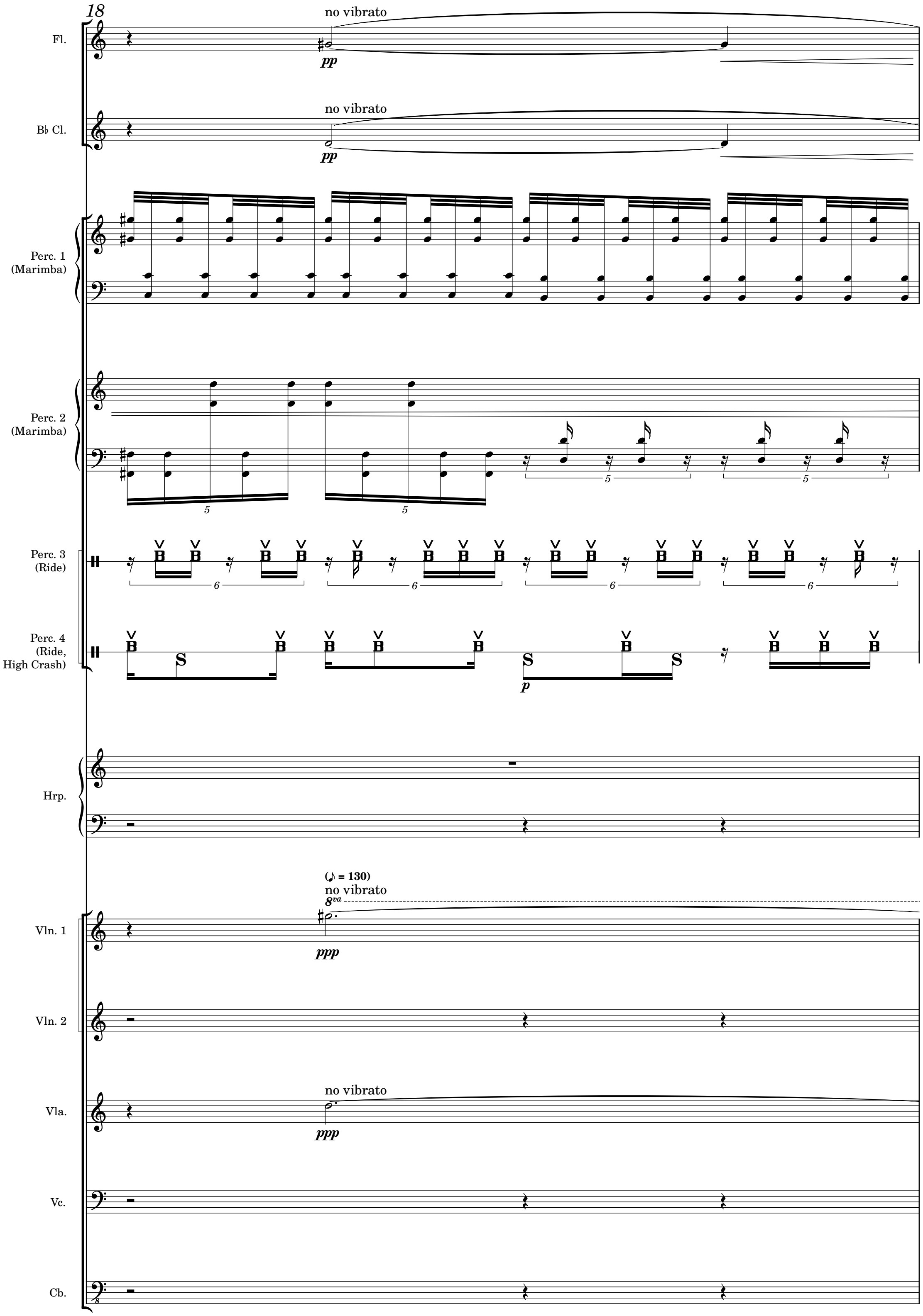

13
Fl.
pp
B♭ Cl.
pp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
5
Perc. 3
(Low Crash)
6
ppp
Perc. 4
(High Crash)
ppp
Hrp.
7
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

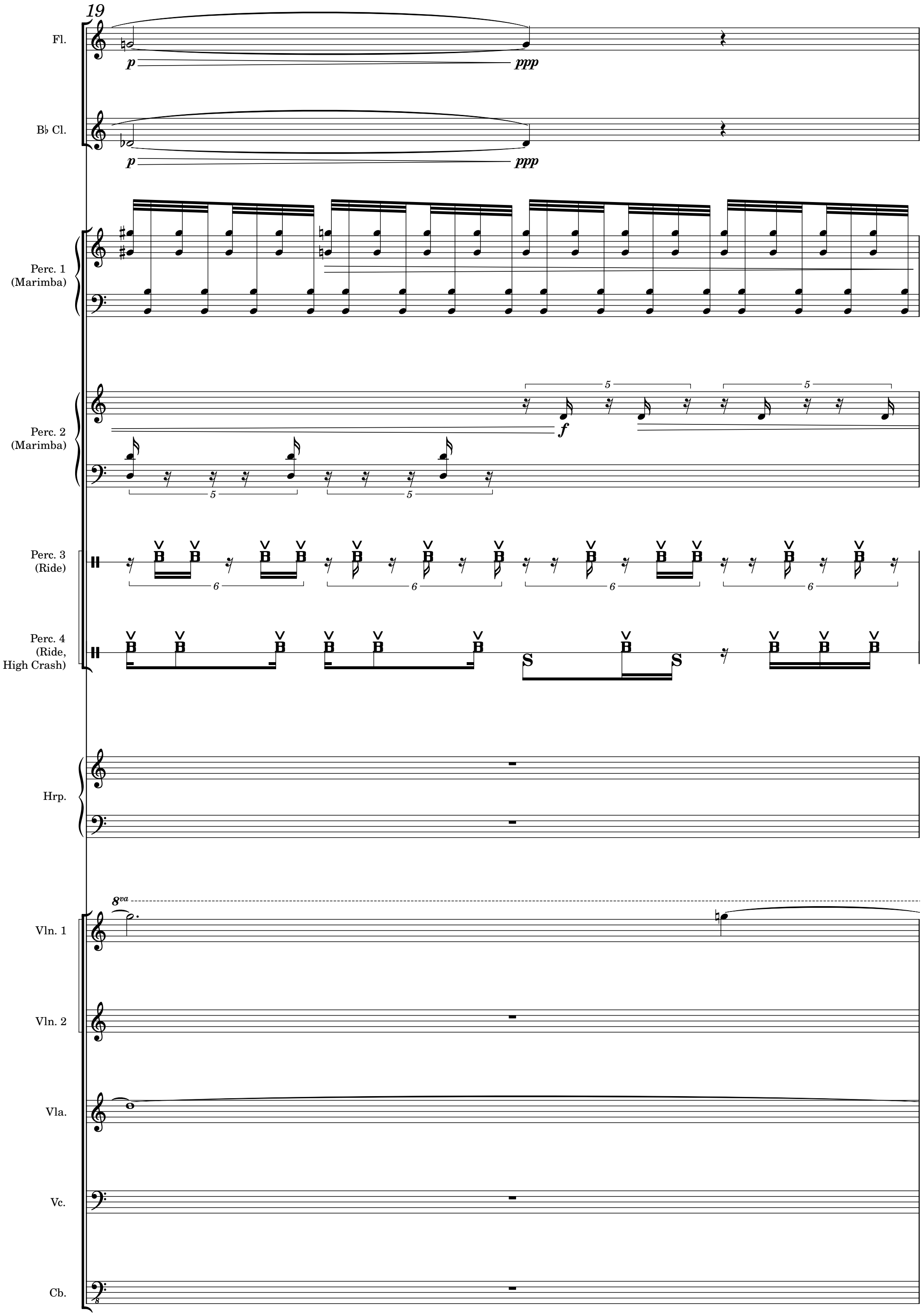
14
Fl.
tr
p
B♭ Cl.
p
Perc. 1 (Marimba)
mp
Perc. 2 (Marimba)
mf
5
Perc. 3 (Low Crash)
mp
6
Perc. 4 (High Crash)
mp
Hrp.
mf
7
DCB|EF#G#A
D#CB|EF#G#A
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

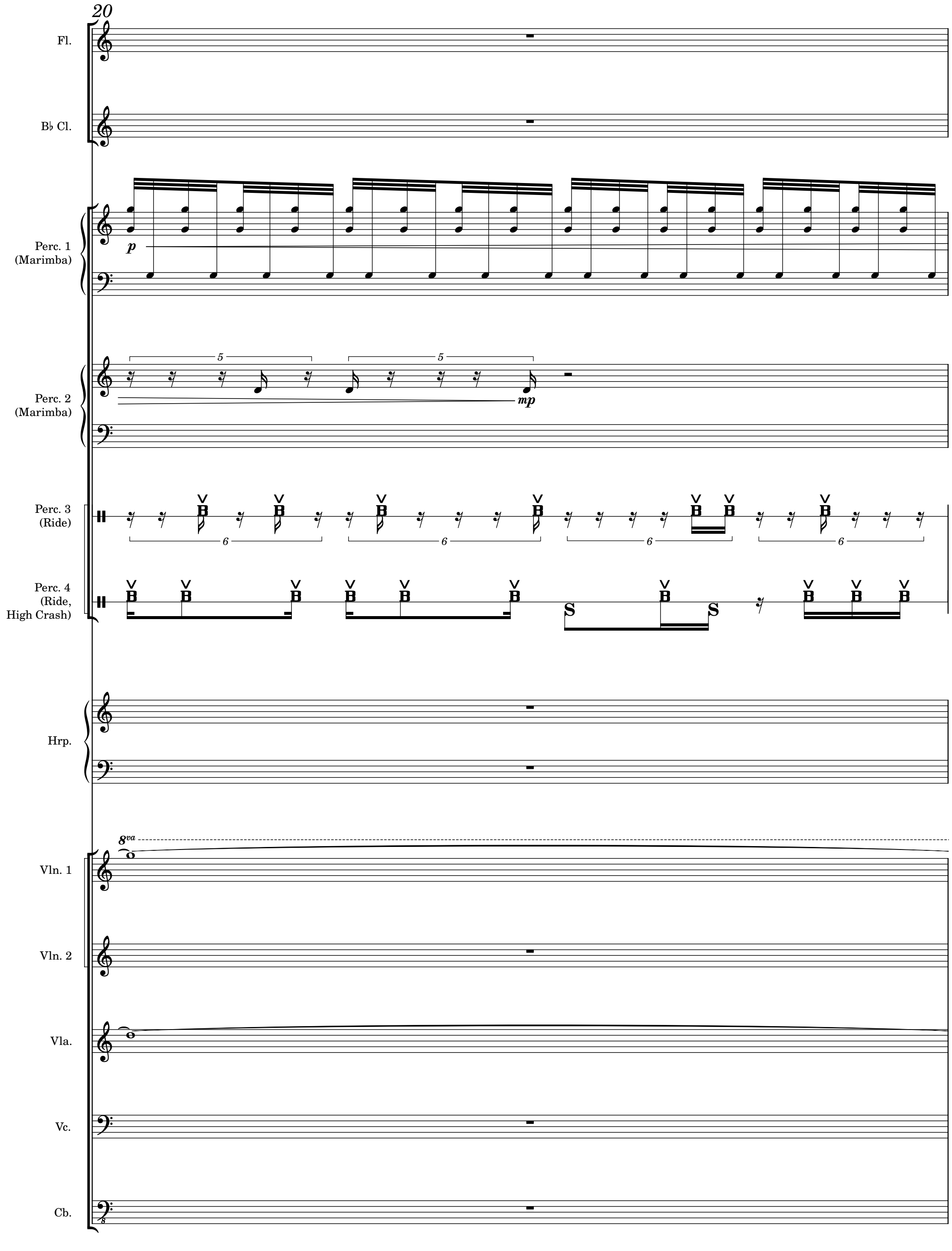

15
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
5
Perc. 3
(Low Crash)
Shared Ride Cymbal, bottom of bell
6
Perc. 4
(High Crash)
S
B
Hrp.
7
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

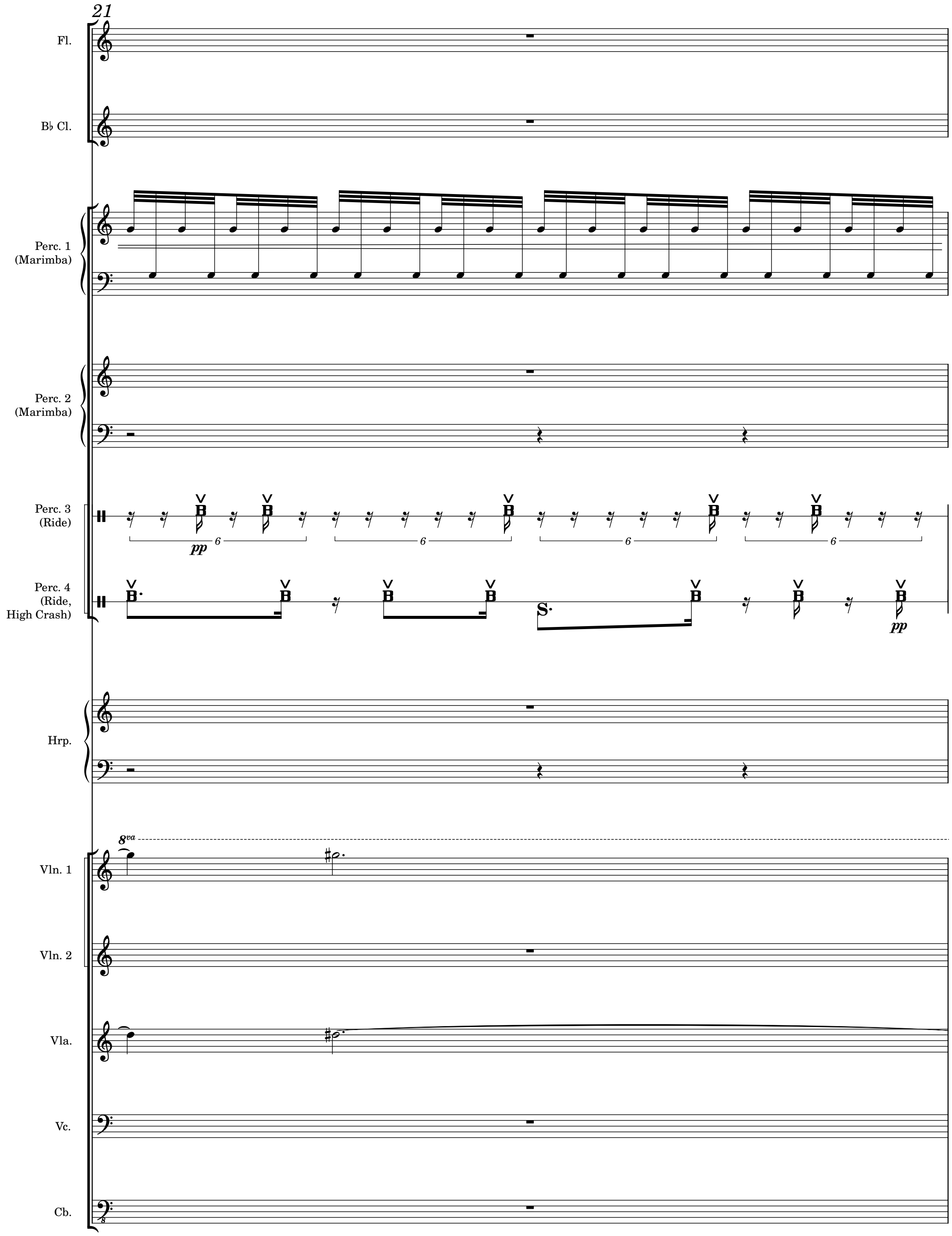

16
fast trill
slow trill
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
5
6

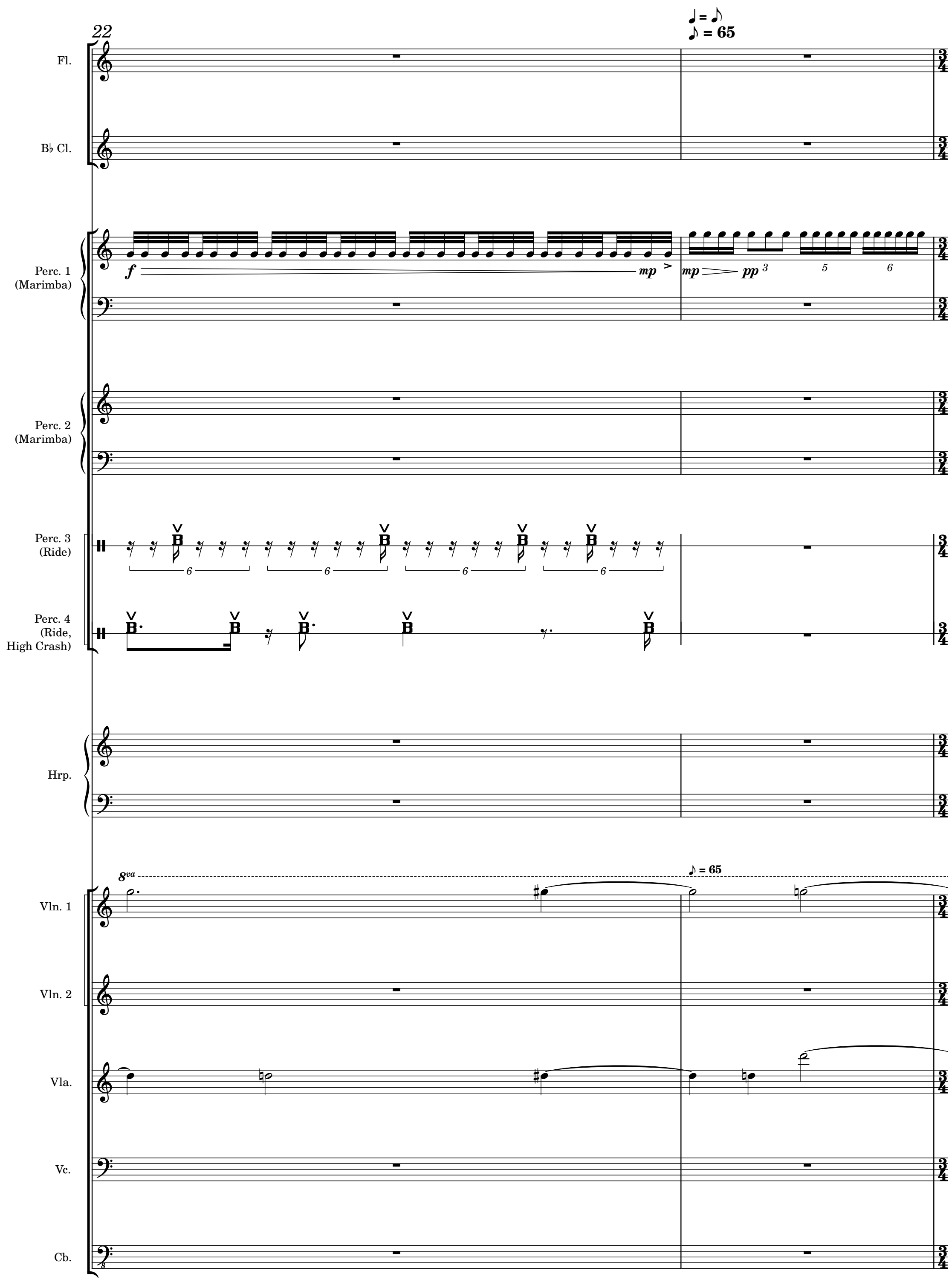

17
slow trill
fast trill
Fl.
B♭ Cl.
Perc. 1
(Marimba)
mf
Perc. 2
(Marimba)
p
5
Perc. 3
(Ride)
6
Perc. 4
(High Crash)
Shared Ride Cymbal,
bottom of bell
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

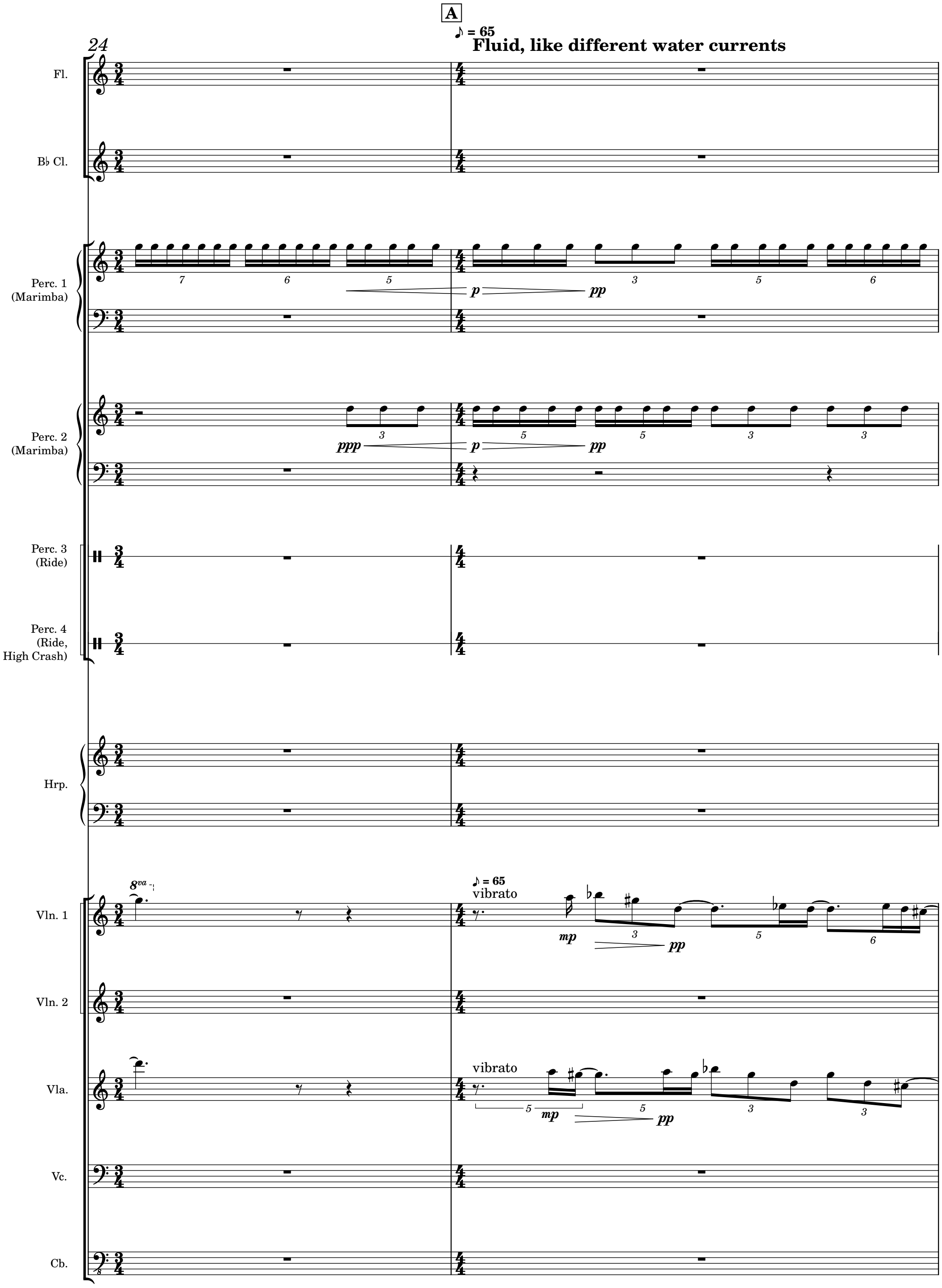

18
Fl.
no vibrato
pp
B♭ Cl.
no vibrato
pp
Perc. 1 (Marimba)
Perc. 2 (Marimba)
5
5
5
5
Perc. 3 (Ride)
6
6
6
6
Perc. 4 (Ride, High Crash)
p
Hrp.
(♪ = 130)
no vibrato
8va
ppp
Vln. 1
Vln. 2
no vibrato
ppp
Vla.
Vc.
Cb.

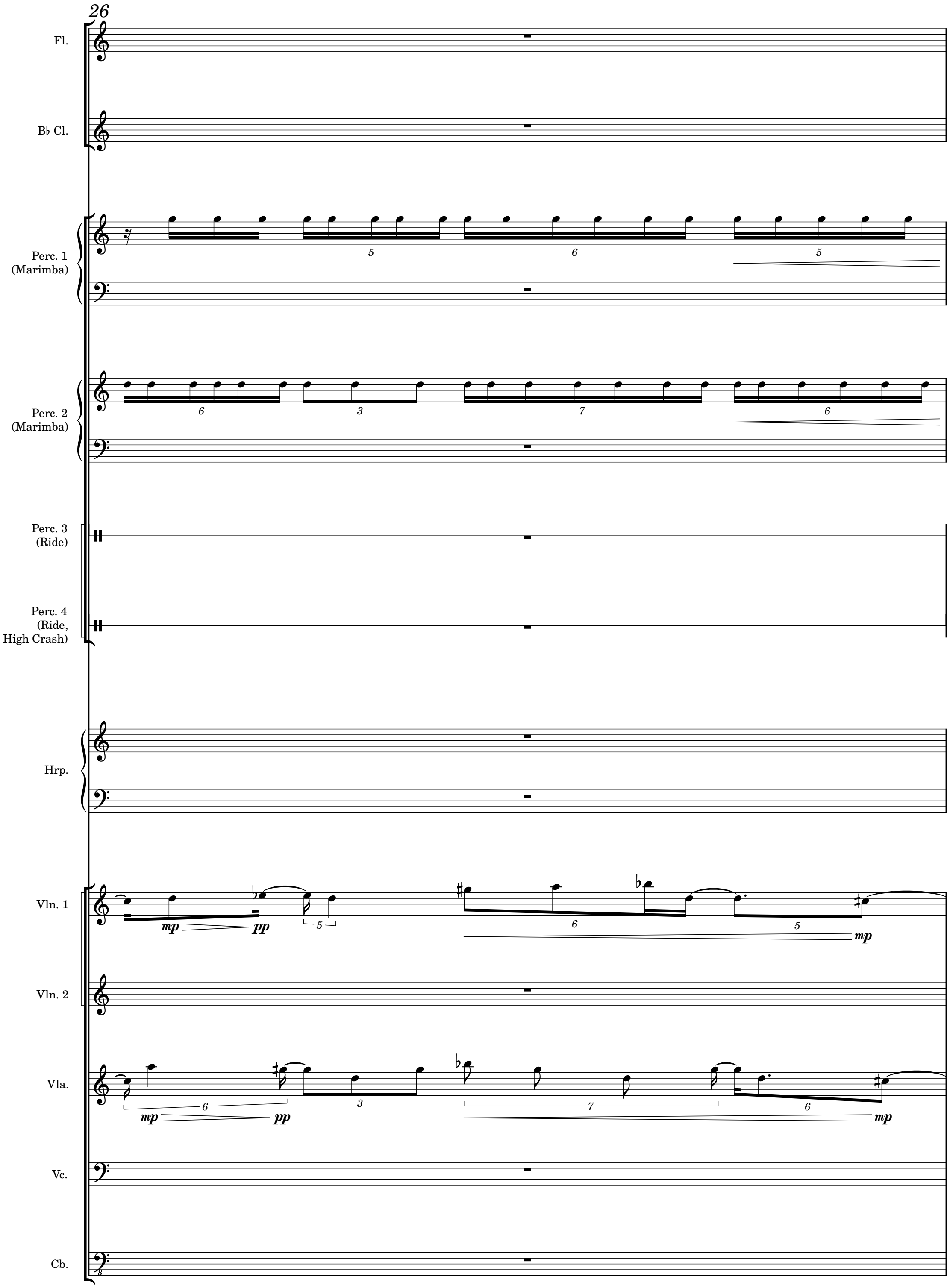

19
Fl.
p
ppp
B♭ Cl.
p
ppp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
5
f
5
5
5
Perc. 3
(Ride)
6
6
6
6
Perc. 4
(Ride,
High Crash)
Hrp.
8va
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

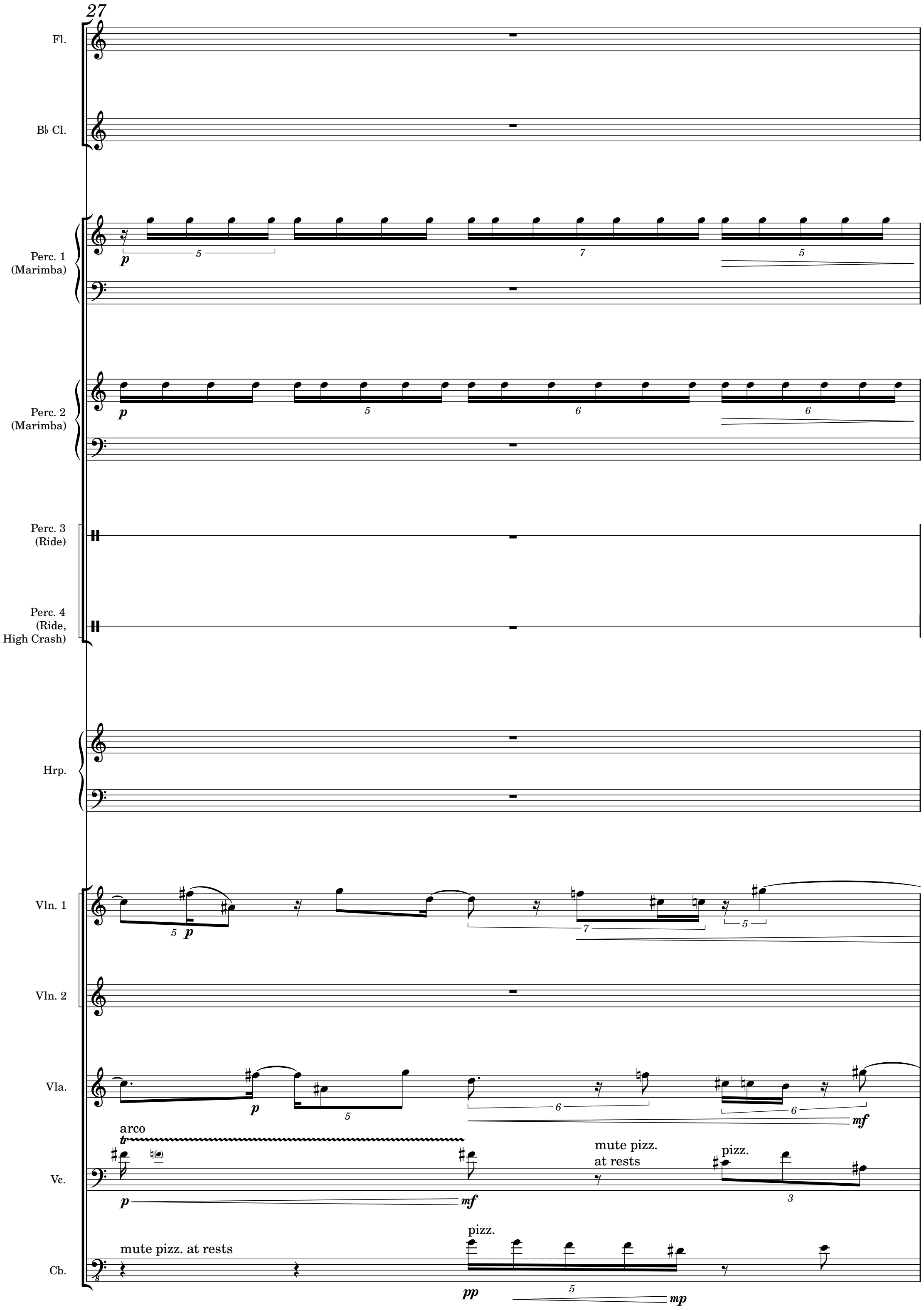

20
Fl.
B♭ Cl.
Perc. 1
(Marimba)
p
Perc. 2
(Marimba)
5
5
mp
Perc. 3
(Ride)
6
6
6
6
Perc. 4
(Ride,
High Crash)
S
S
Hrp.
8va
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

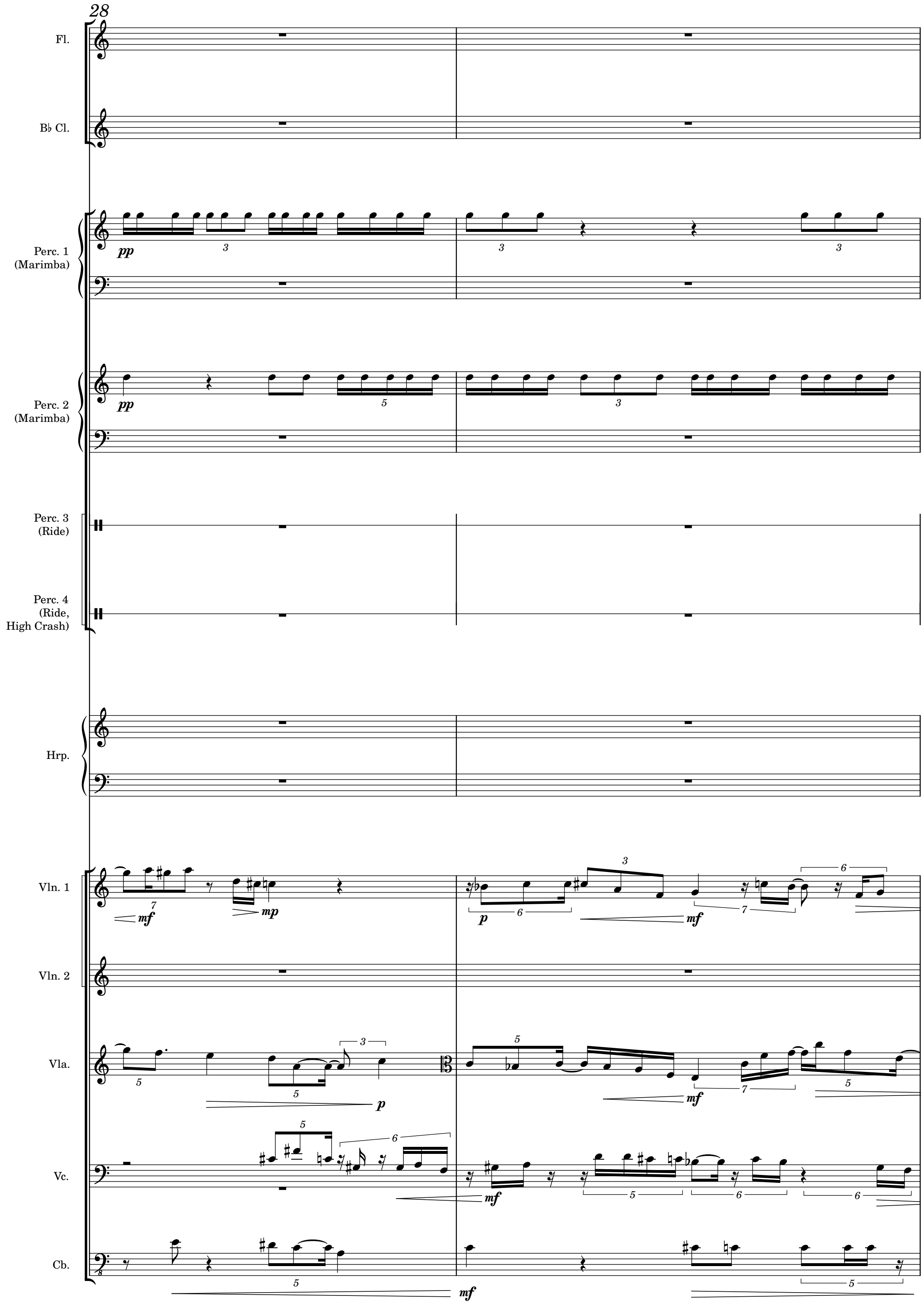

21
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
pp
6
6
6
6
Perc. 4 (Ride, High Crash)
pp
Hrp.
8va
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

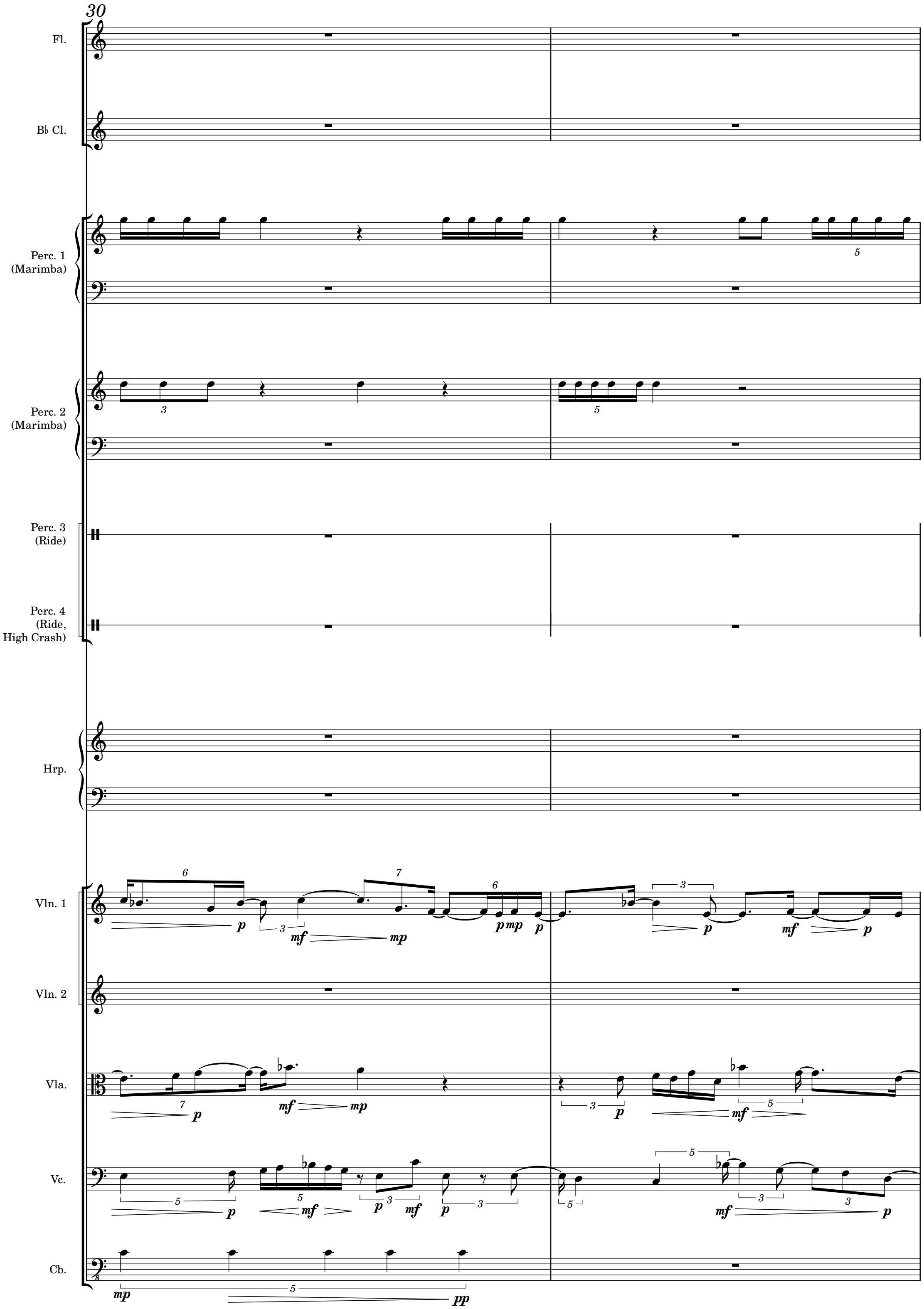

22
♩=♪
♪ = 65
Fl.
B♭ Cl.
Perc. 1 (Marimba)
f
mp
mp
pp
3
5
6
Perc. 2 (Marimba)
Perc. 3 (Ride)
6
Perc. 4 (Ride, High Crash)
Hrp.
8va
♪ = 65
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

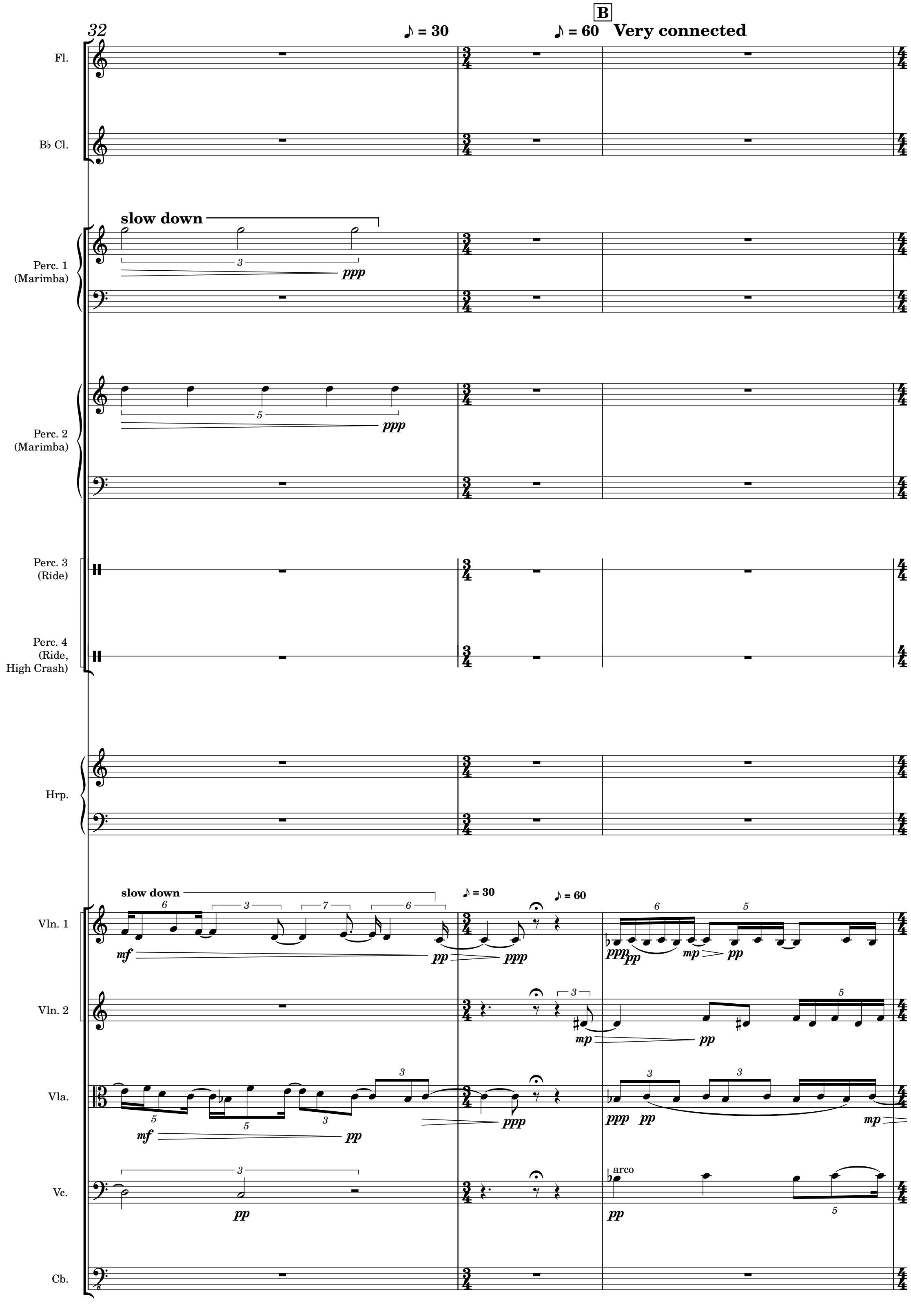

A
♪ = 65
Fluid, like different water currents
24
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
ppp
p
pp
mp
8va
♪ = 65
vibrato
vibrato

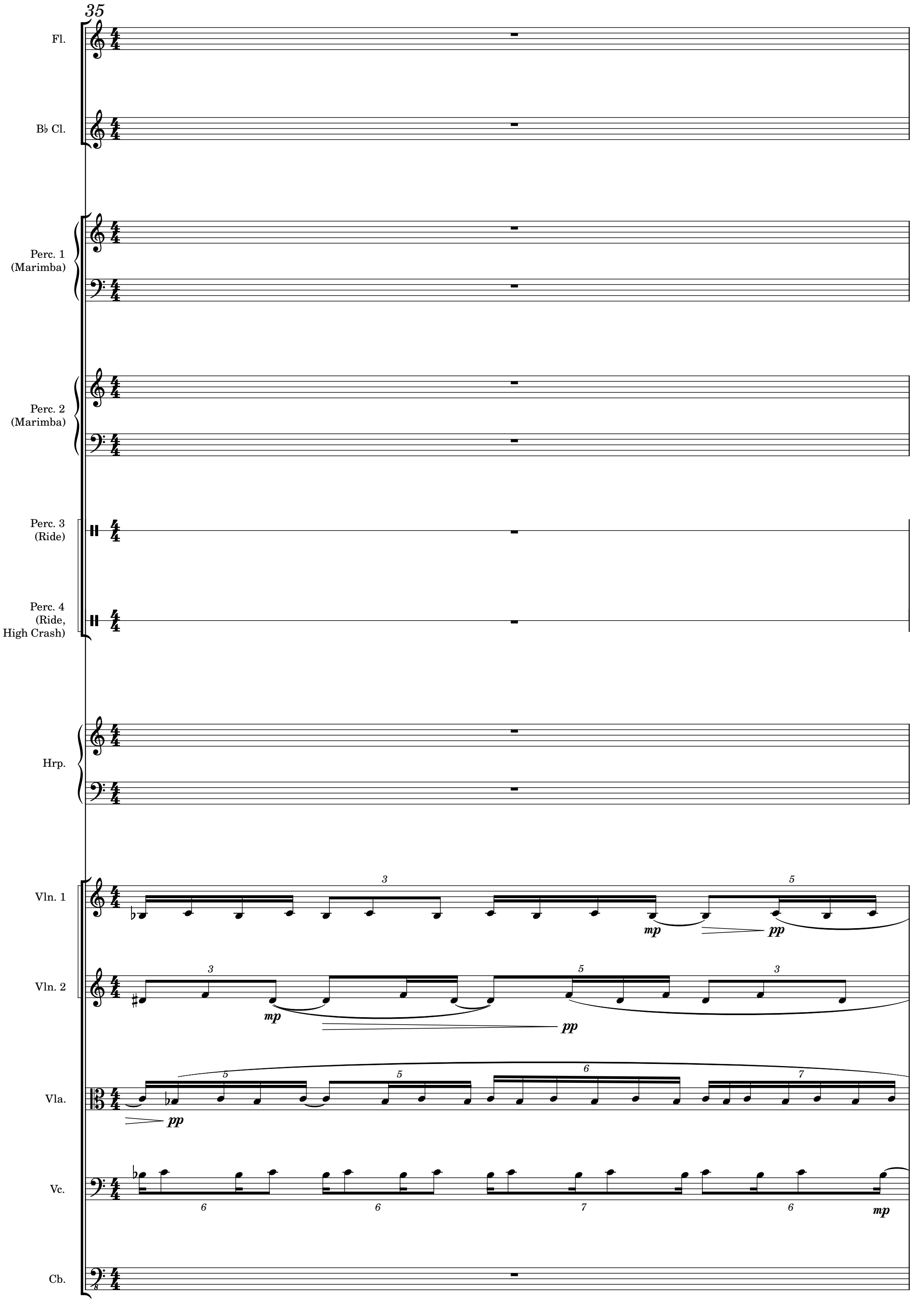

26
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mp
pp
mp
5
6
3
7

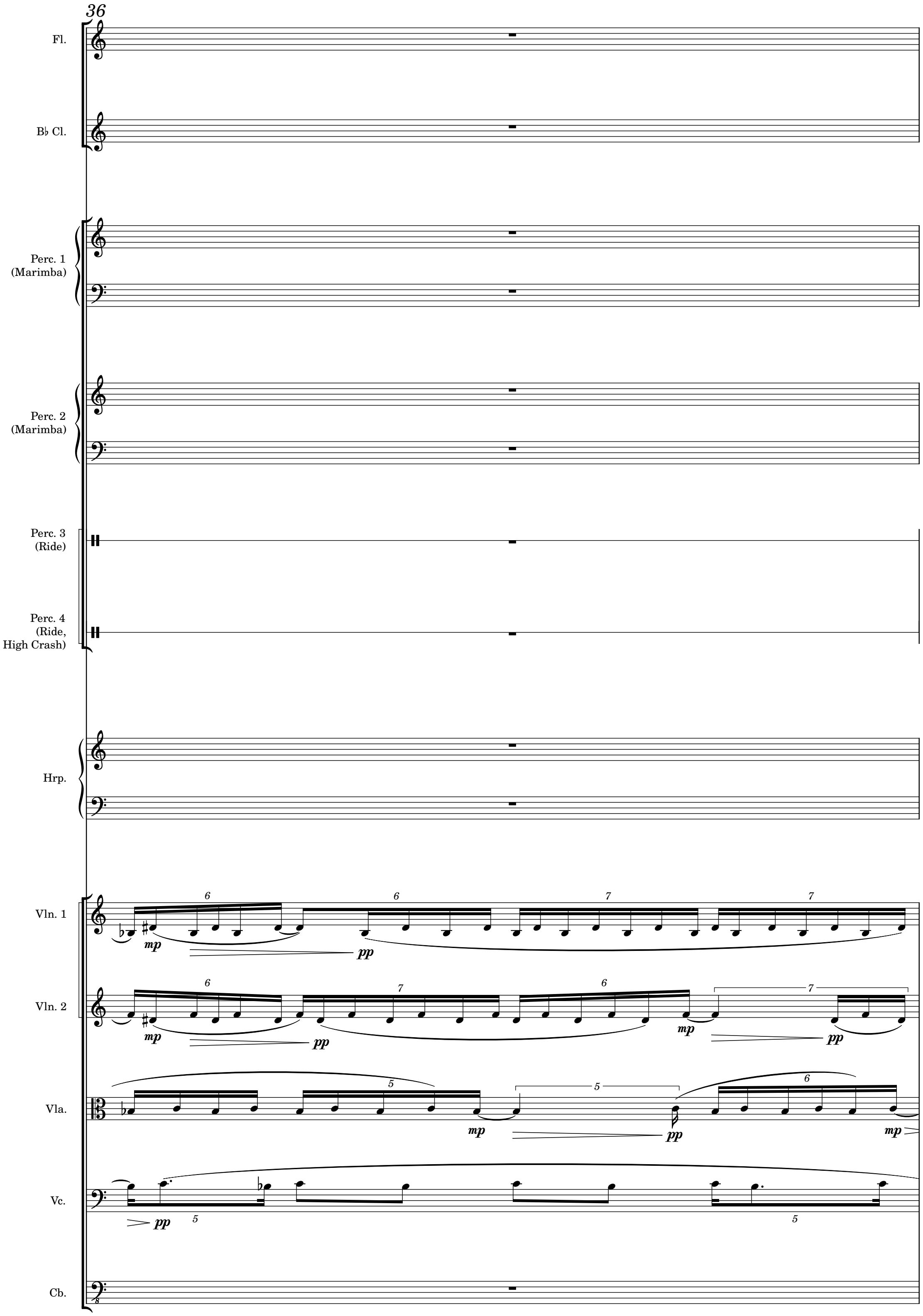

27
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
5
7
6
3
arco
tr
mf
mute pizz. at rests
pizz.
pp
mp

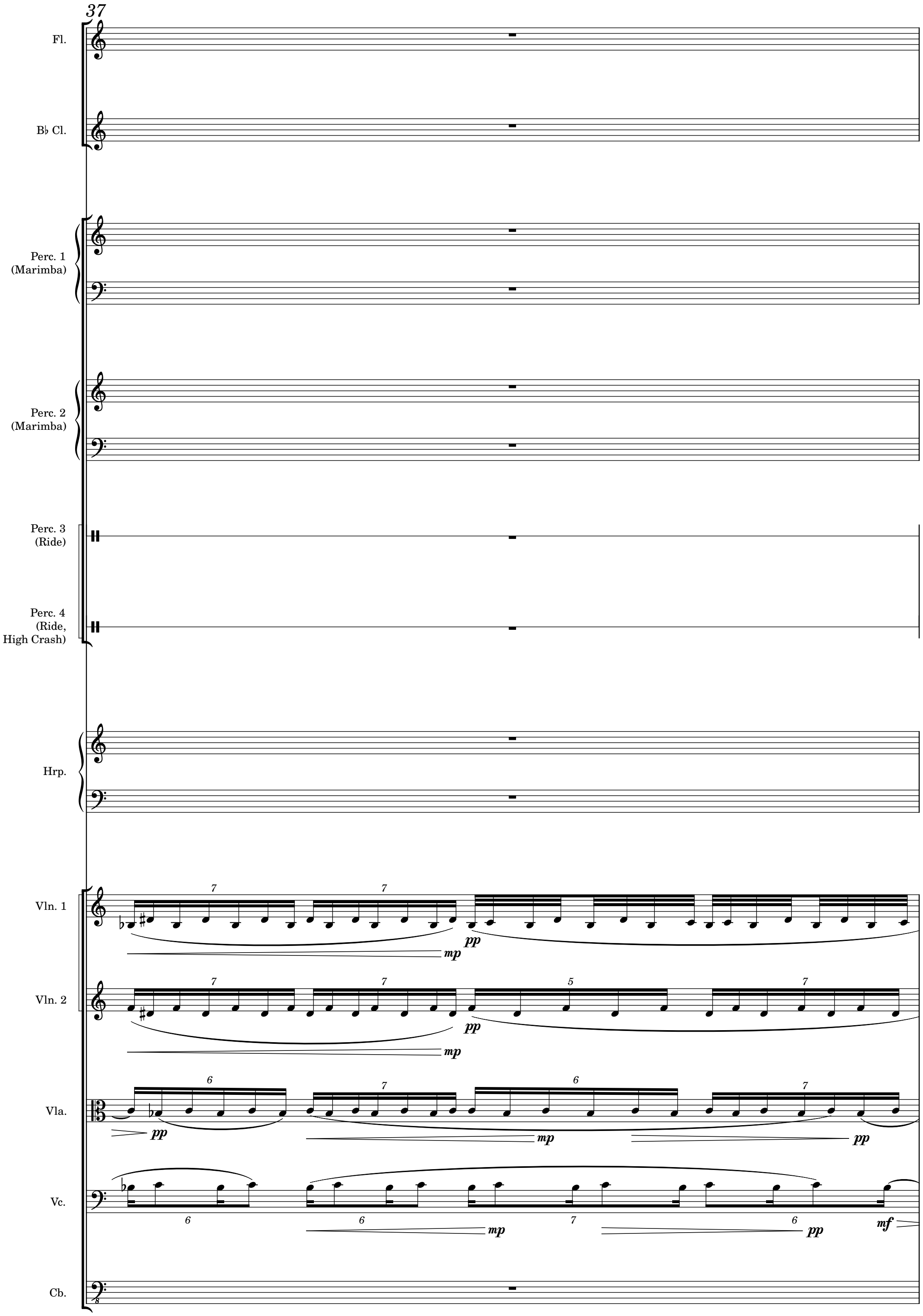

28
Fl.
B♭ Cl.
Perc. 1
(Marimba)
pp
3
Perc. 2
(Marimba)
pp
5
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
7
mf
mp
p
6
mf
Vln. 2
Vla.
5
p
mf
Vc.
6
5
mf
Cb.
mf

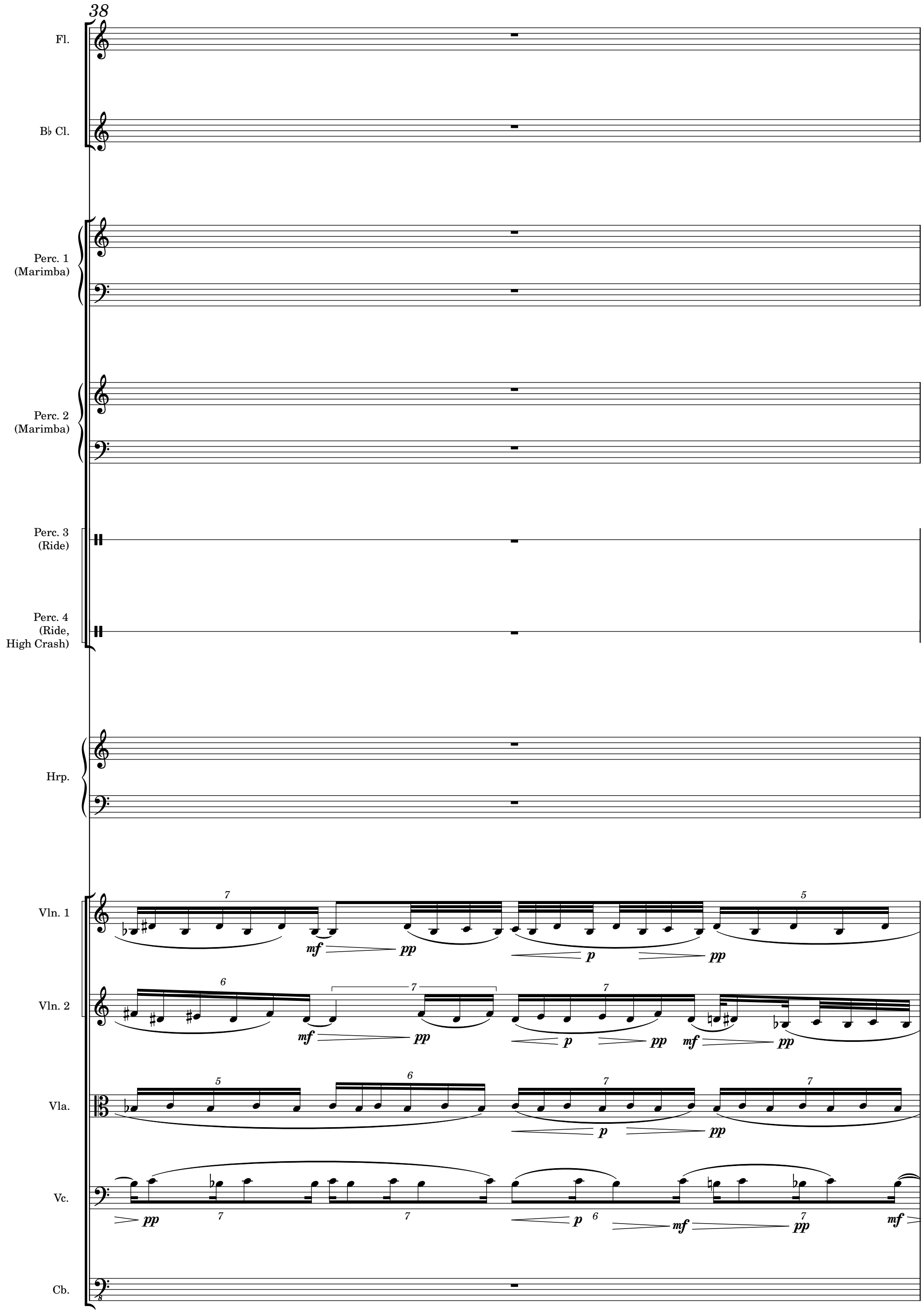

30
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
mf
mp
pp

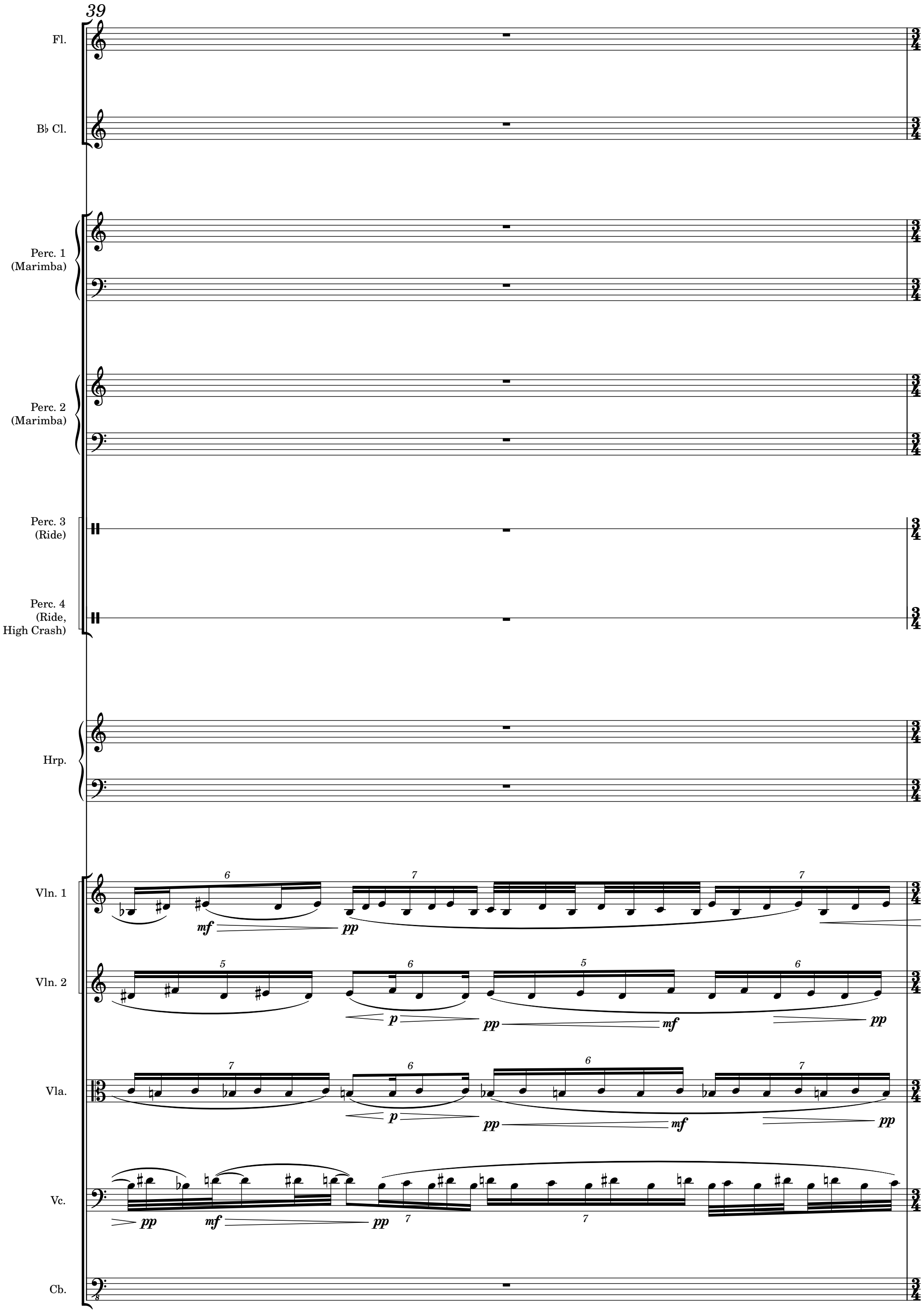

32
B
♪ = 30
♪ = 60
Very connected
Fl.
B♭ Cl.
slow down
ppp
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
pp
mp
arco

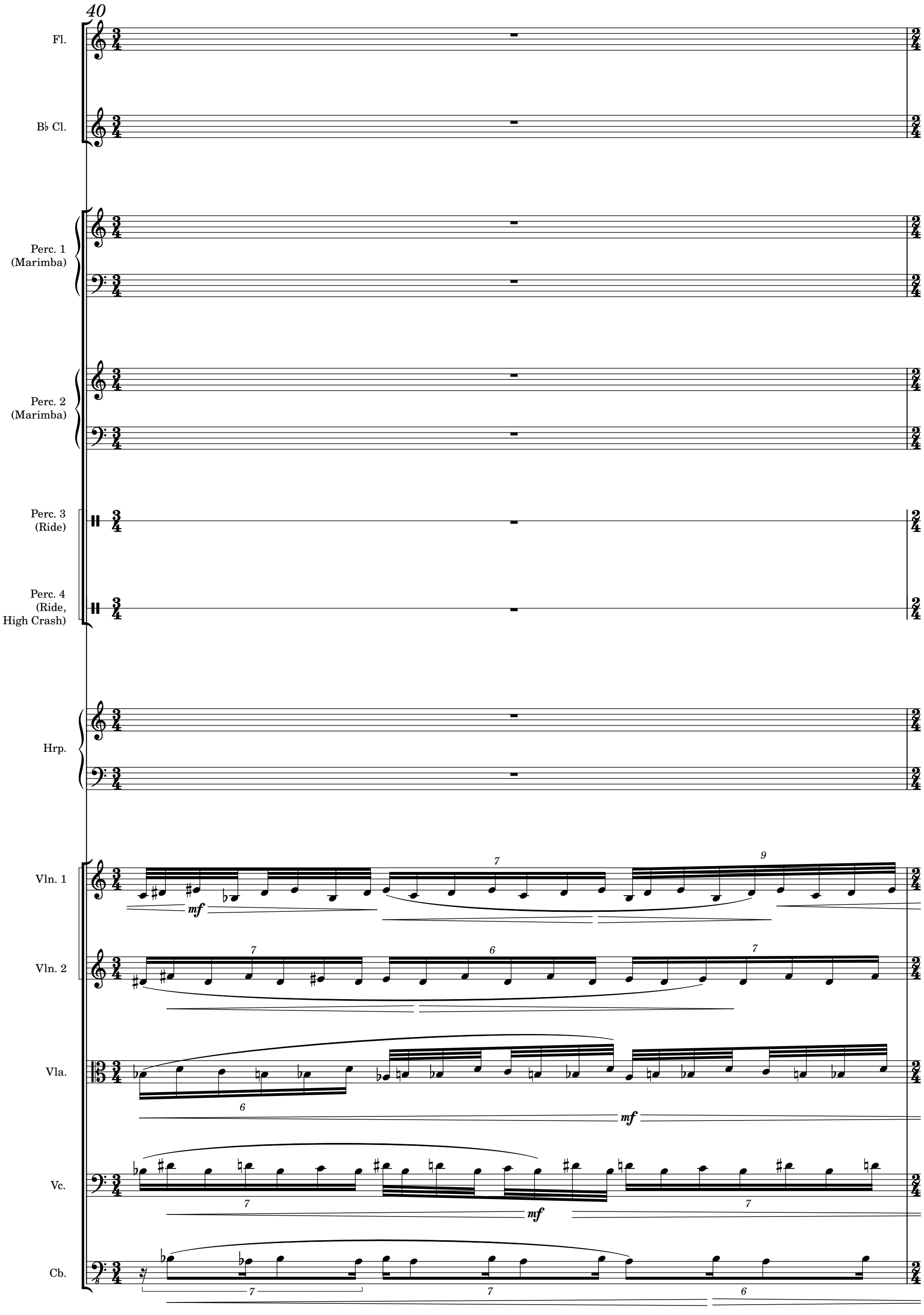

35
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
3
5
mp
pp
7
6

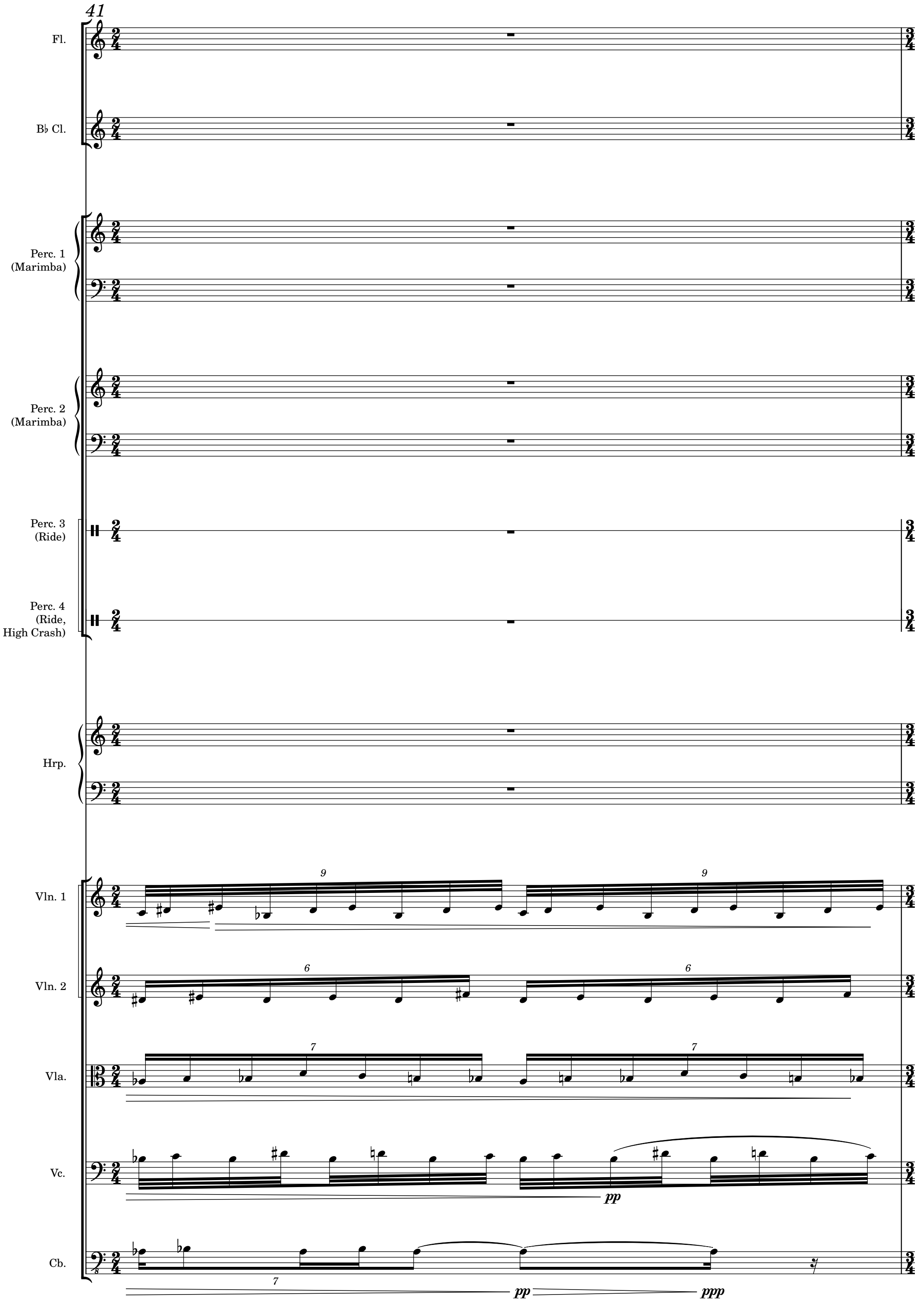

36
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
6
6
7
7
mp
pp
Vln. 2
6
7
6
7
mp
pp
mp
pp
Vla.
5
5
6
mp
pp
mp
Vc.
pp
5
5
Cb.

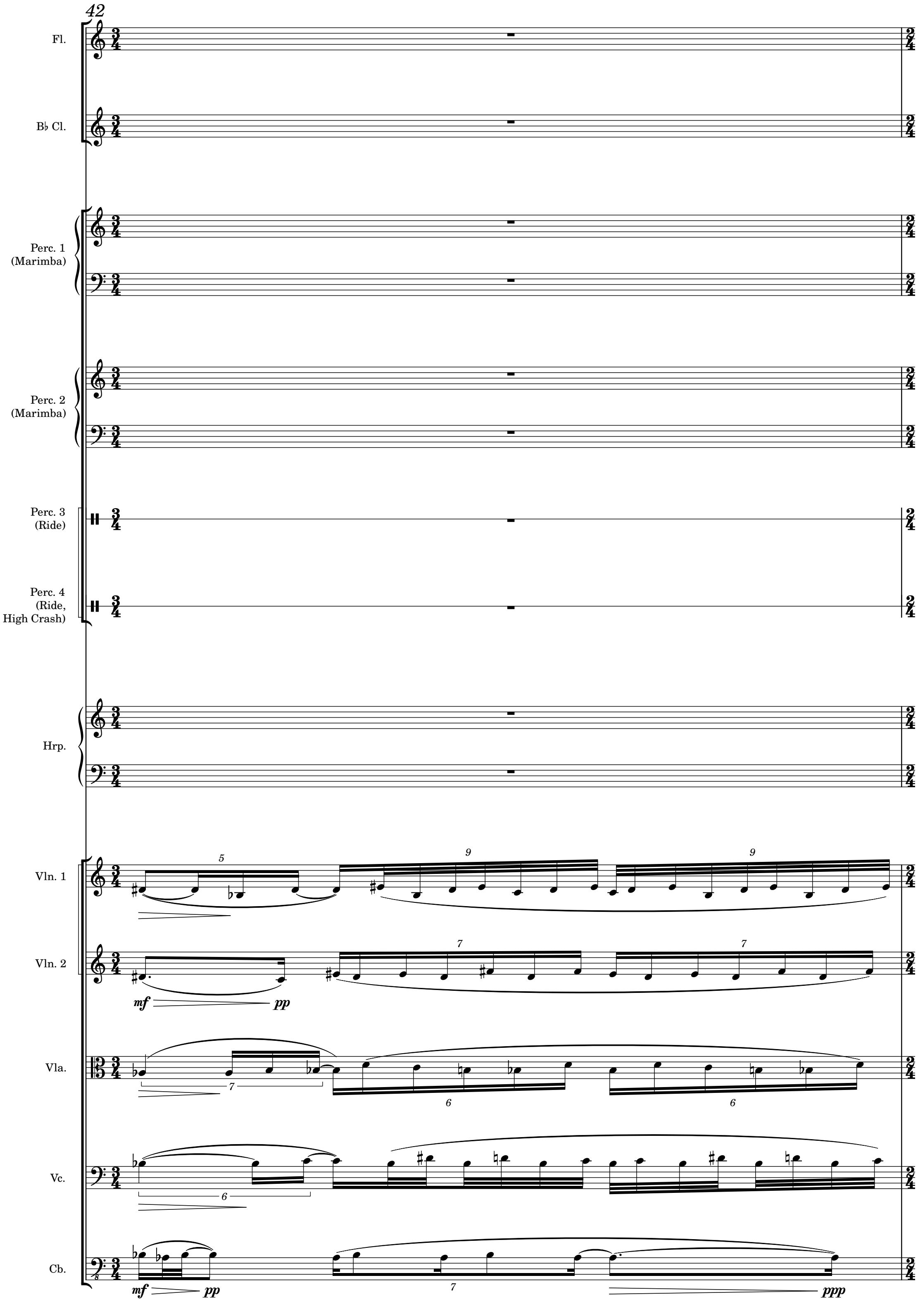

37
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
7
7
pp
mp
7
7
5
7
pp
mp
6
7
6
7
pp
mp
pp
6
6
7
6
mp
pp
mf

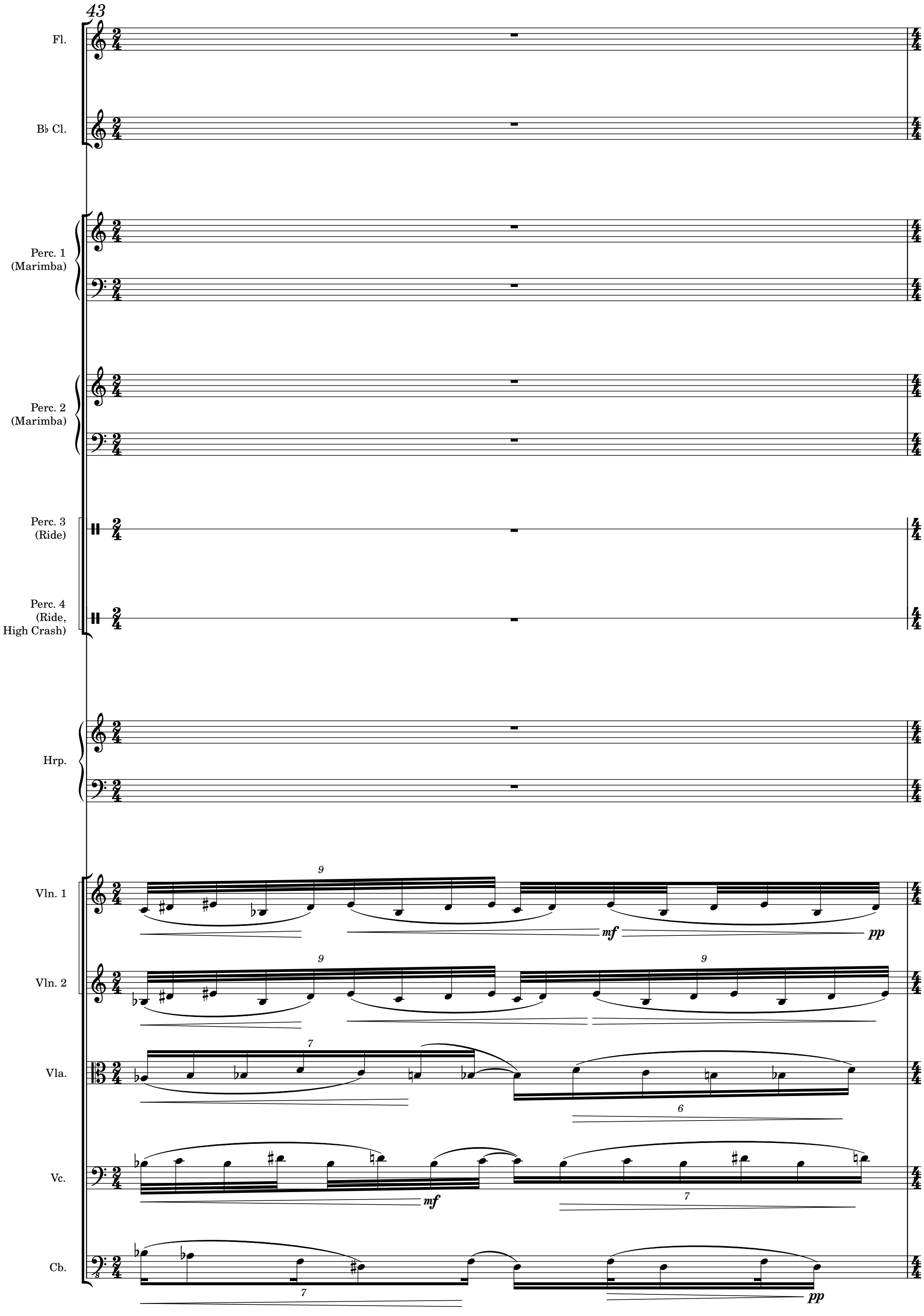

38
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
pp
p

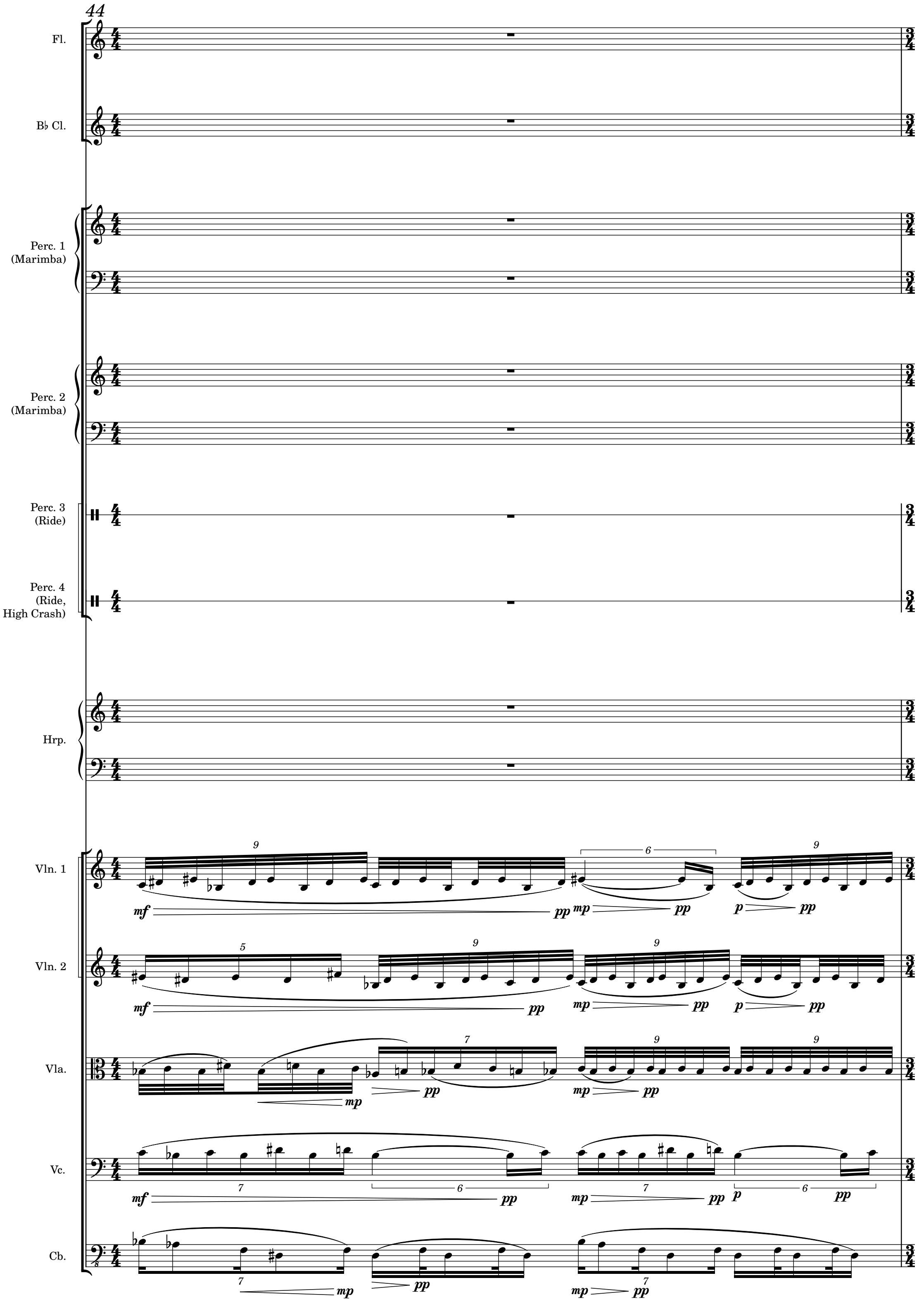

39
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
6
7
5
mf
pp
p

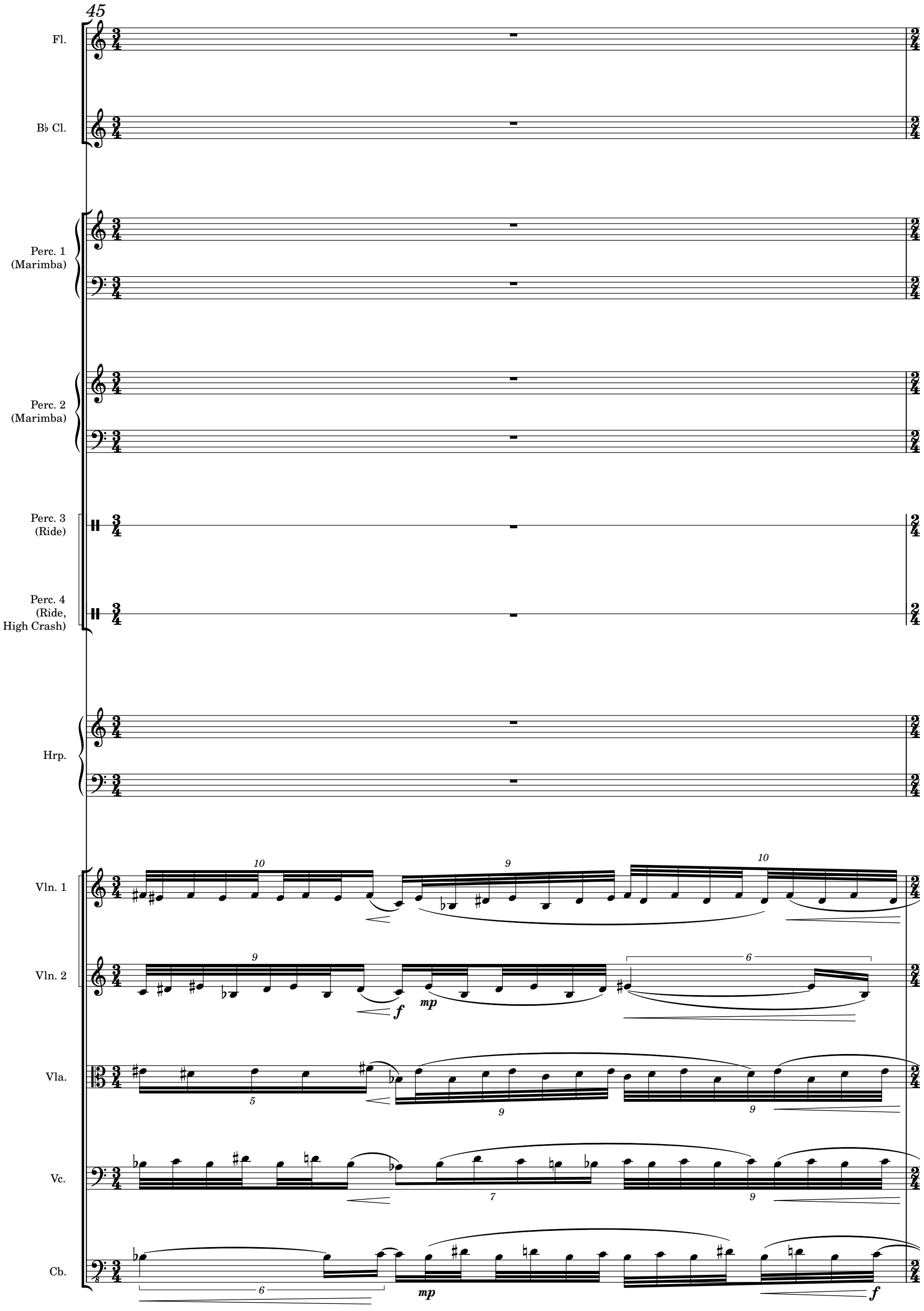

40
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
7
9
6
7
mf
7
7
mf
7
7
6

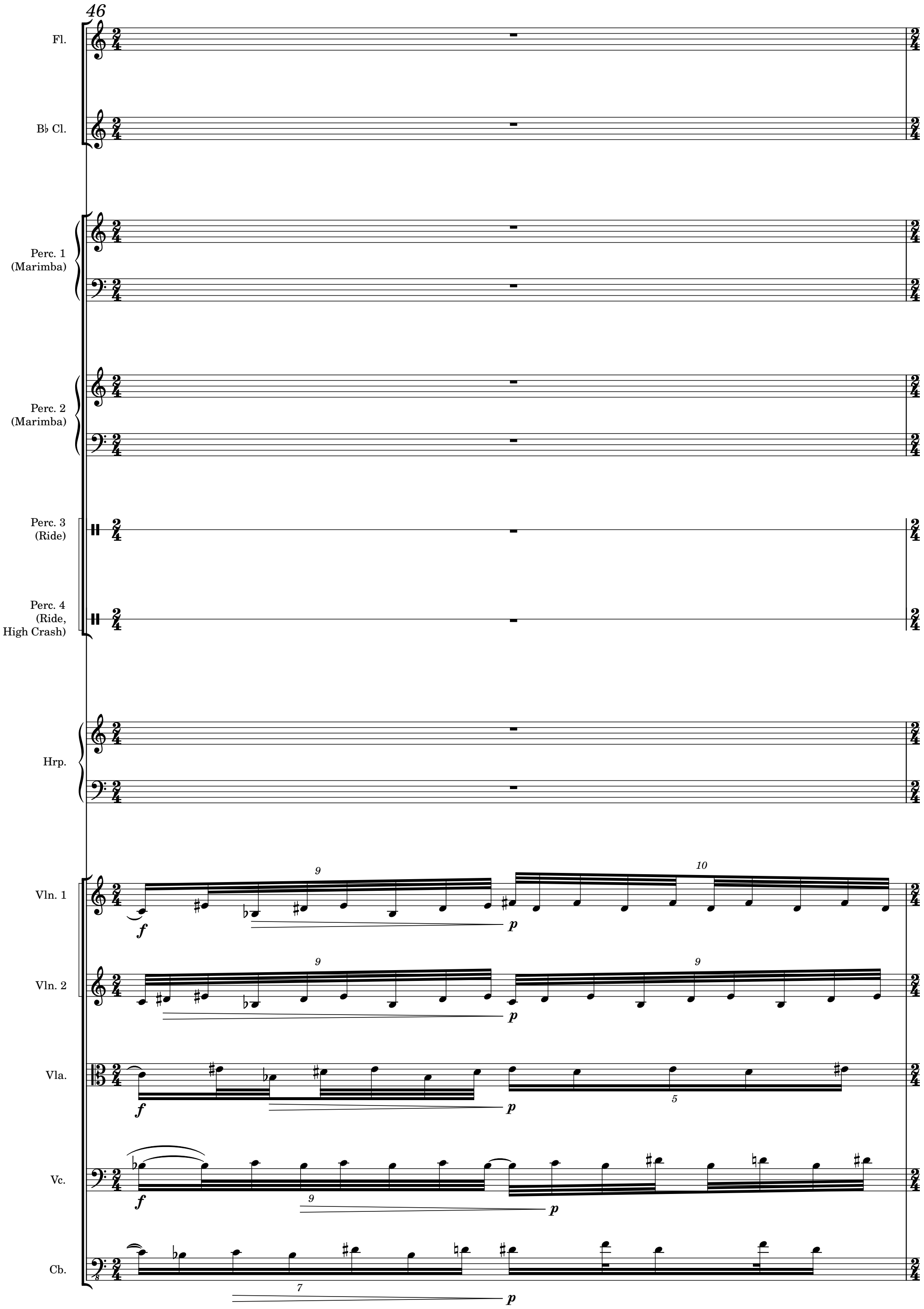

41
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
6
7
pp
ppp

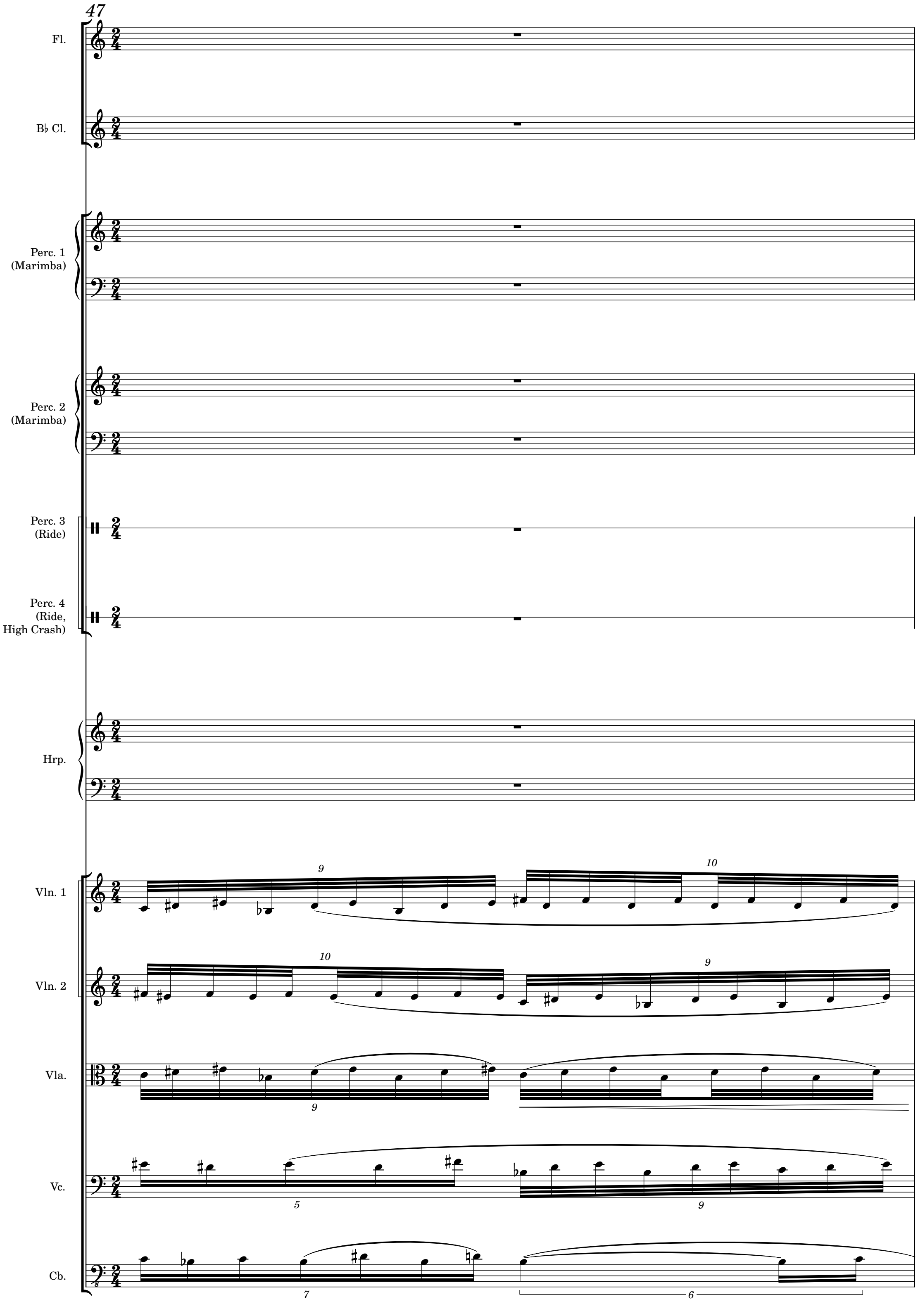

42
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
5
9
9
7
7
7
6
6
6
7
mf
pp
mf
pp
ppp

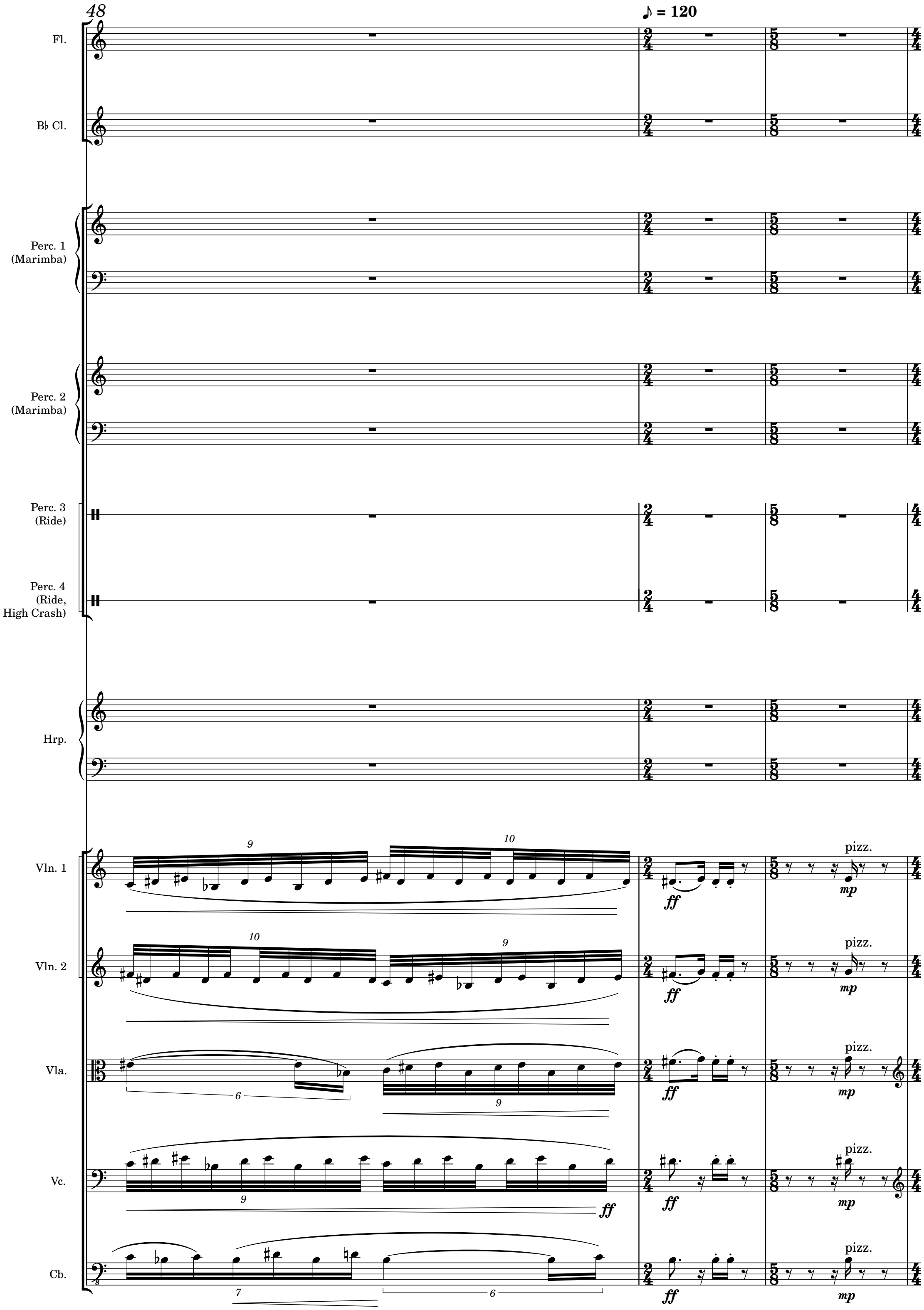

43
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
mf
pp
9
9
7
6
mf
7
7
pp

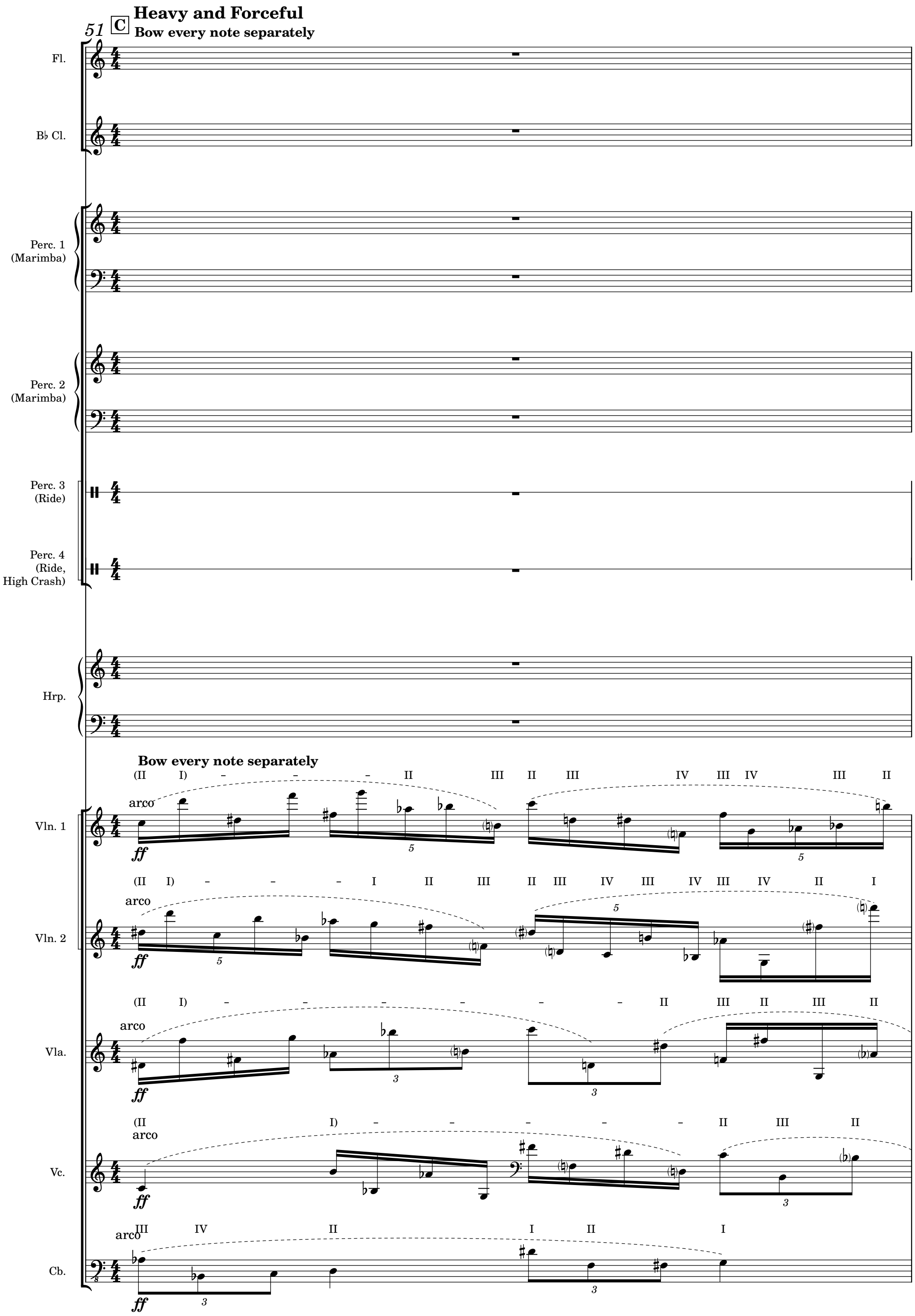

44
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
6
5
7
mf
pp
mp
p

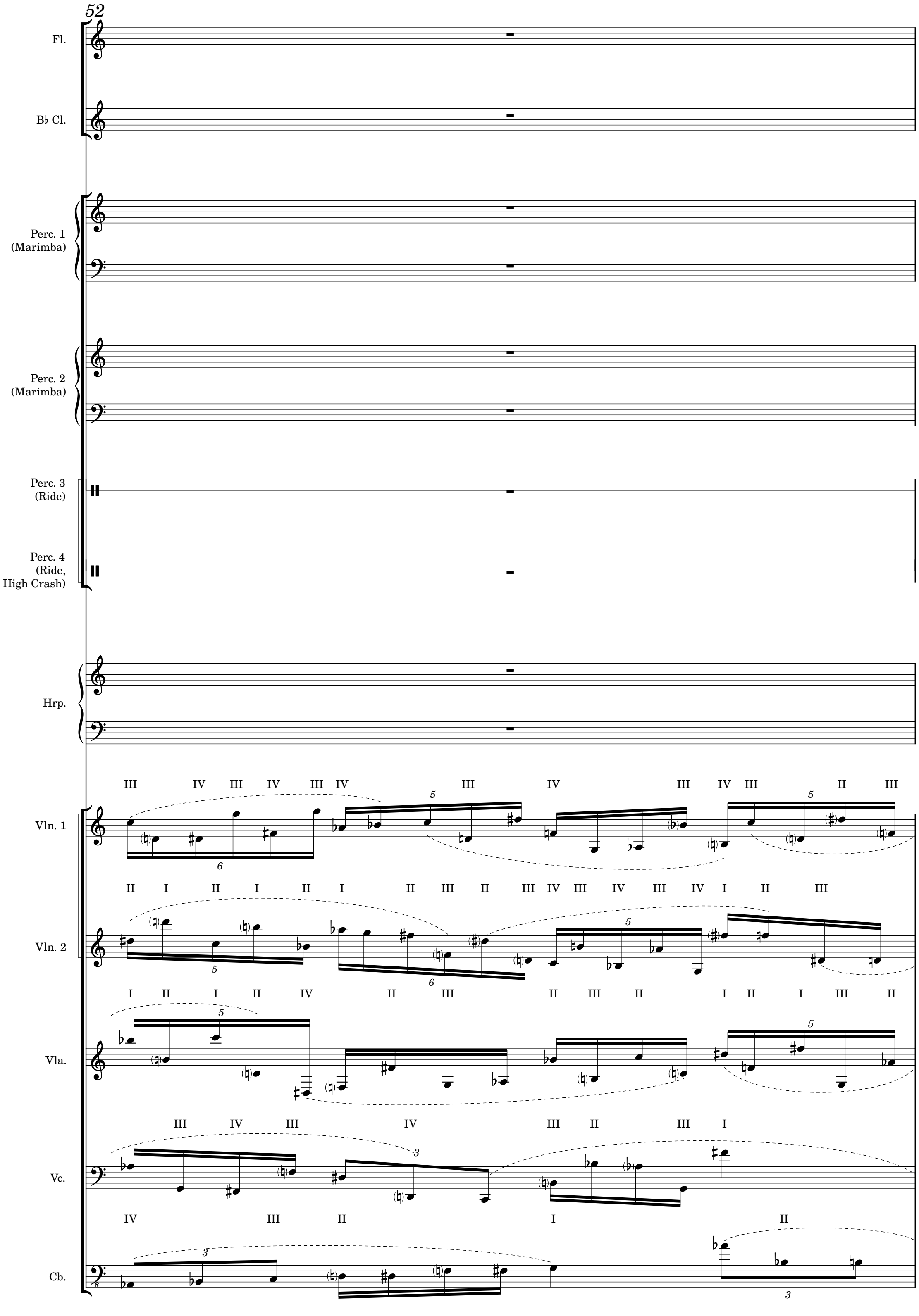

45
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
10
9
10
9
6
f
mp
5
9
9
7
9
6
mp
f

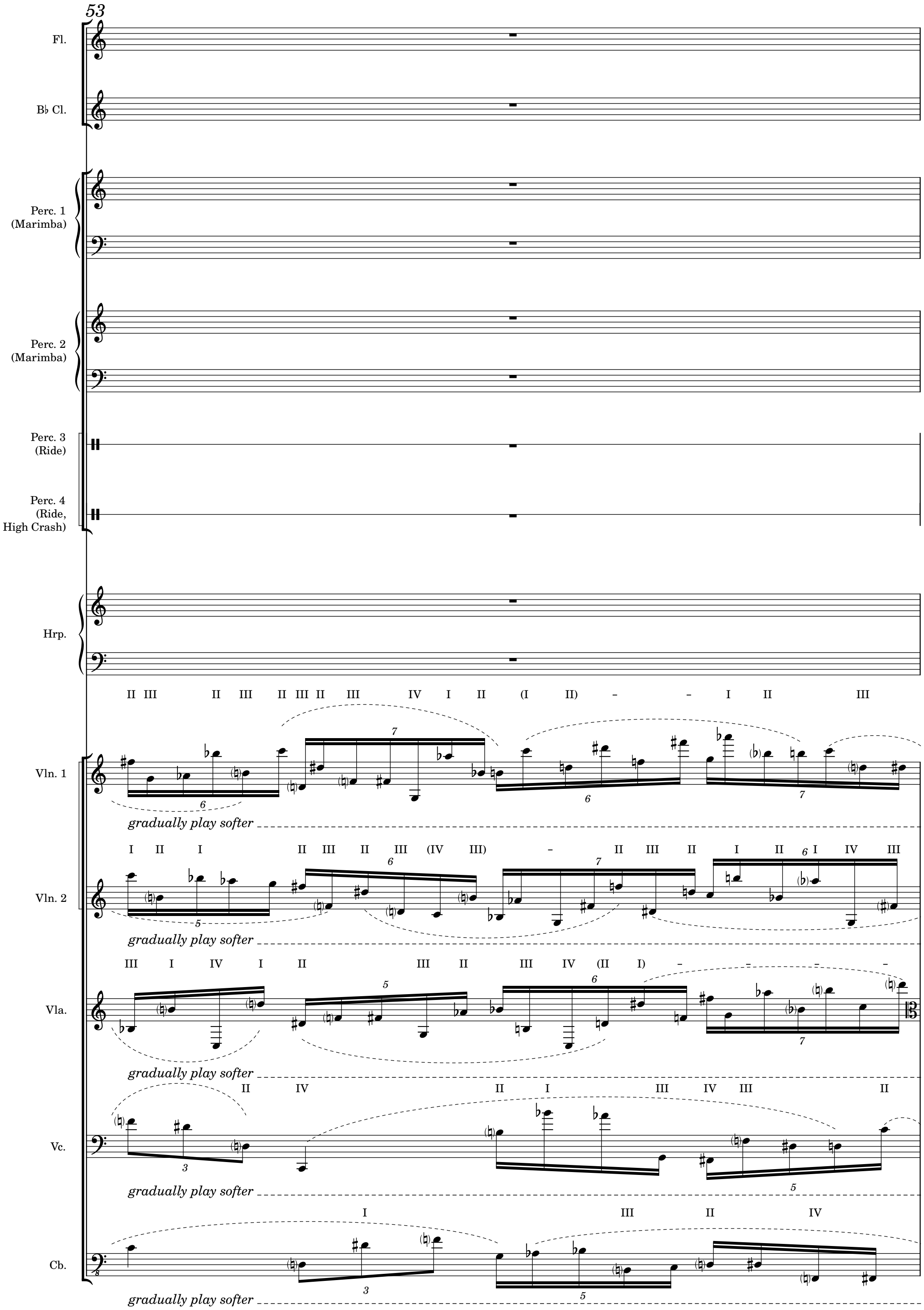

46
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
10
9
9
5
9
7
f
p

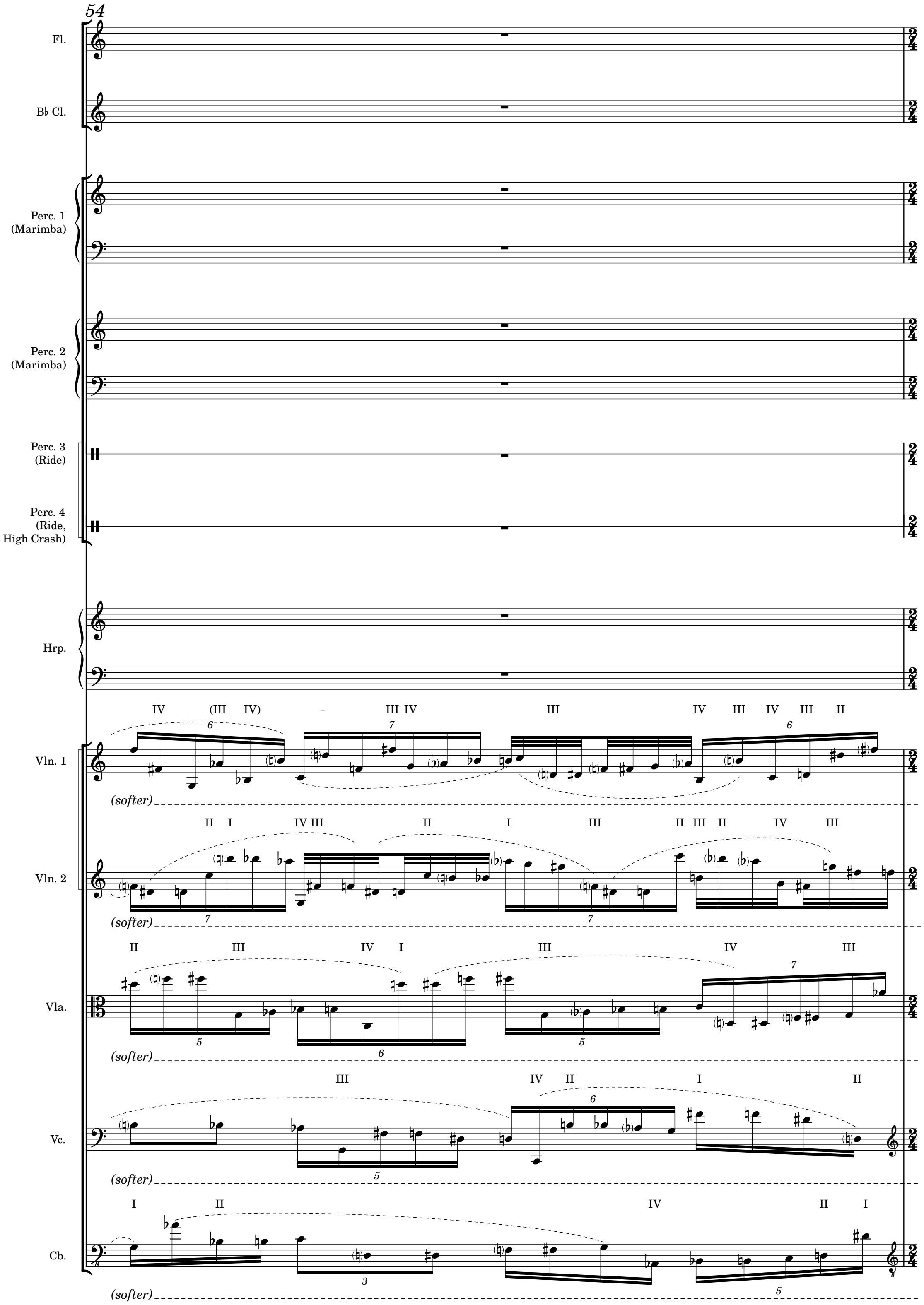

47
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
10
10
9
9
5
9
7
6

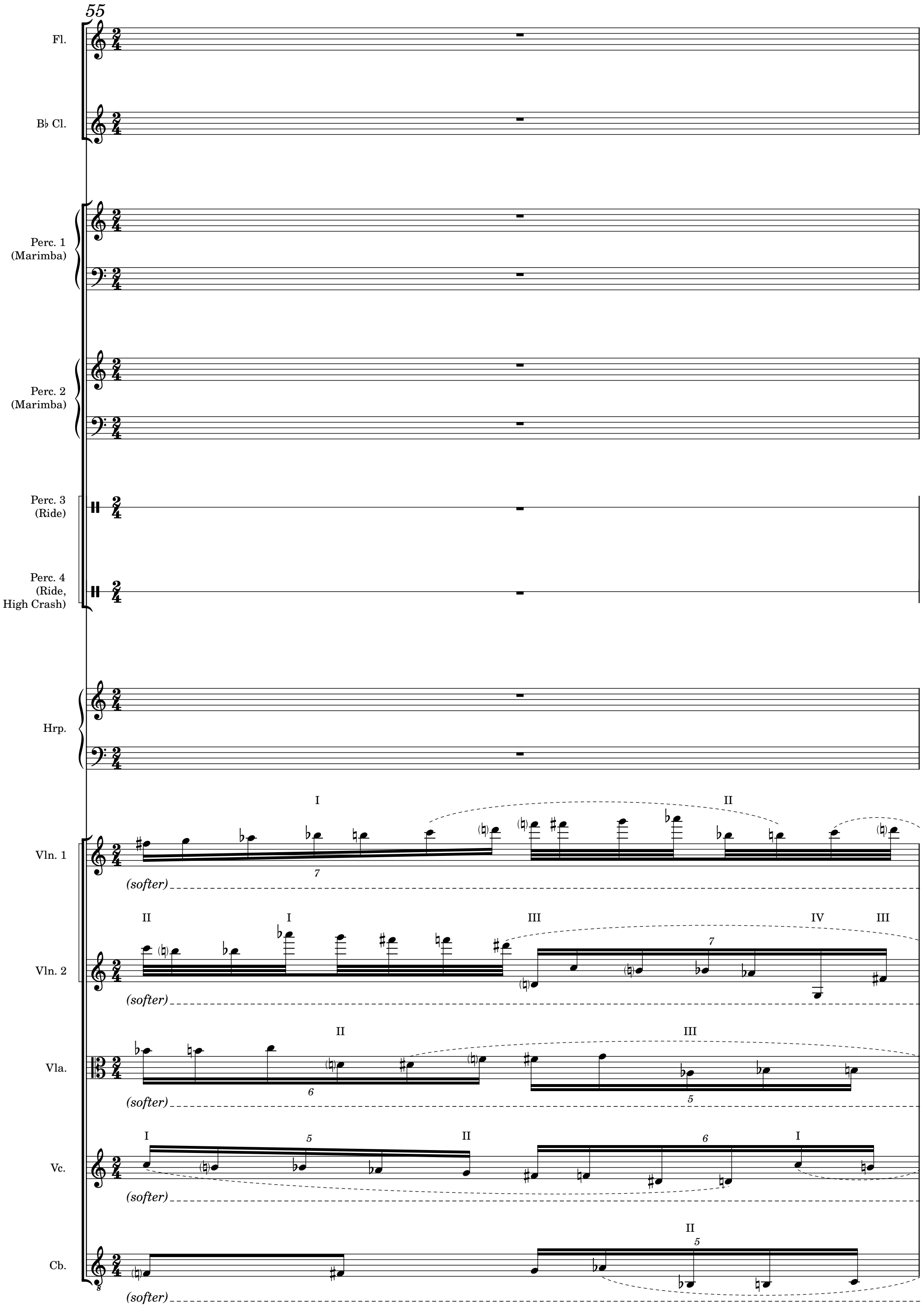

48
♪ = 120
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
10
6
7
ff
mp
pizz.

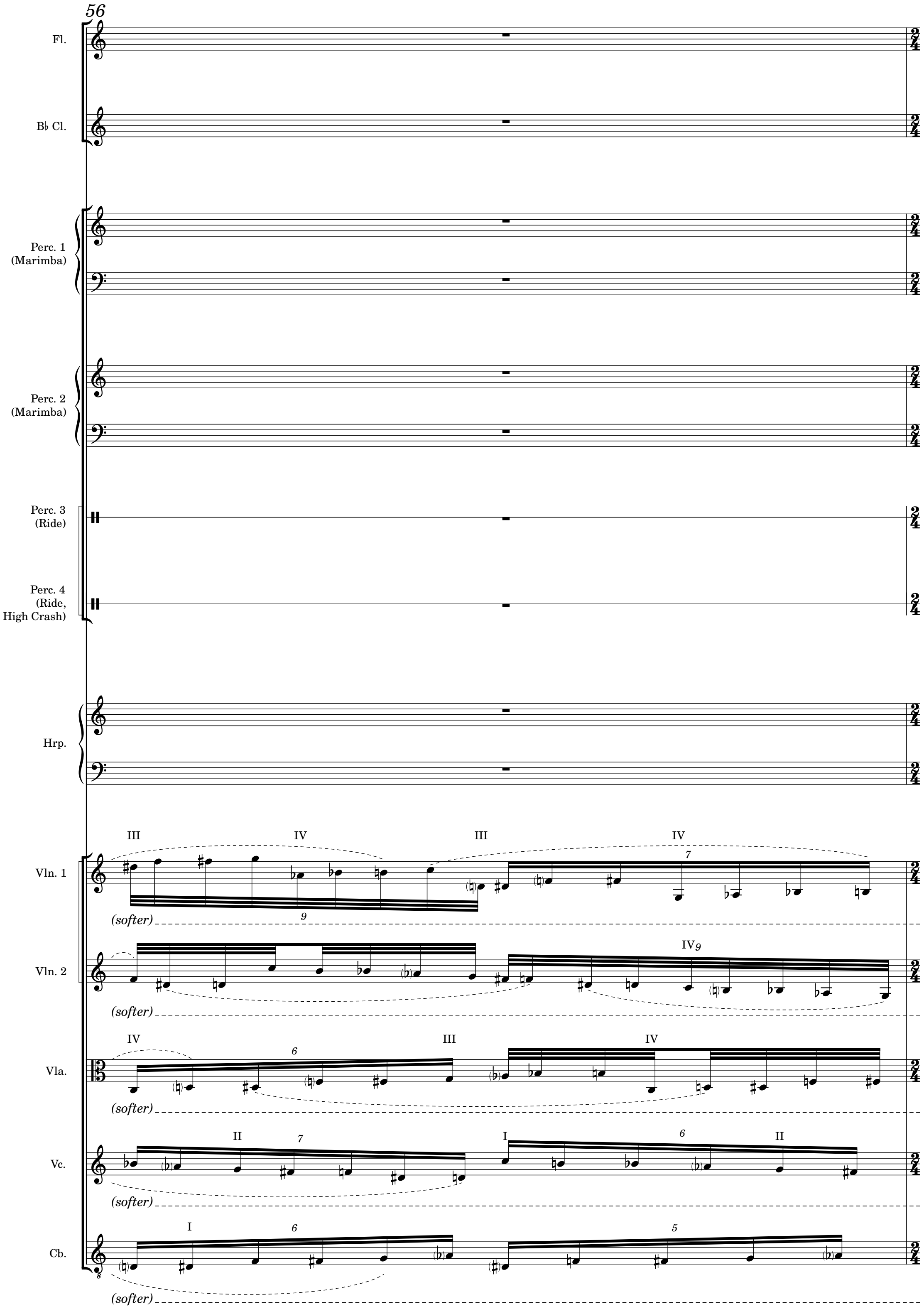

51
C
Heavy and Forceful
Bow every note separately
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Bow every note separately
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
arco
ff
(II I) – – – II III II III IV III IV III II
(II I) – – – I II III II III IV III IV III IV II I
(II I) – – – – – – II III II III II
(II I) – – – – – II III II
III IV II I II I
5
3

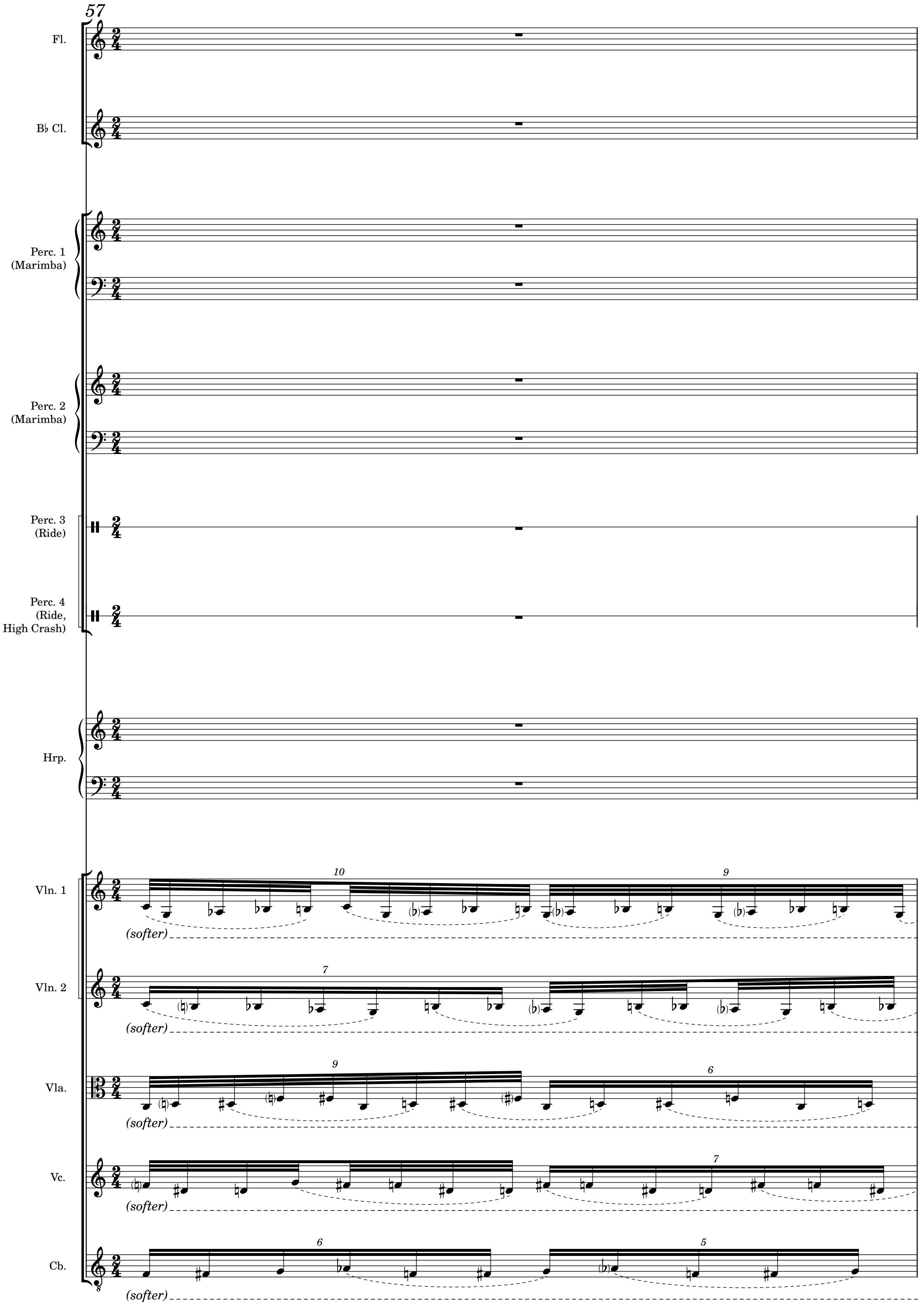

52
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
III IV III IV III IV III IV III IV III 5 II III
II I II I II I II III II III IV III IV III IV I II III
I II I II IV II III II III II I II I III II
III IV III IV III II III I
IV III II I II
6 5 5 5 6 5 5 5 3 3 3

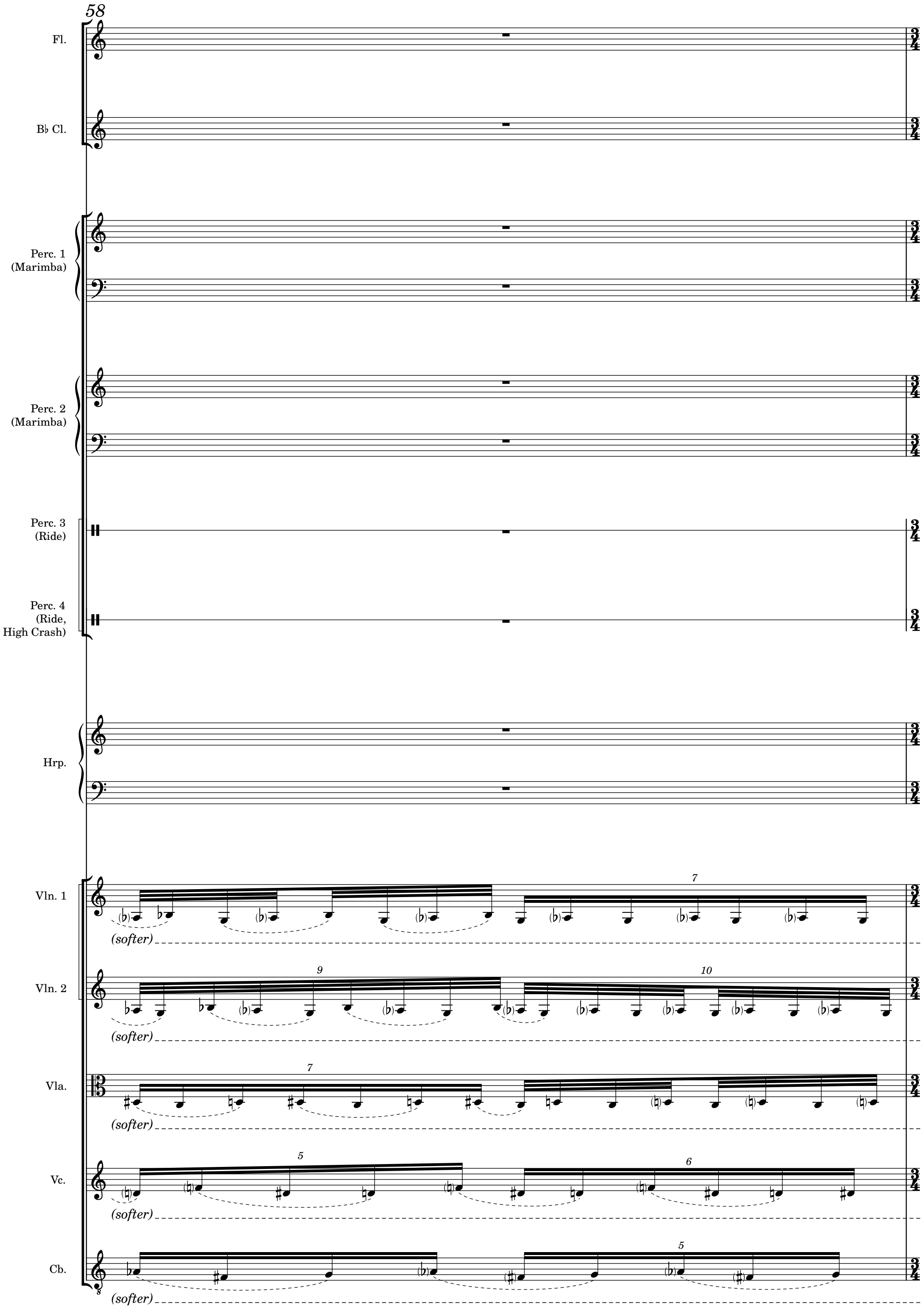

53
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
II III II III II III II III IV I II (I II) - - I II III
Vln. 1
gradually play softer
I II I II III II III (IV III) - II III II I II I IV III
Vln. 2
gradually play softer
III I IV I II III II III IV (II I) - - - -
Vla.
gradually play softer
II IV II I III IV III II
Vc.
gradually play softer
I III II IV
Cb.
gradually play softer

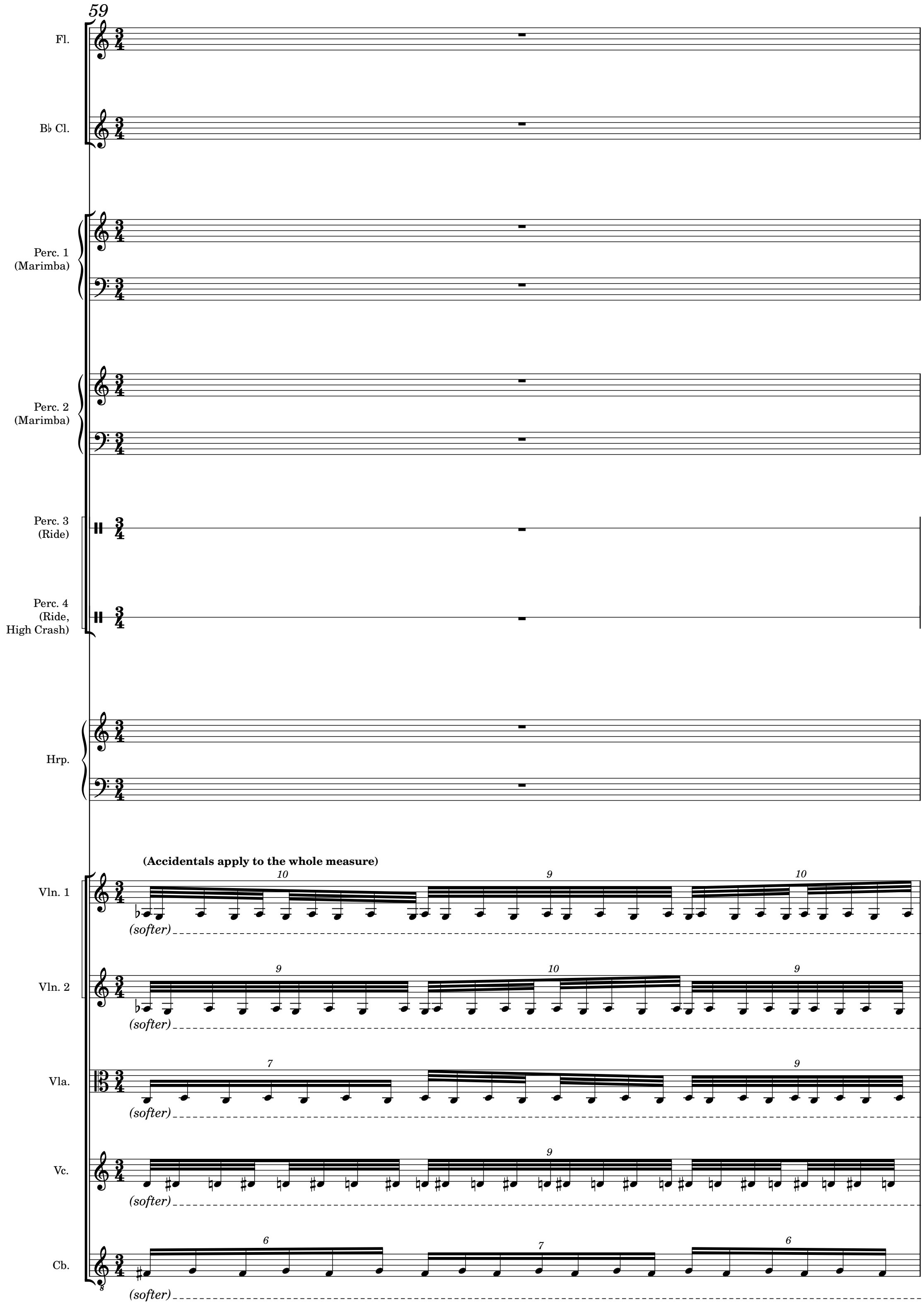

54
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
IV
(III
IV)
III IV
III
IV
III
IV
III
II
II
I
IV III
II
I
III
II III II
IV
III
III
IV
I
6
7
5
3
(softer)

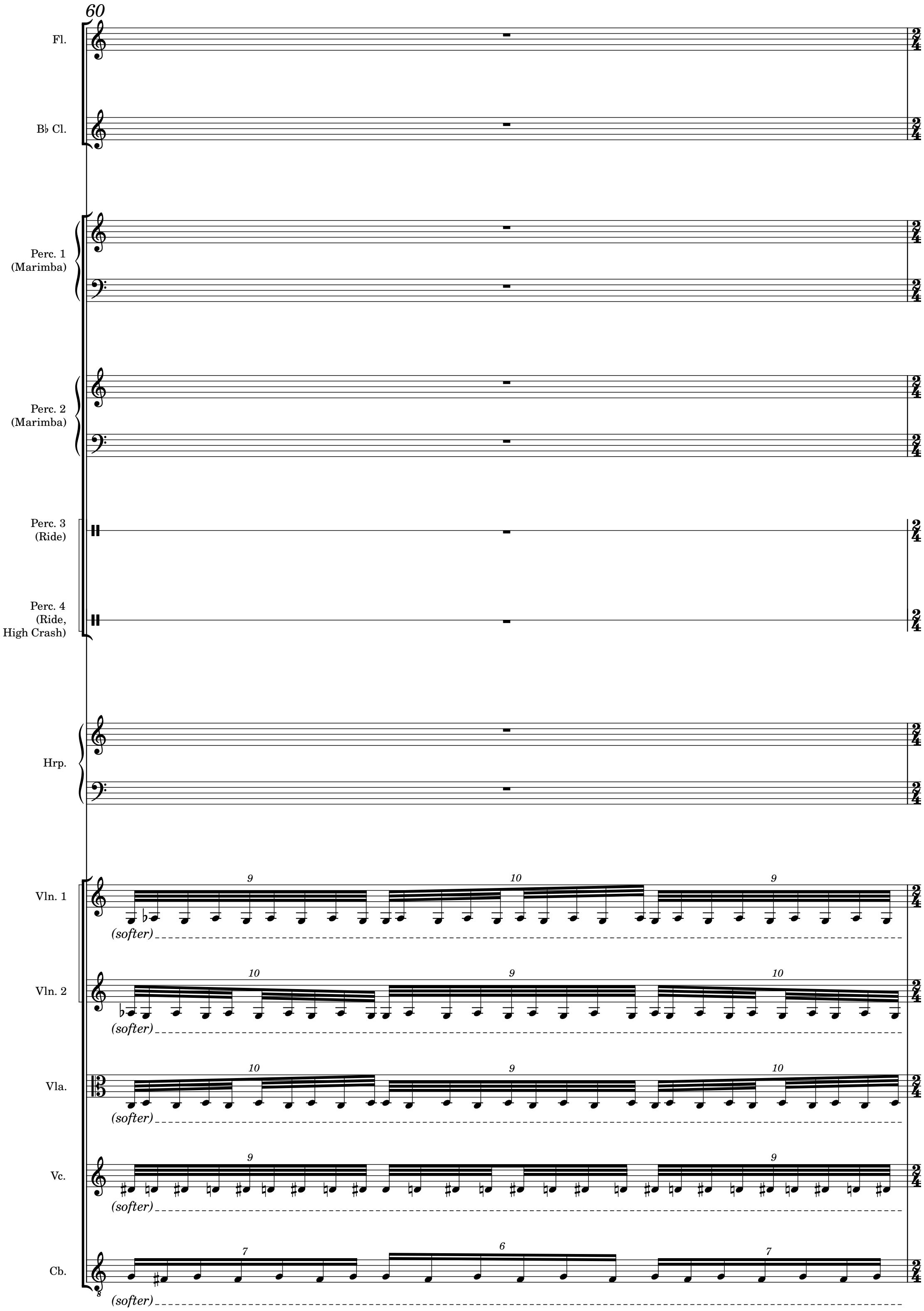

55
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
I
II
7
Vln. 1
(softer)
II
I
III
IV
III
7
Vln. 2
(softer)
II
III
6
5
Vla.
(softer)
I
5
II
6
I
Vc.
(softer)
II
5
Cb.
(softer)

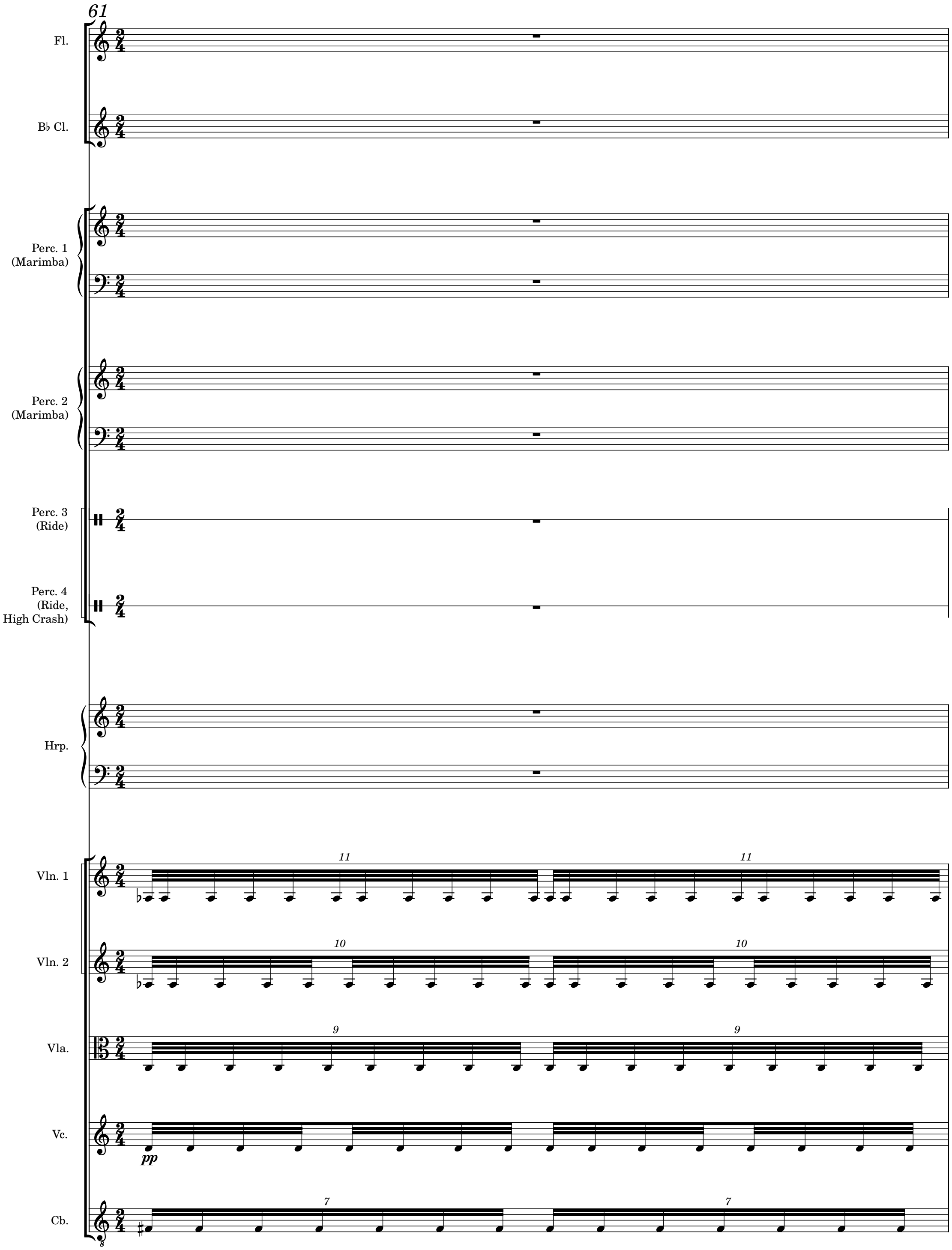

56
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
III
IV
III
IV
9
7
IV
9
6
I
II
7
6
II
I
6
5
(softer)
(softer)
(softer)
(softer)
(softer)

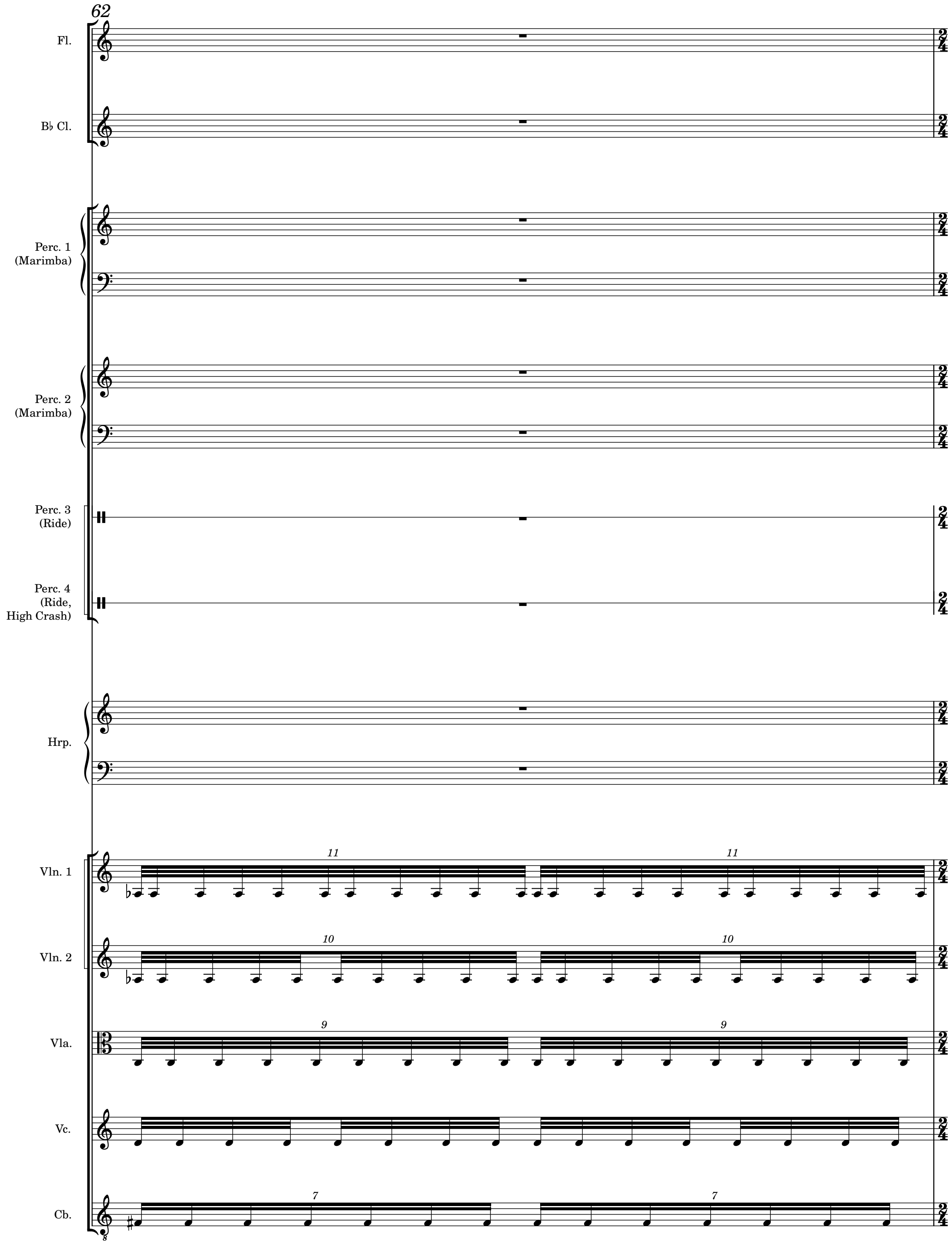

57
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
10
9
(softer)
Vln. 2
7
(softer)
Vla.
9
6
(softer)
Vc.
7
(softer)
Cb.
6
5
(softer)

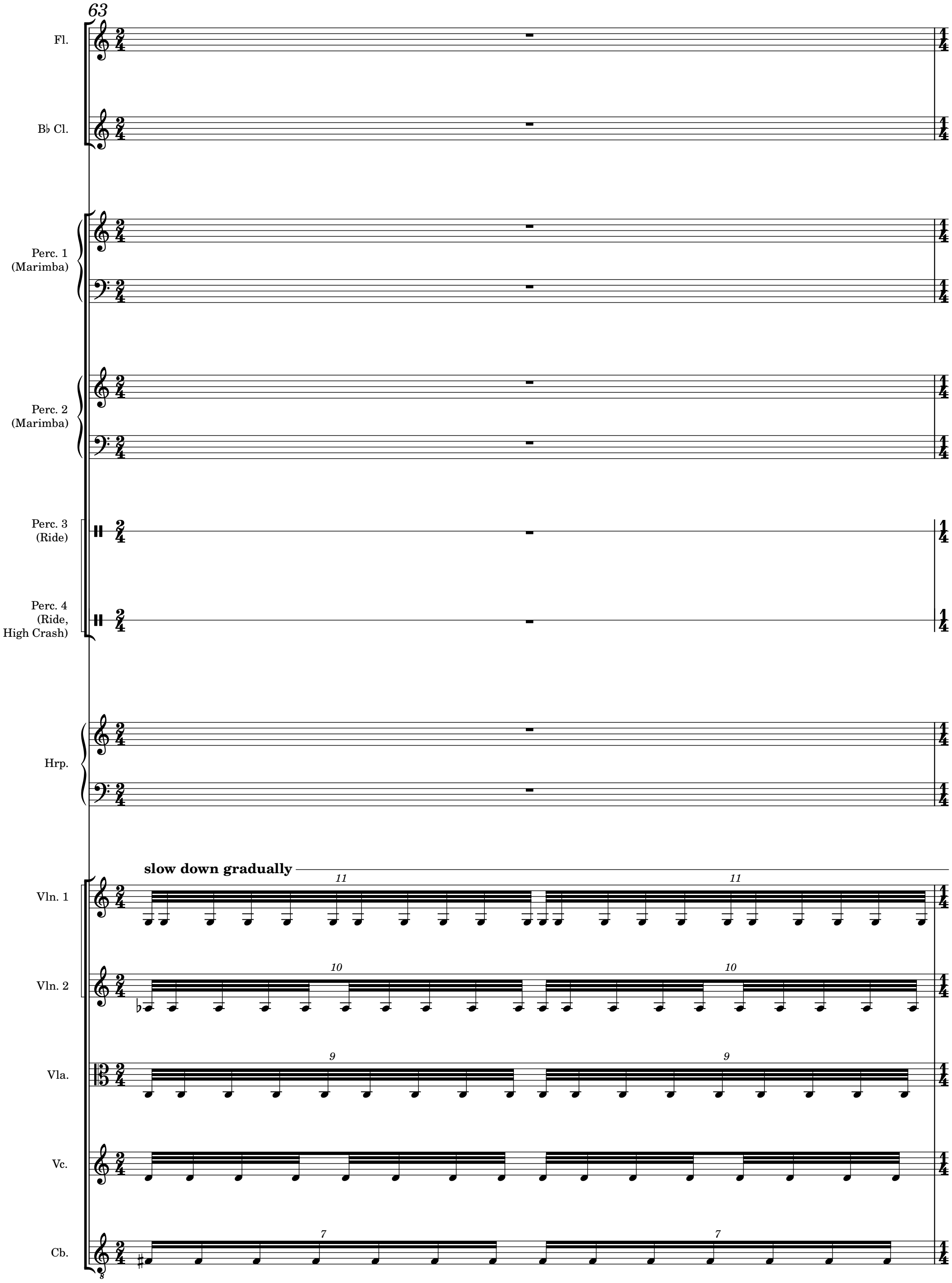

58
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
7
(softer)
Vln. 2
9
10
(softer)
Vla.
7
(softer)
Vc.
5
6
(softer)
Cb.
5
(softer)

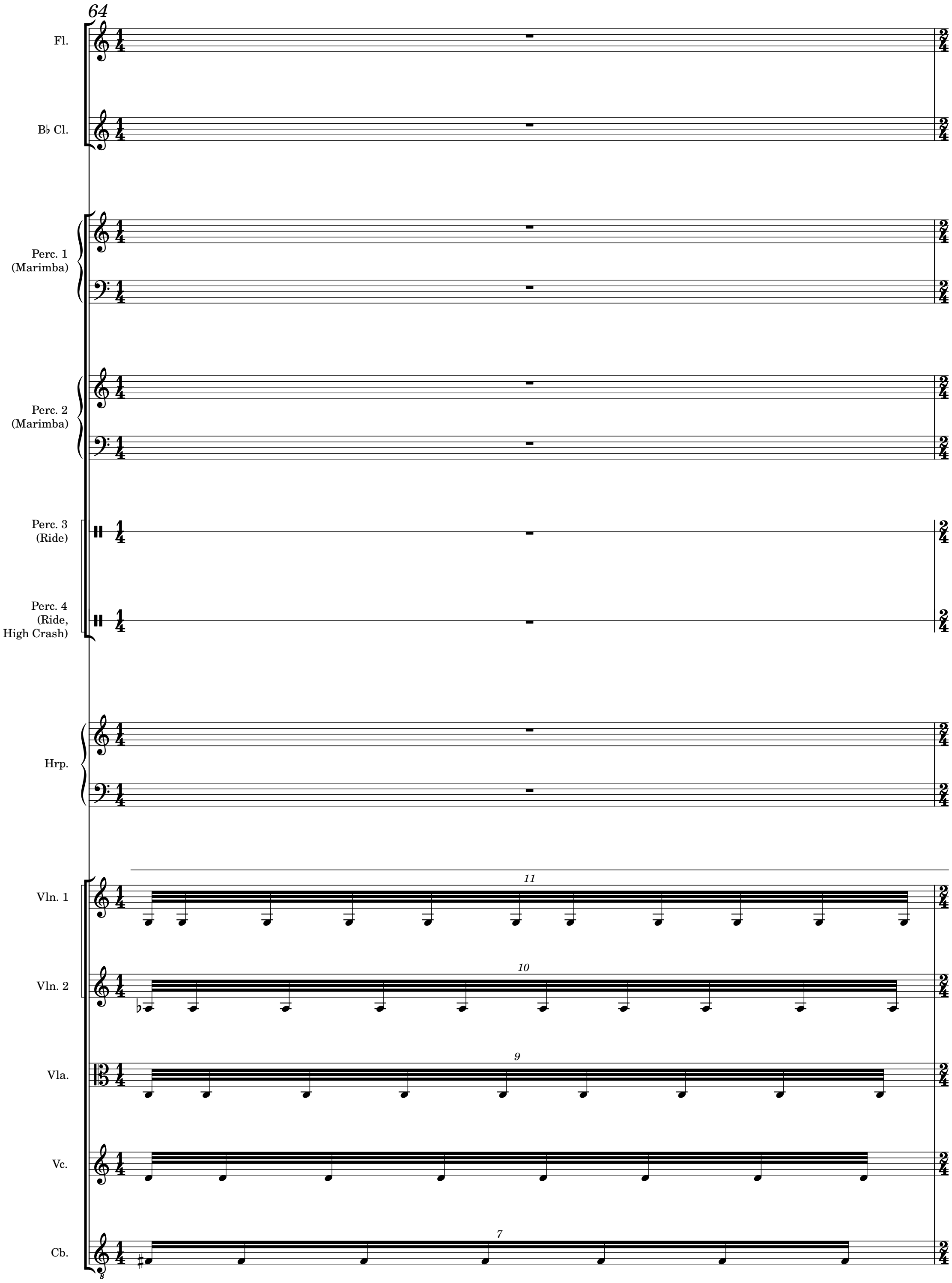

59
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
(Accidentals apply to the whole measure)
Vln. 1
10
9
10
(softer)
Vln. 2
9
10
9
(softer)
Vla.
7
9
(softer)
Vc.
9
(softer)
Cb.
6
7
6
(softer)

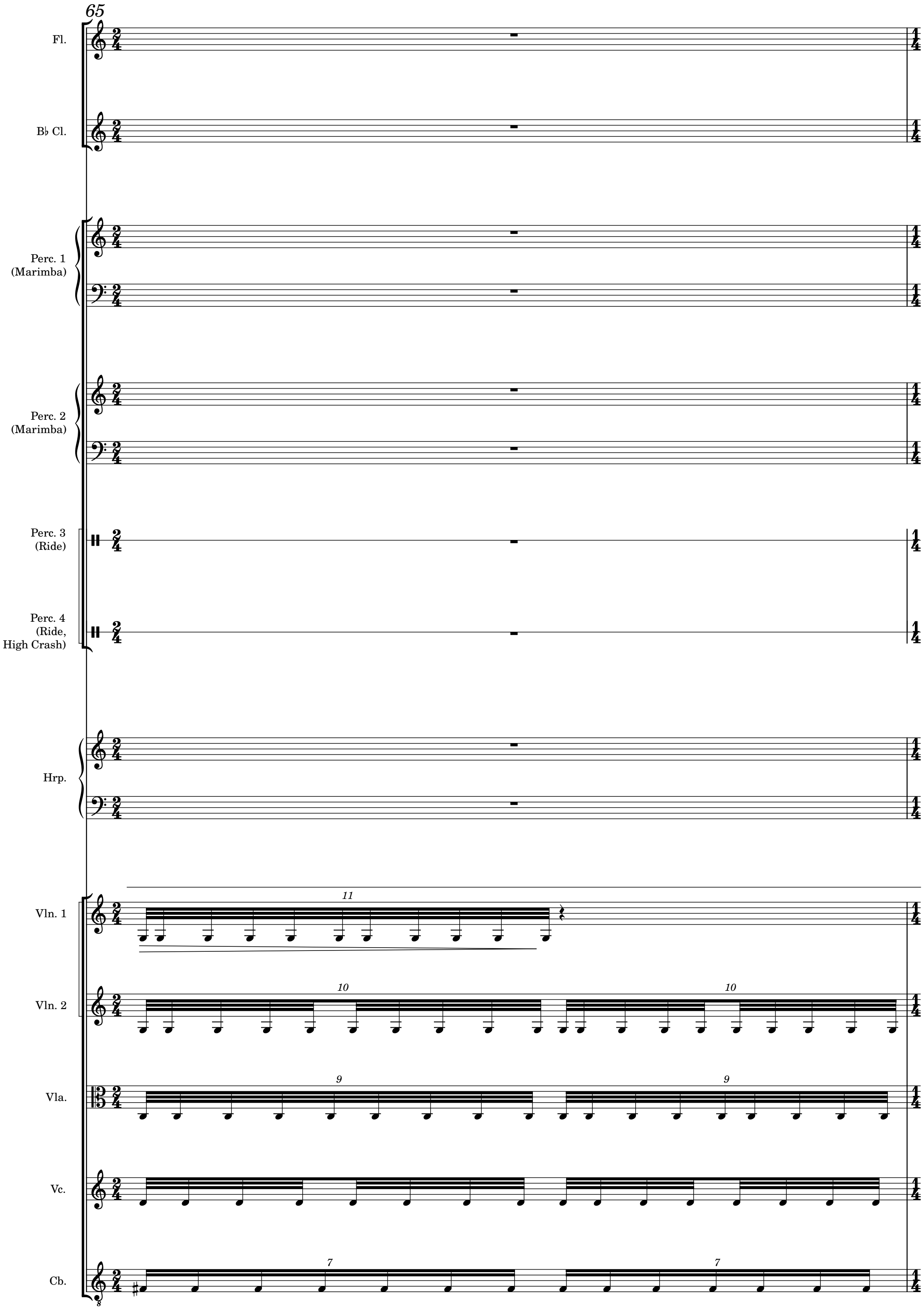

60
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
10
9
10
9
10
10
9
10
9
9
7
6
7
(softer)
(softer)
(softer)
(softer)
(softer)

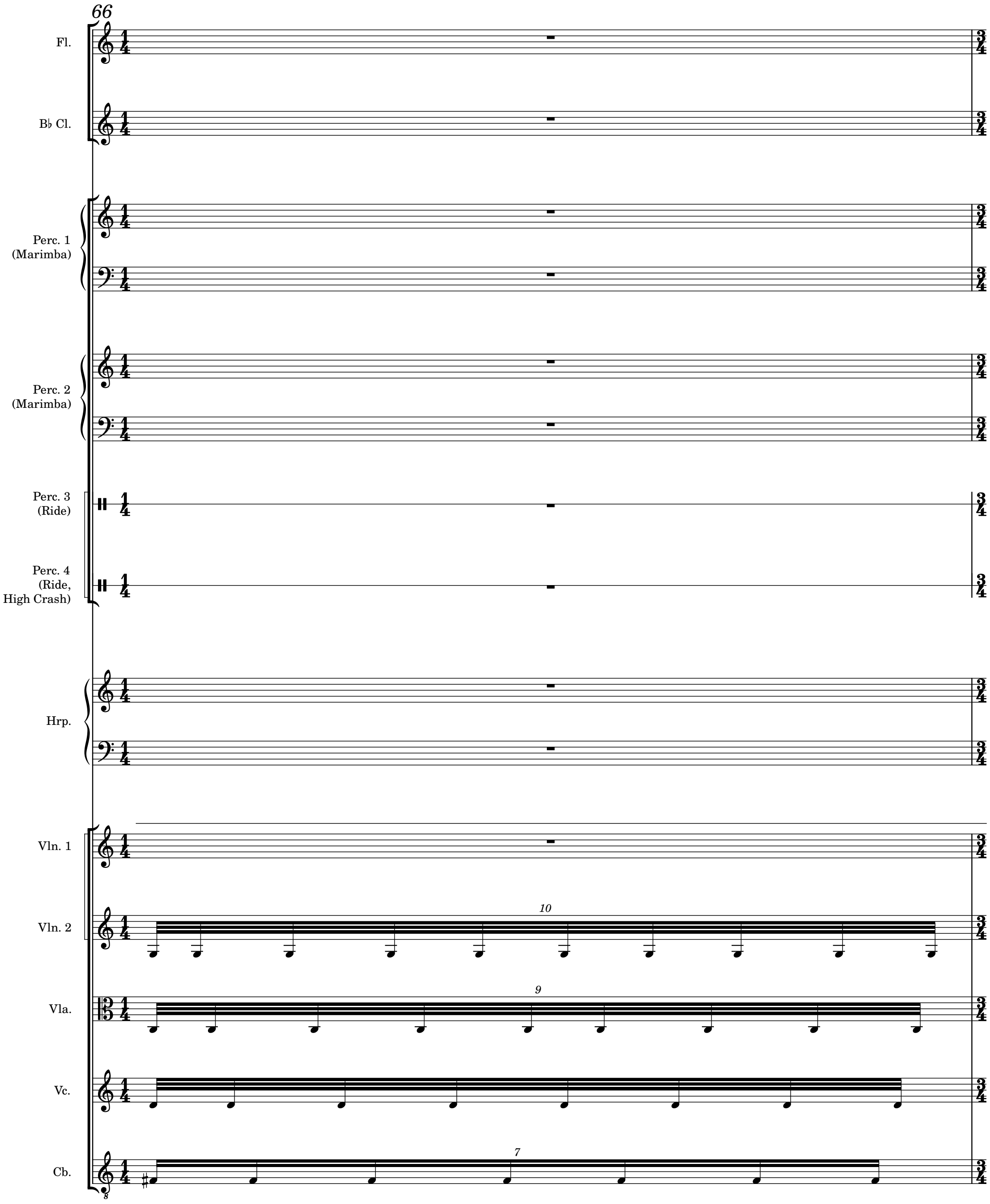

61
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
11
11
10
10
9
9
pp
7
7

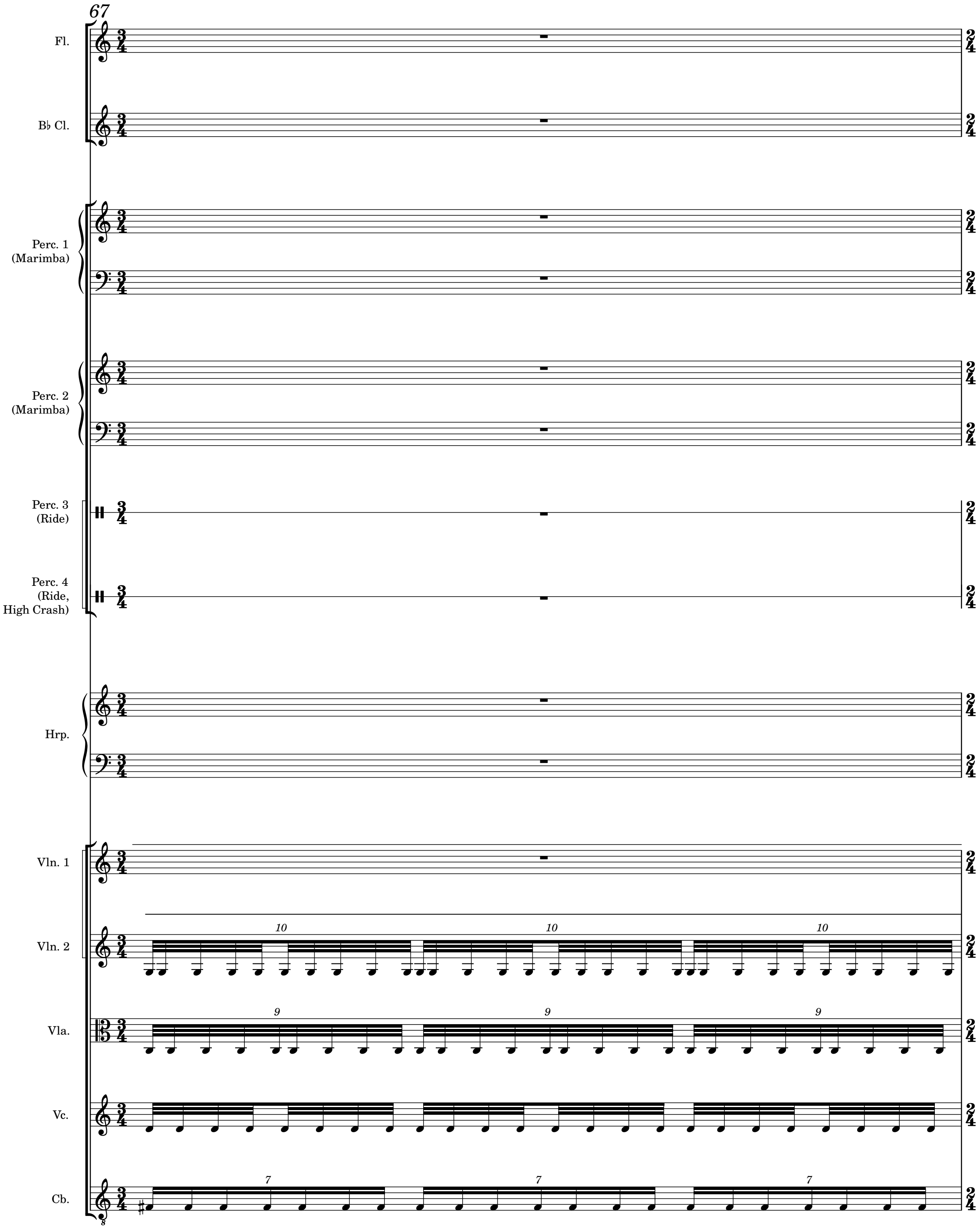

62
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
11
11
10
10
9
9
7
7

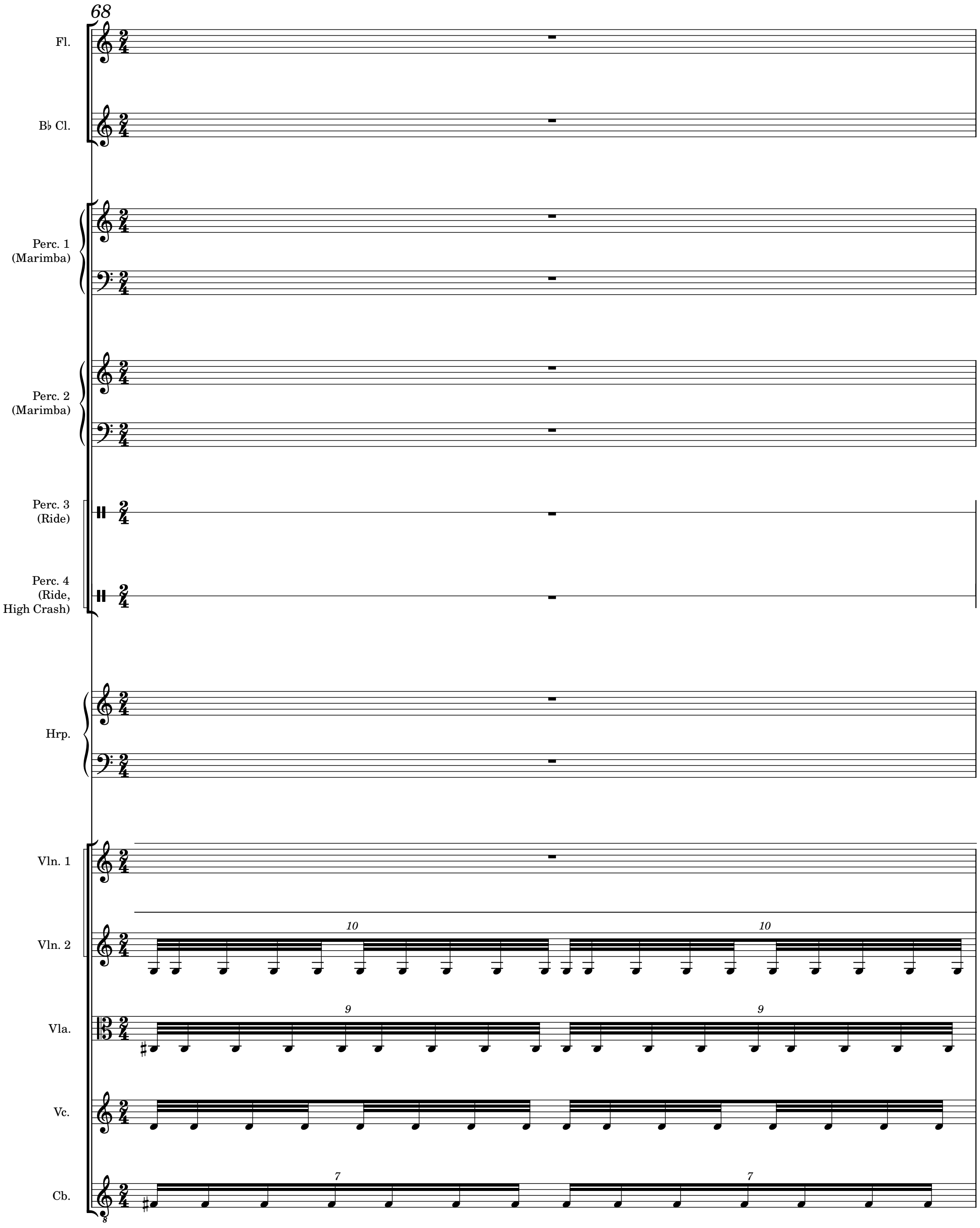

63
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
slow down gradually
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
11
11
10
10
9
9
7
7

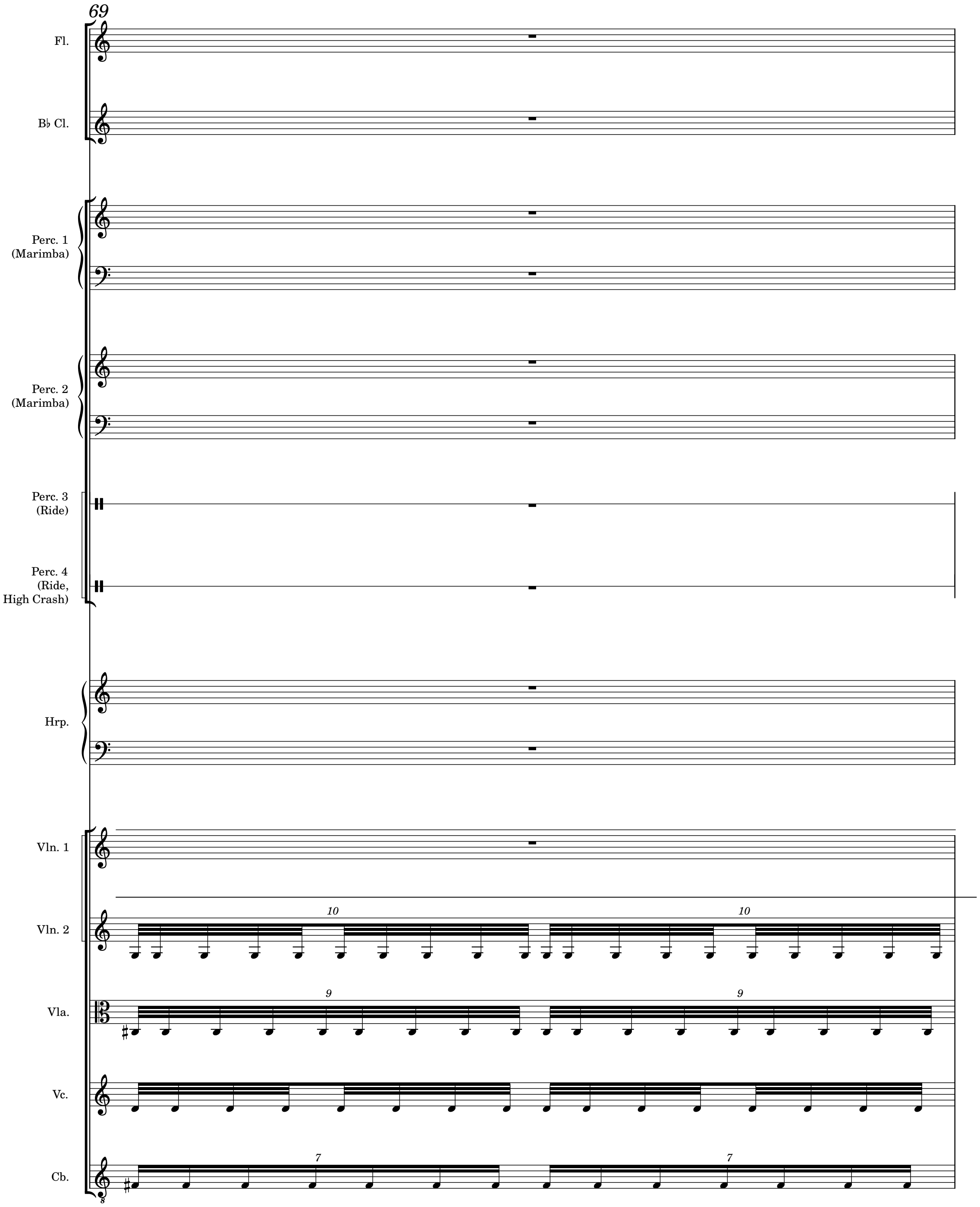

64
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
11
10
9
7

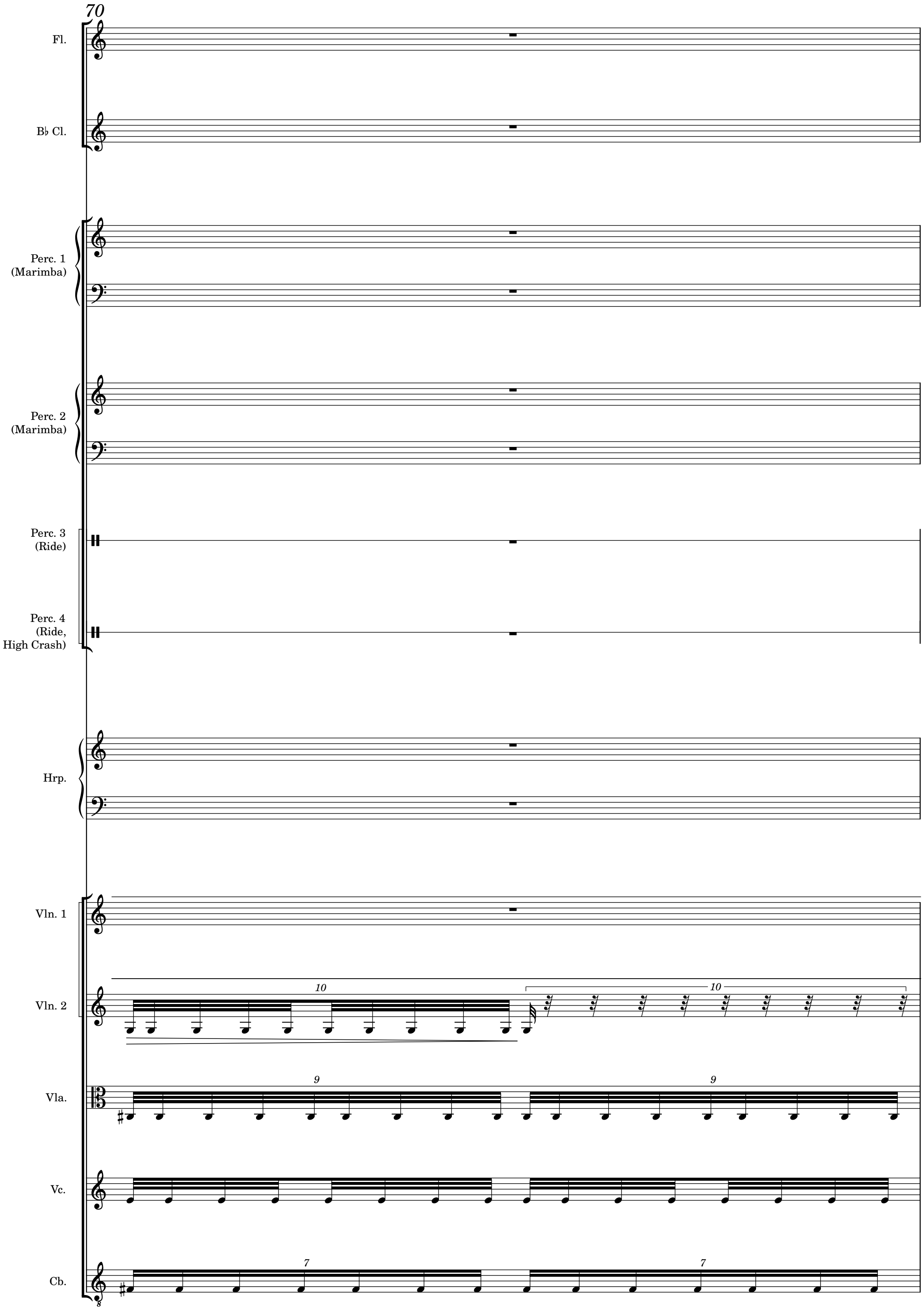

65
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
11
Vln. 2
10
10
Vla.
9
9
Vc.
Cb.
7
7

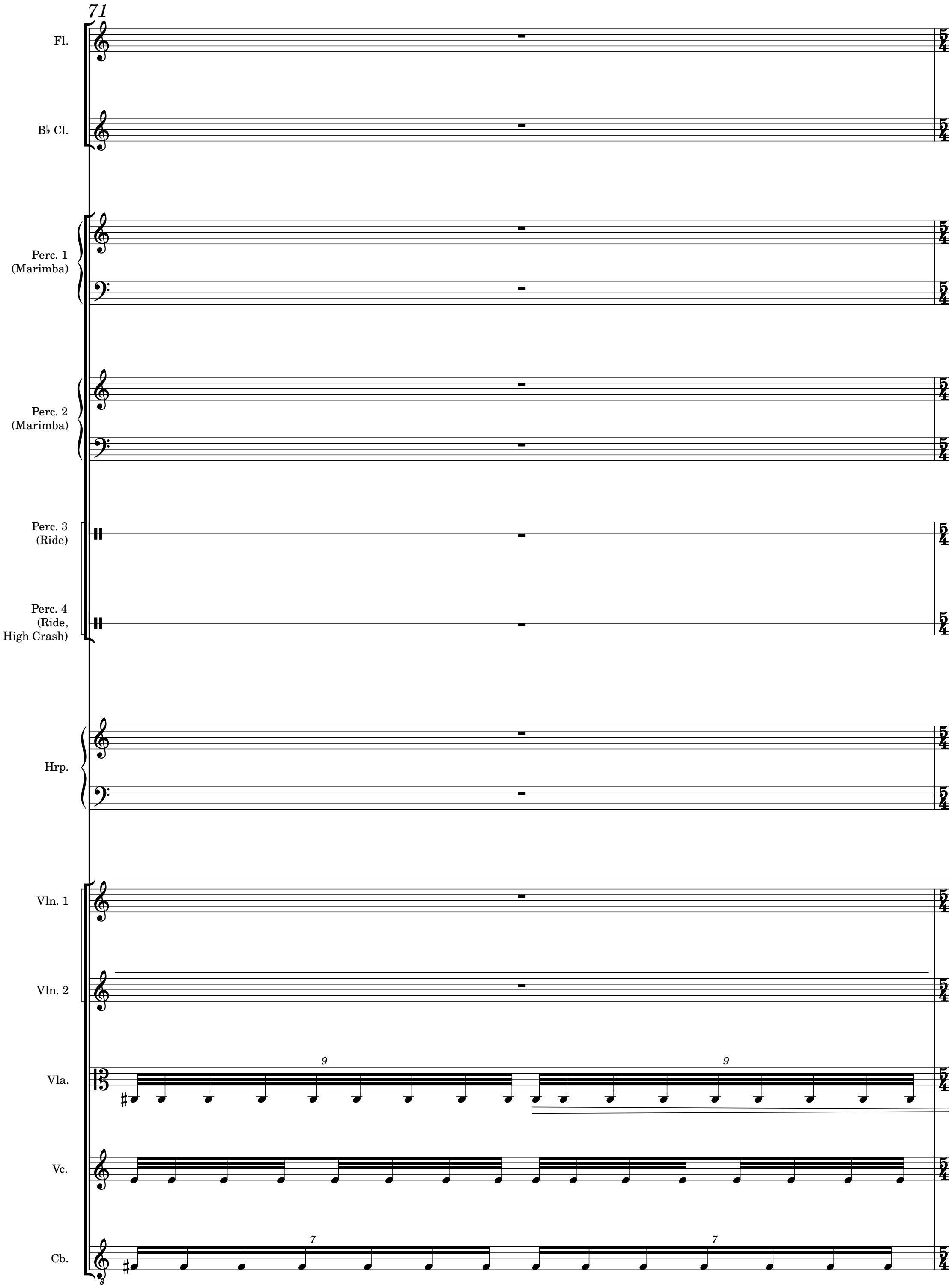

66
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
10
9
7

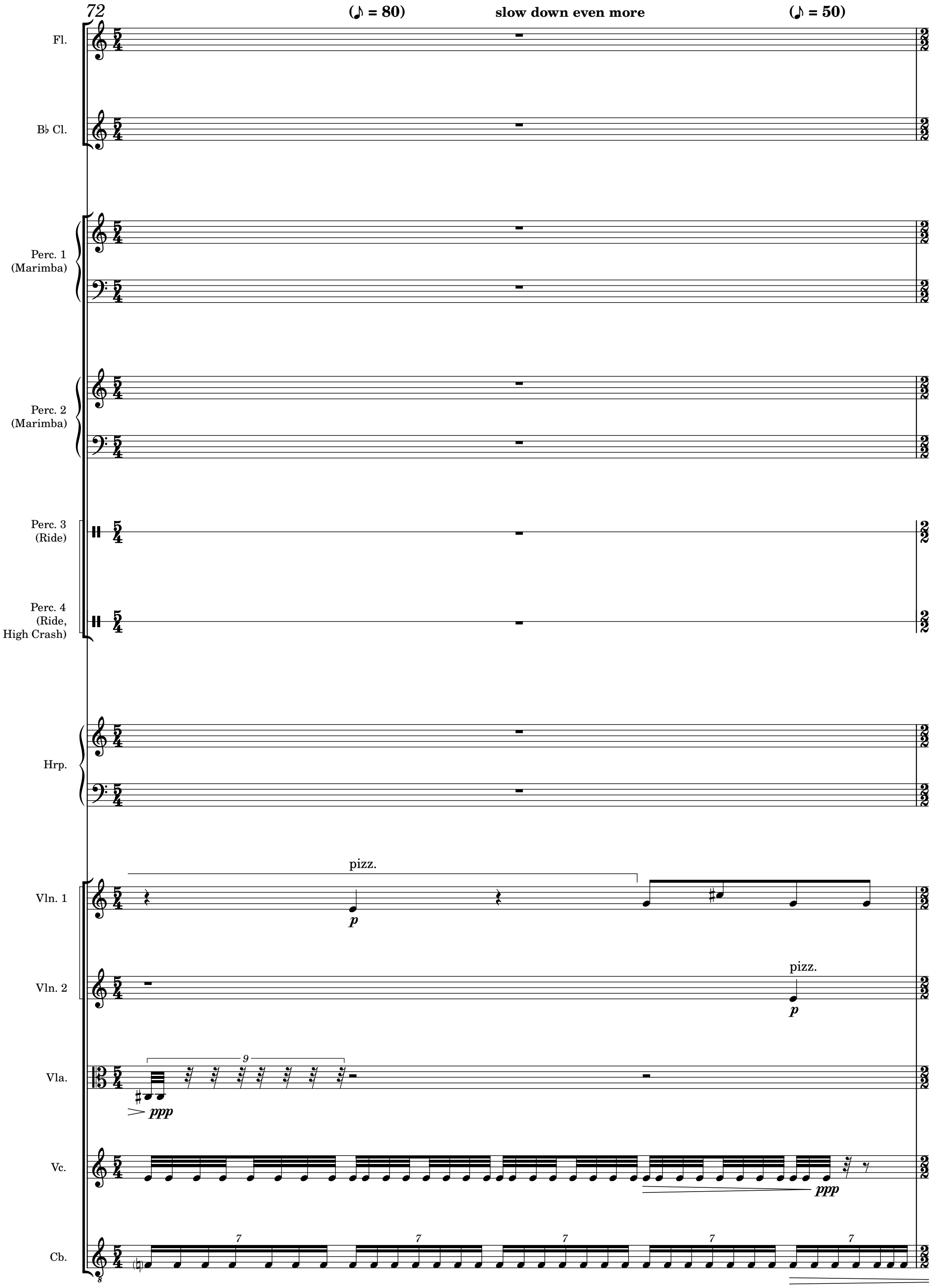

67
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
10
10
10
9
9
9
7
7
7

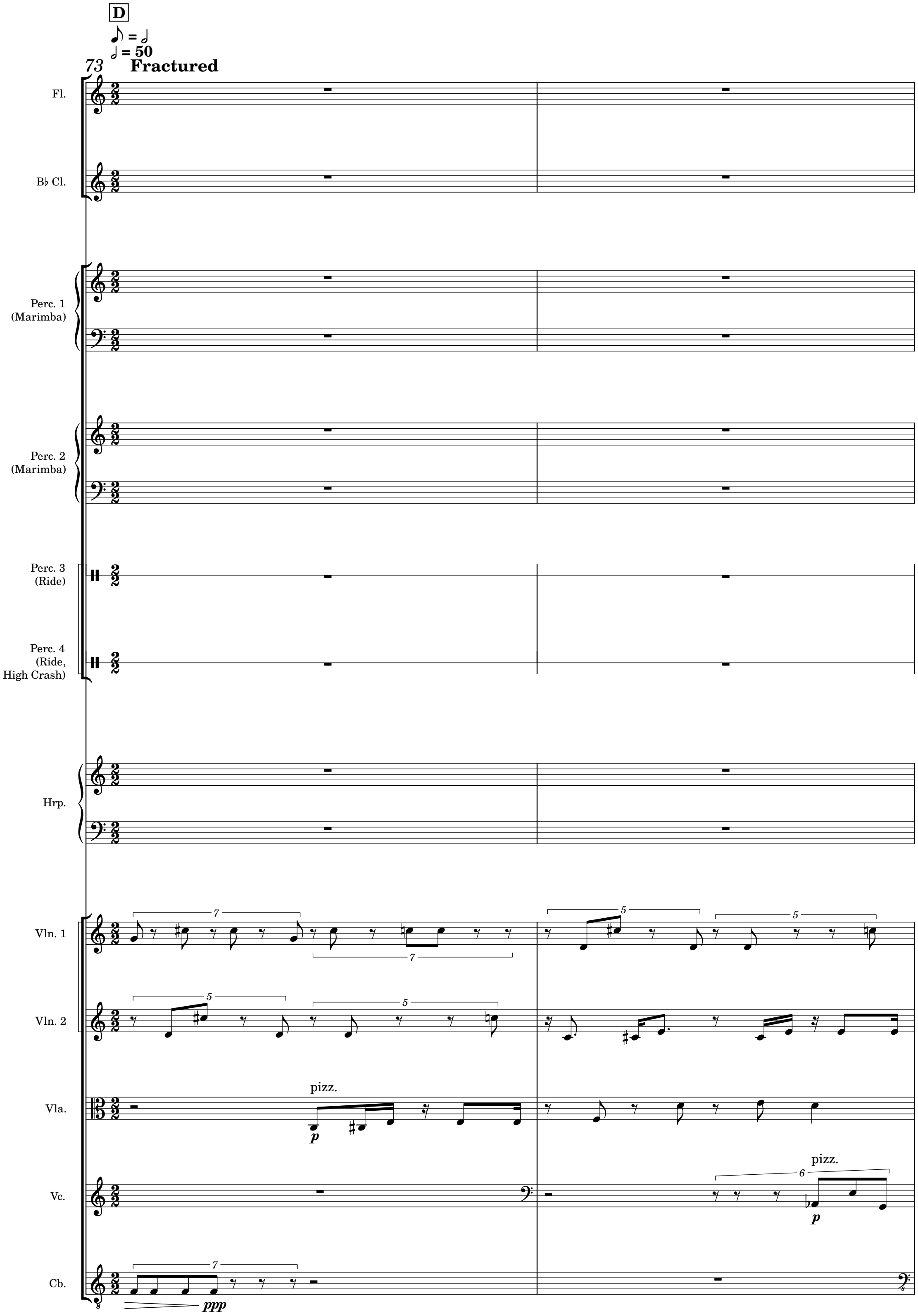

68
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
10
10
9
9
7
7

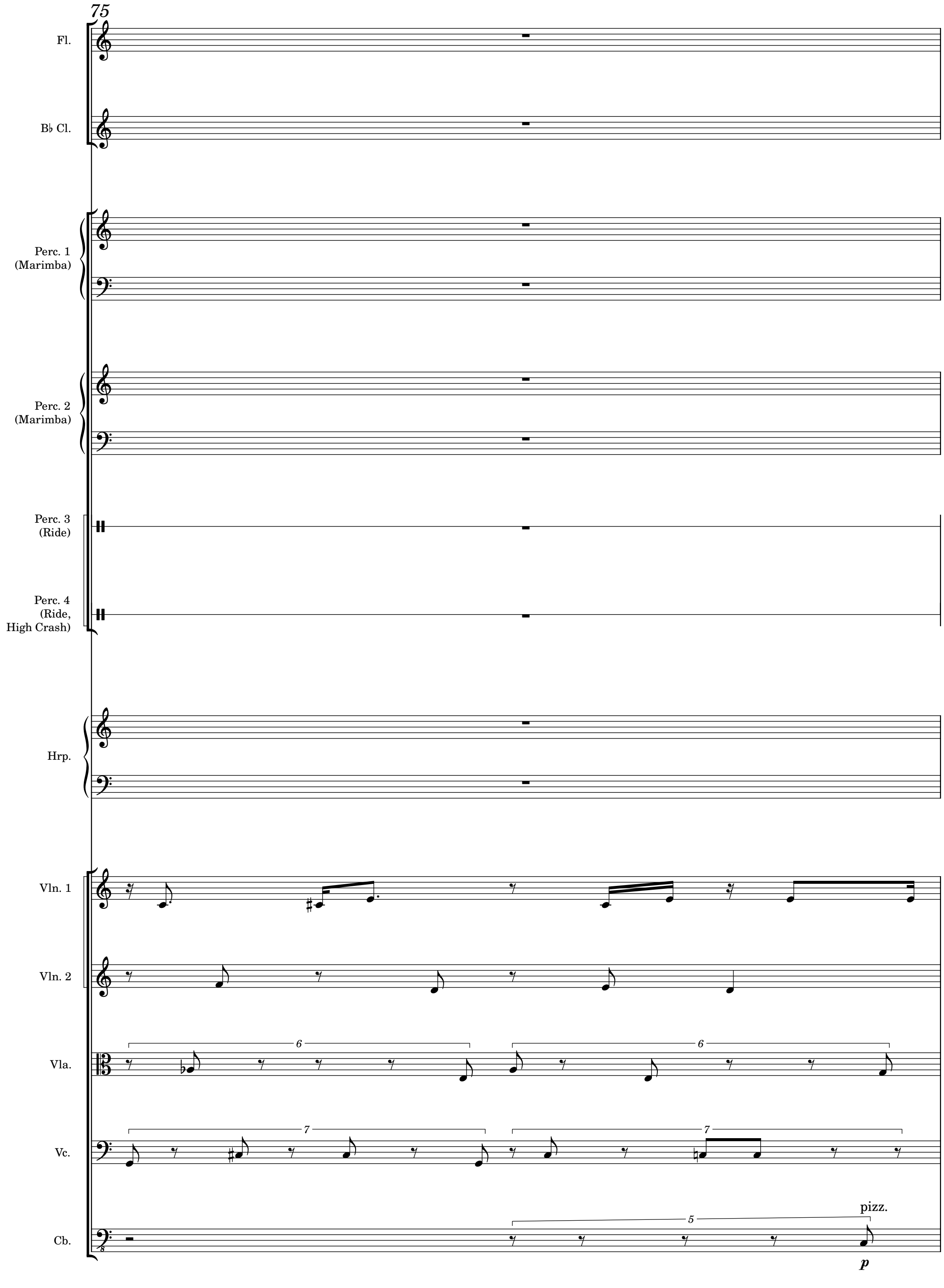

69
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
10
10
Vla.
9
9
Vc.
Cb.
7
7

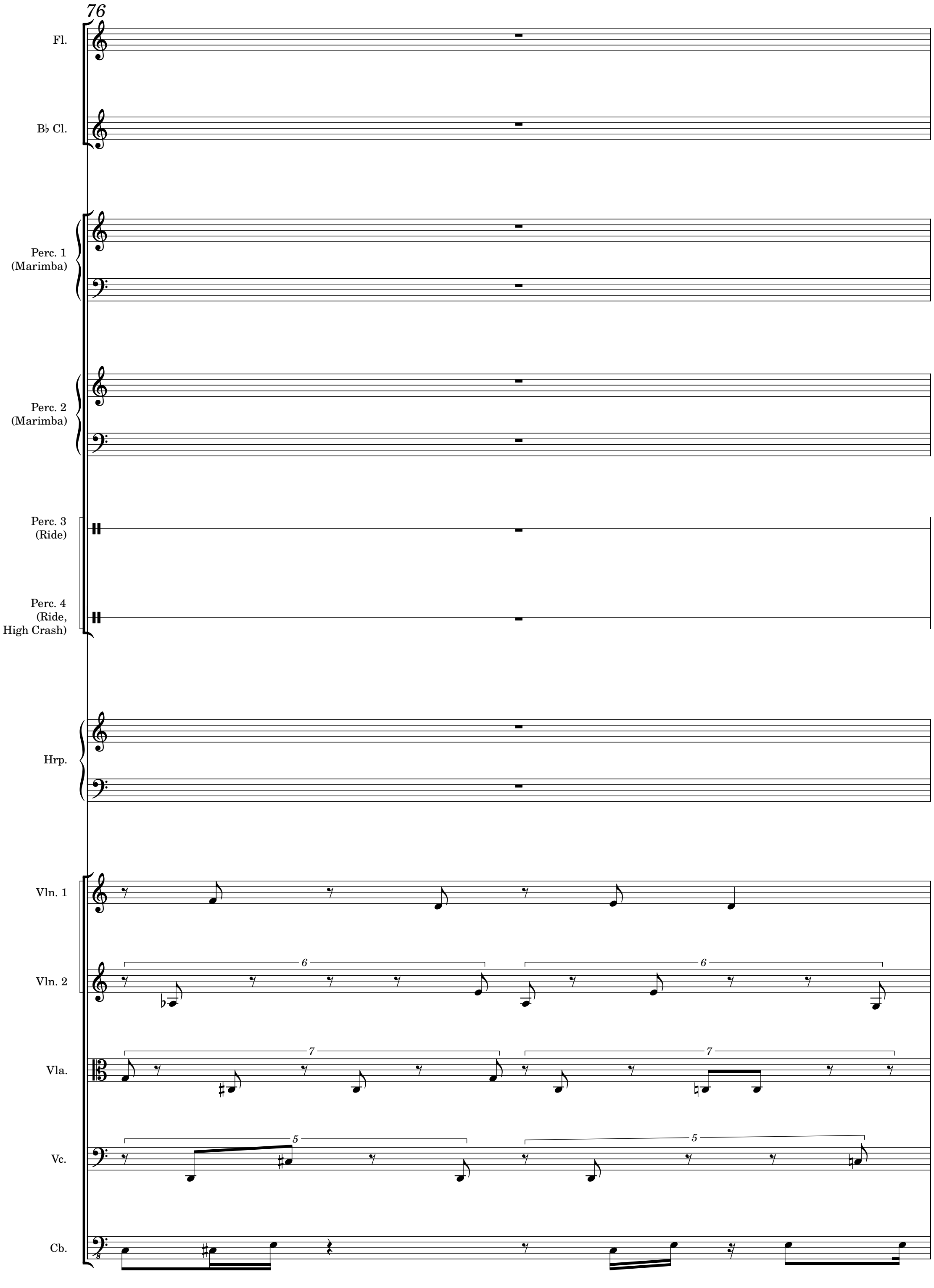

70
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
10
10
Vla.
9
9
Vc.
Cb.
7
7

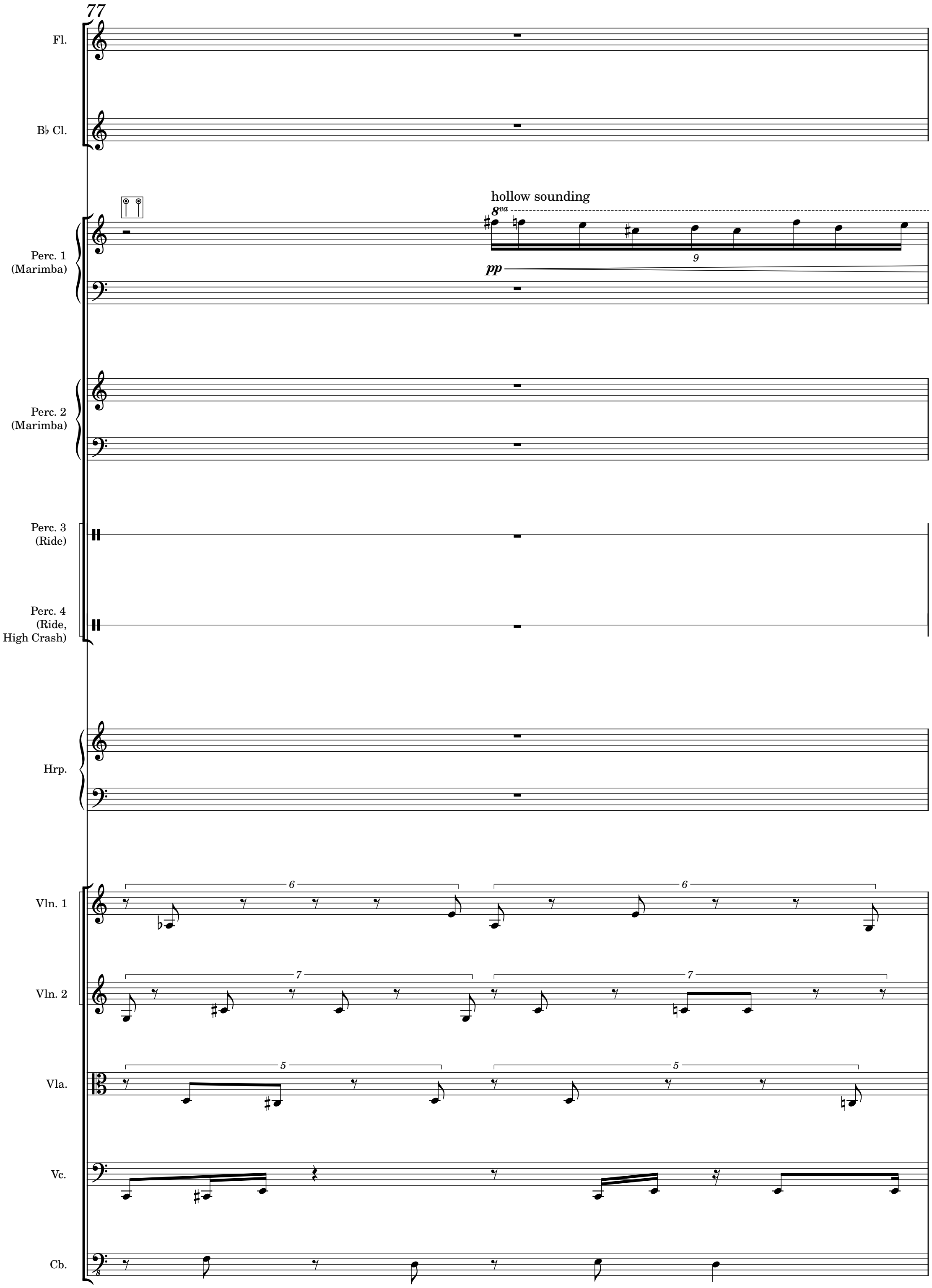

71
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
9
7
7

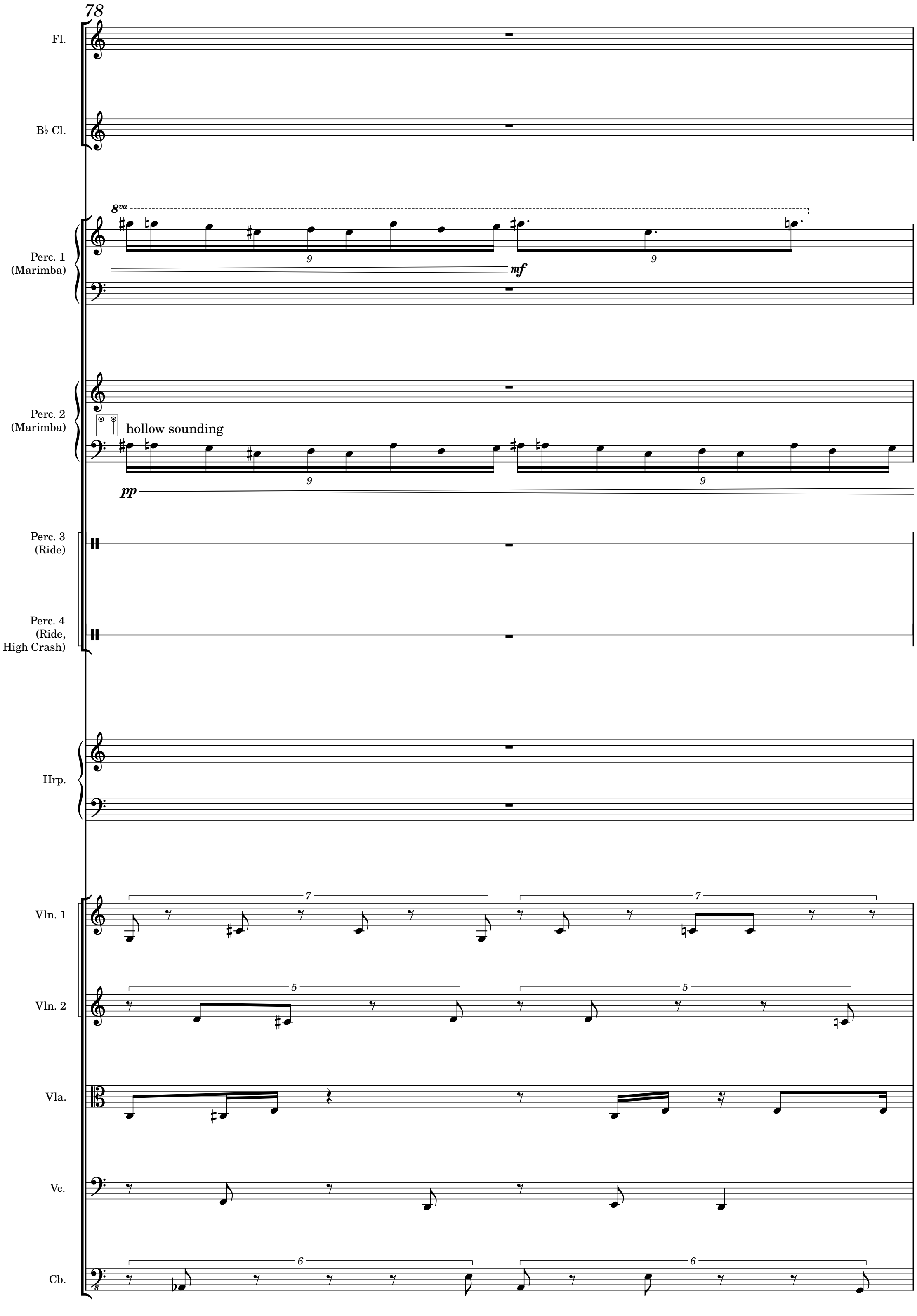

72
(♪ = 80)
slow down even more
(♪ = 50)
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
pizz.
p
Vln. 2
pizz.
p
Vla.
9
ppp
Vc.
ppp
Cb.
7

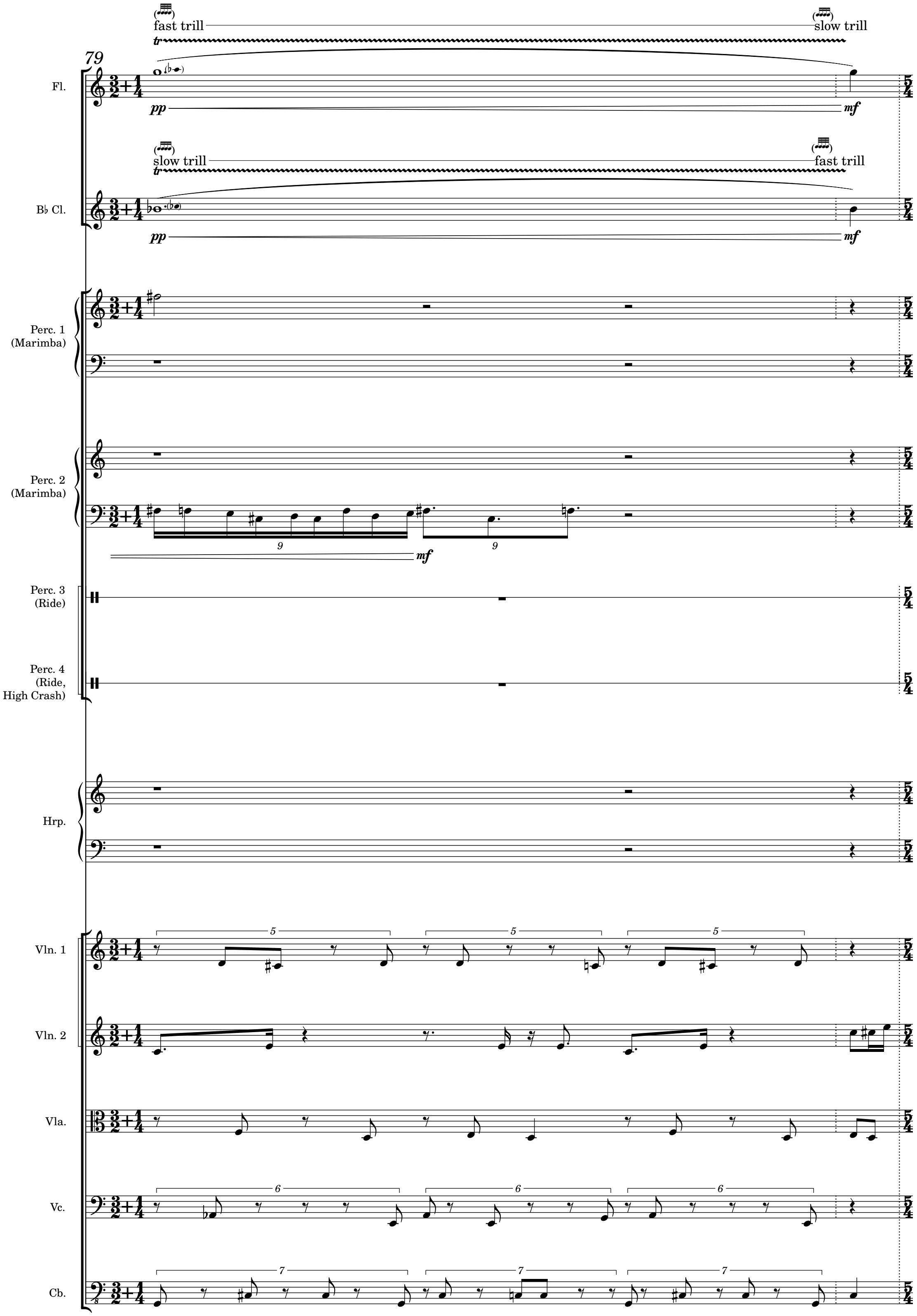

D
♪ = 𝅗𝅥
𝅗𝅥 = 50
73
Fractured
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
7
5
6
pizz.
p
ppp

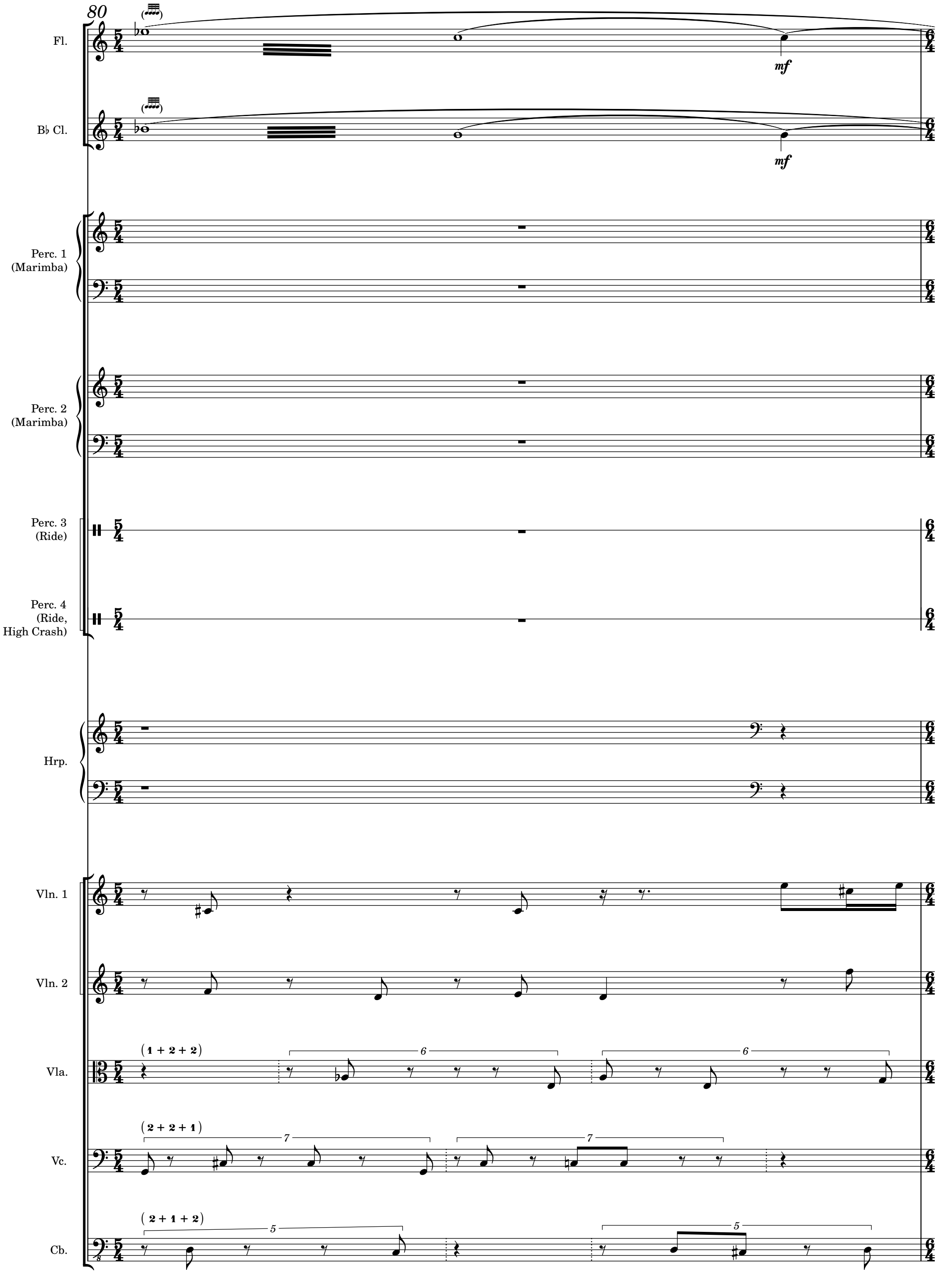

75
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
6
6
Vc.
7
7
Cb.
5
pizz.
p

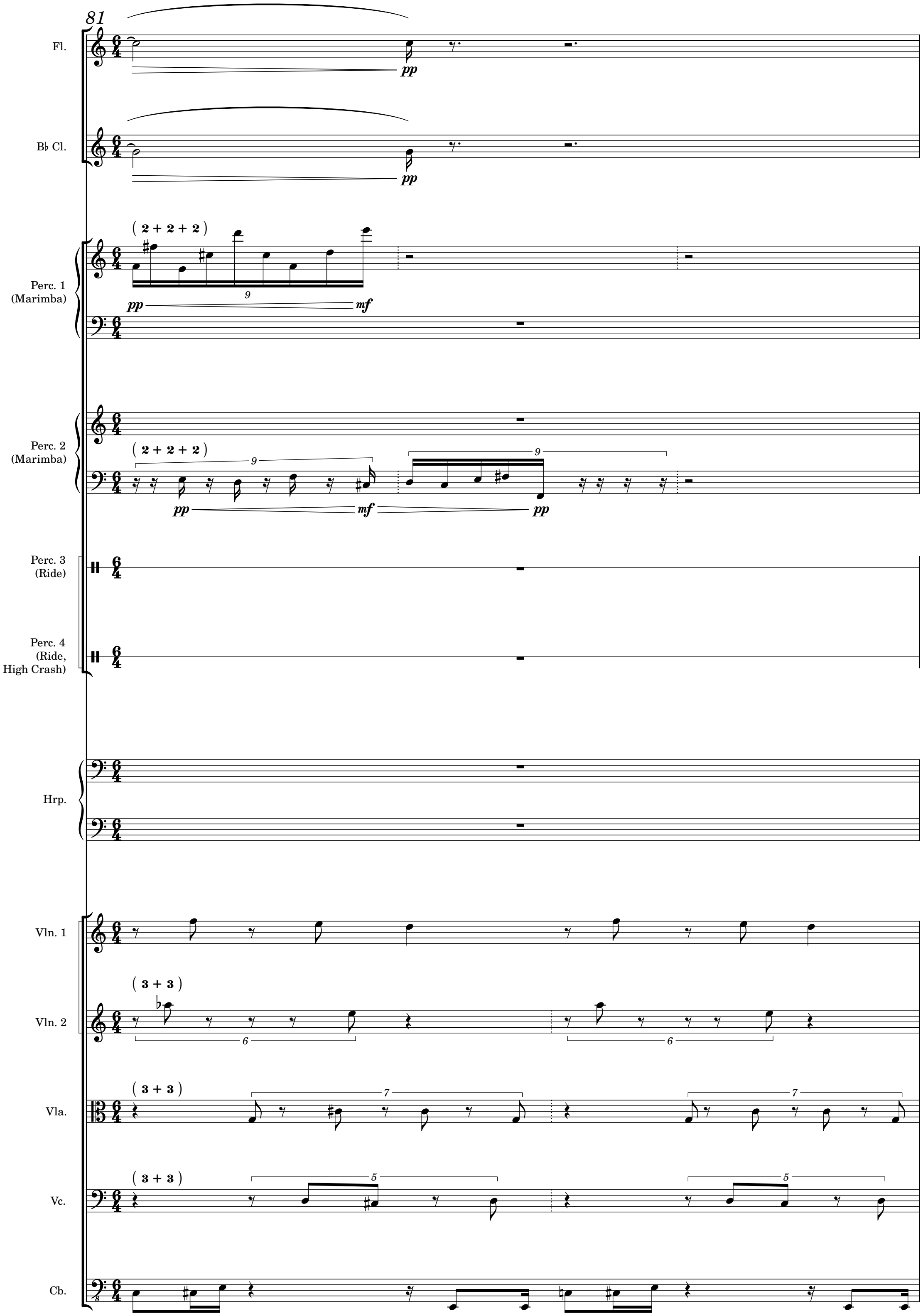

76
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
6
6
7
7
5
5

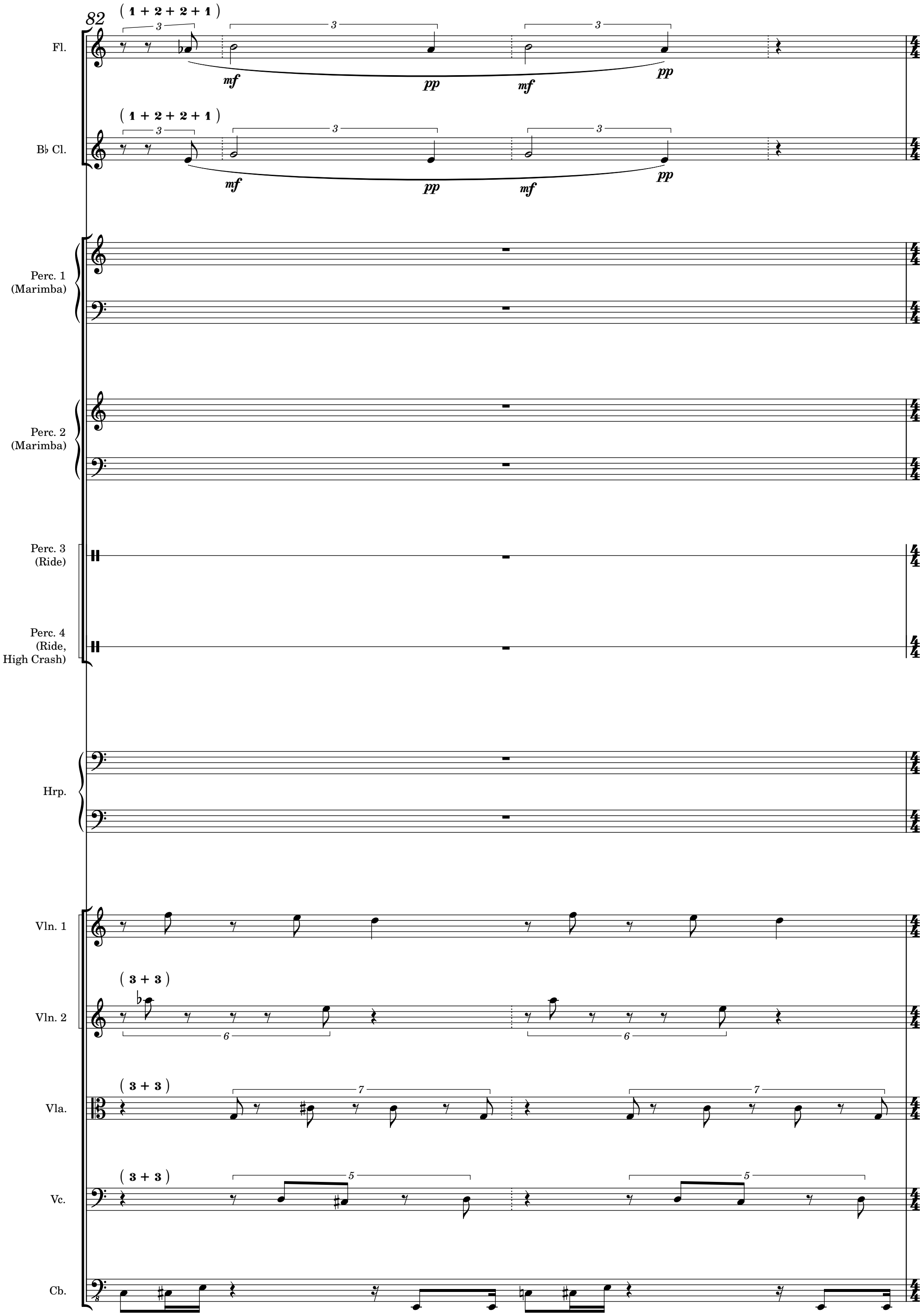

77
Fl.
B♭ Cl.
hollow sounding
8va
pp
9
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
6
6
Vln. 2
7
7
Vla.
5
5
Vc.
Cb.

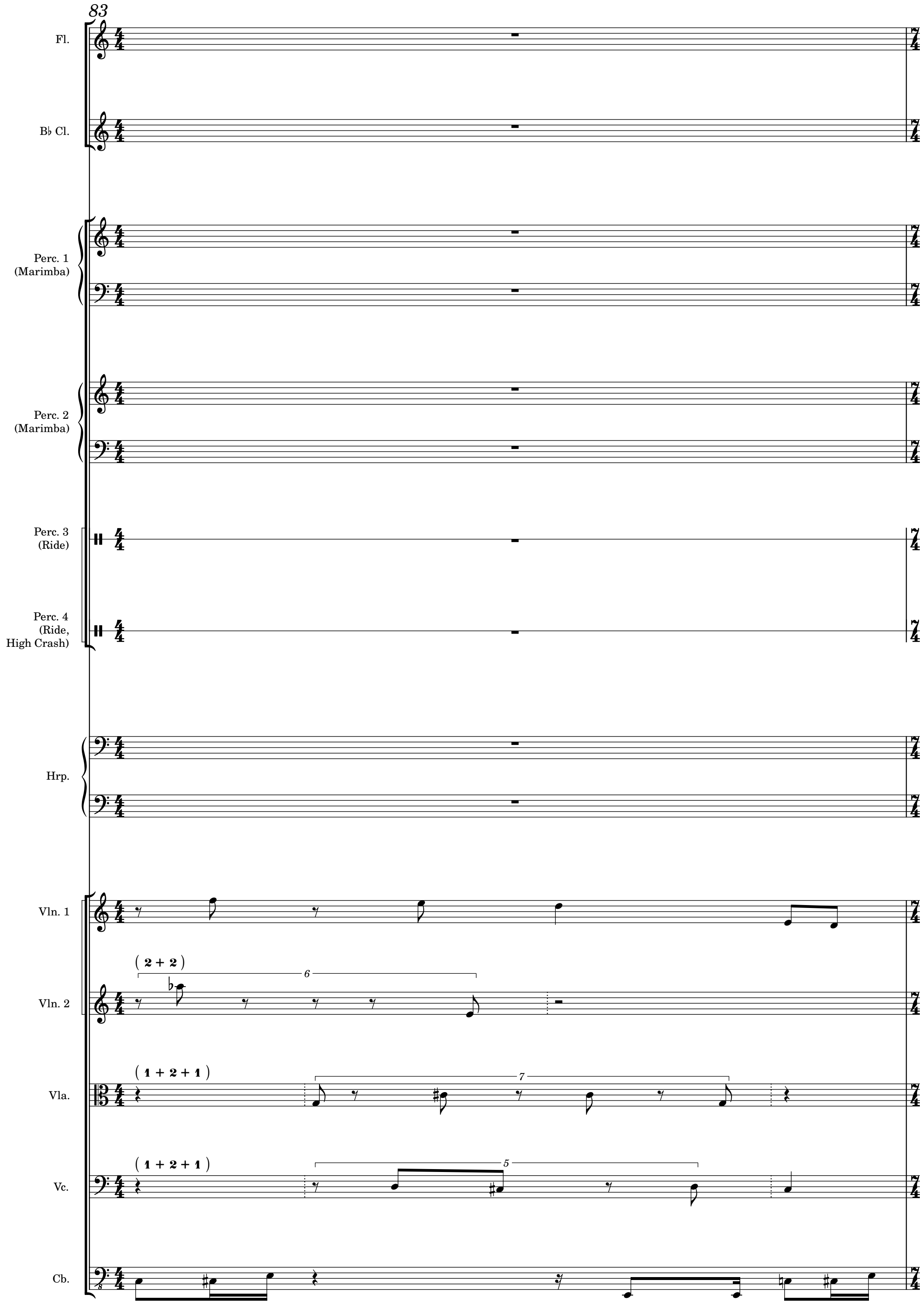

78
Fl.
B♭ Cl.
8va
9
mf
Perc. 1
(Marimba)
Perc. 2
(Marimba)
hollow sounding
pp
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
7
Vln. 1
5
Vln. 2
Vla.
Vc.
6
Cb.

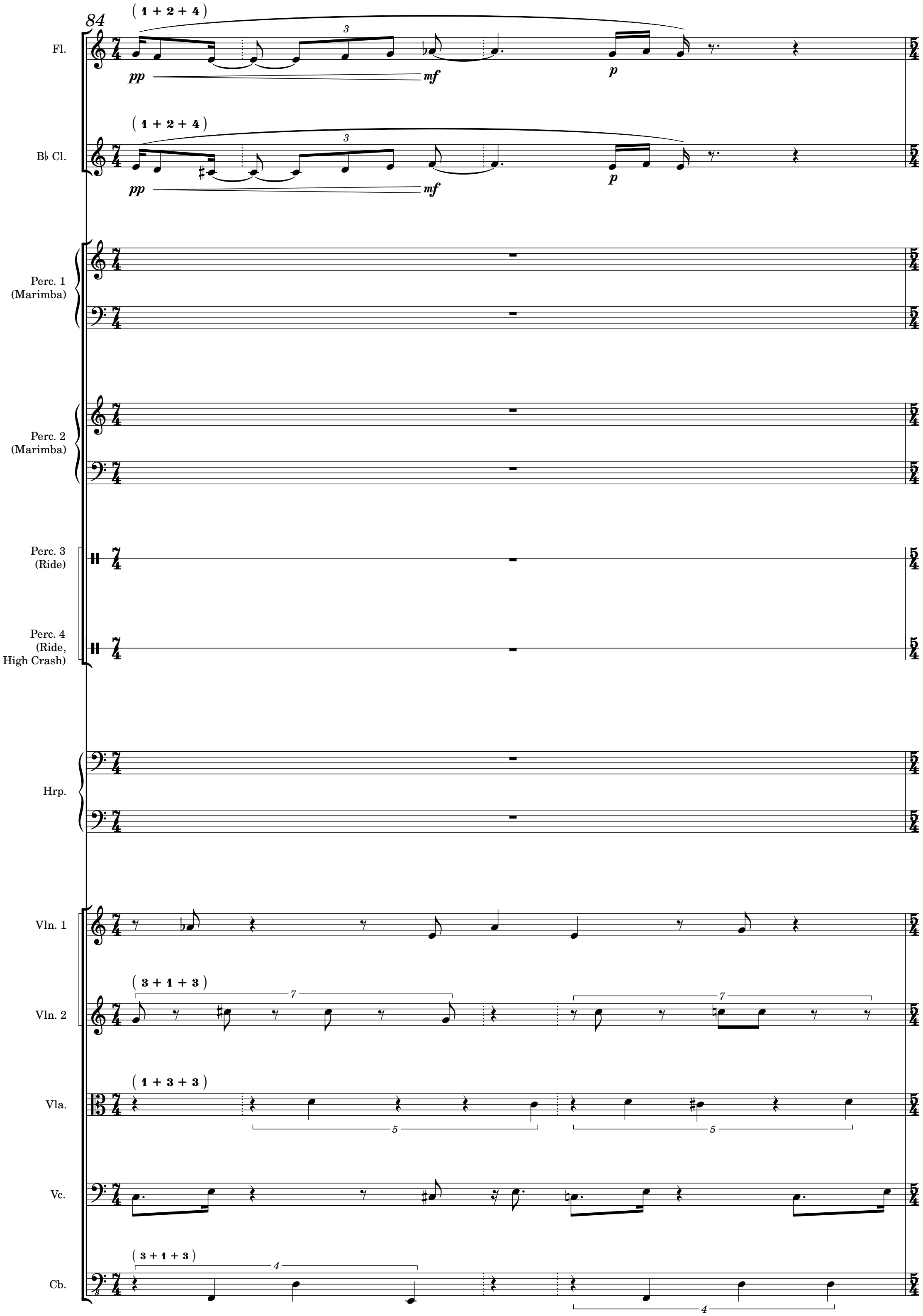

fast trill
slow trill
tr
79
Fl.
pp
mf
slow trill
fast trill
tr
B♭ Cl.
pp
mf
Perc. 1 (Marimba)
Perc. 2 (Marimba)
9
mf
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
5
Vln. 2
Vla.
Vc.
6
Cb.
7
3/2+1/4
5/4

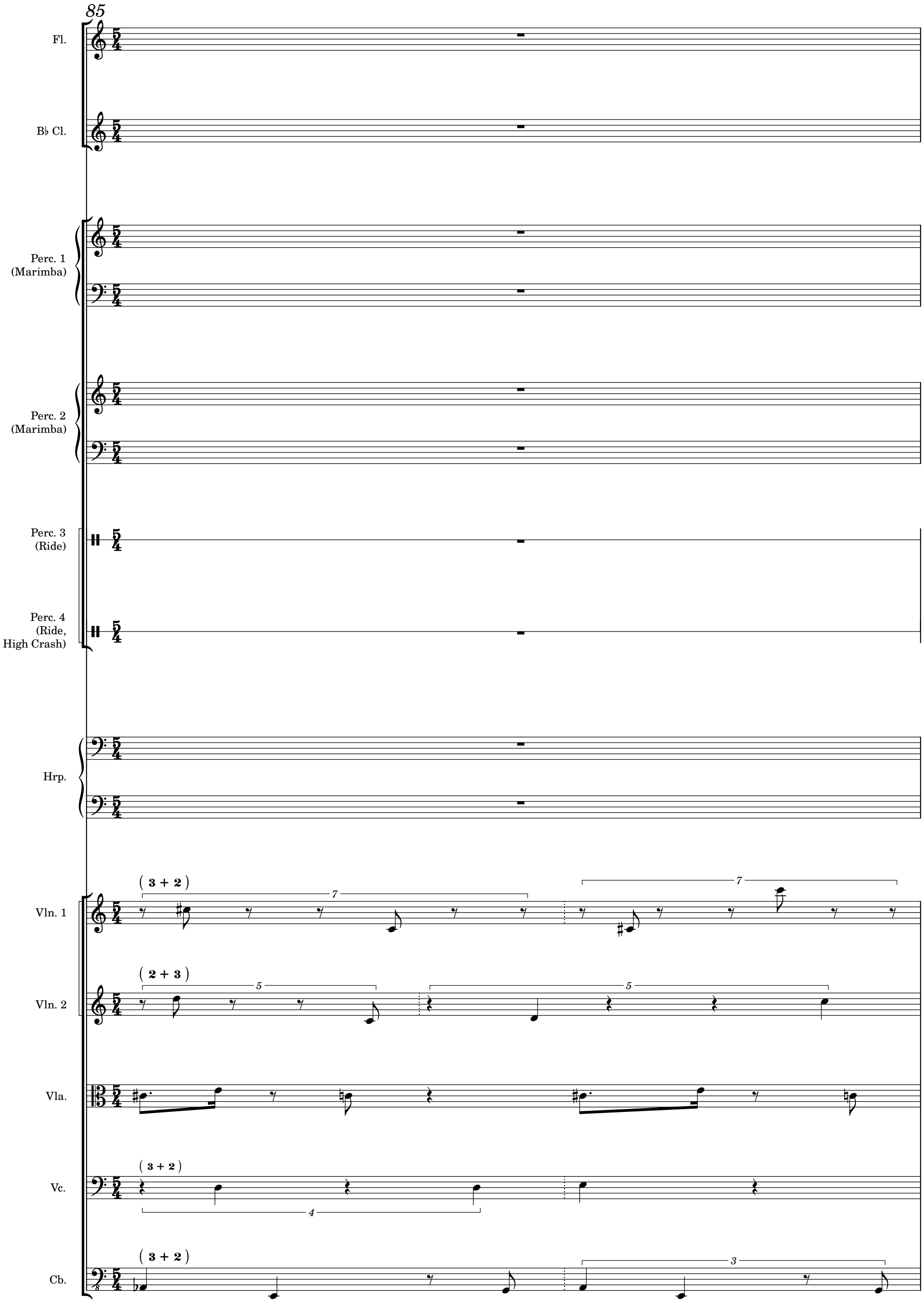

80
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
mf
(1 + 2 + 2)
(2 + 2 + 1)
(2 + 1 + 2)
6
7
5

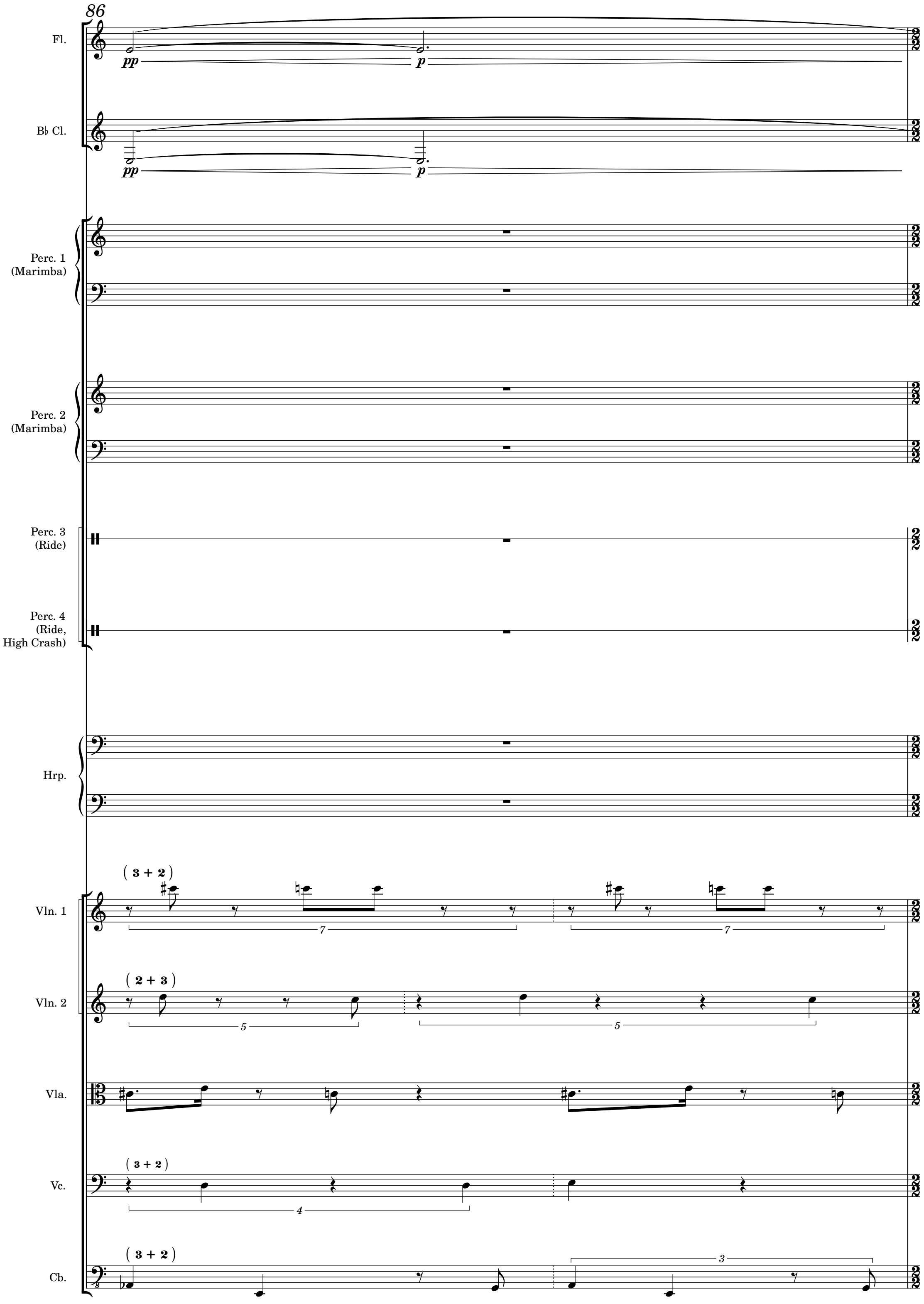

81
Fl.
pp
B♭ Cl.
pp
Perc. 1 (Marimba)
(2 + 2 + 2)
9
pp
mf
Perc. 2 (Marimba)
(2 + 2 + 2)
9
pp
mf
pp
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
(3 + 3)
6
Vla.
(3 + 3)
7
Vc.
(3 + 3)
5
Cb.

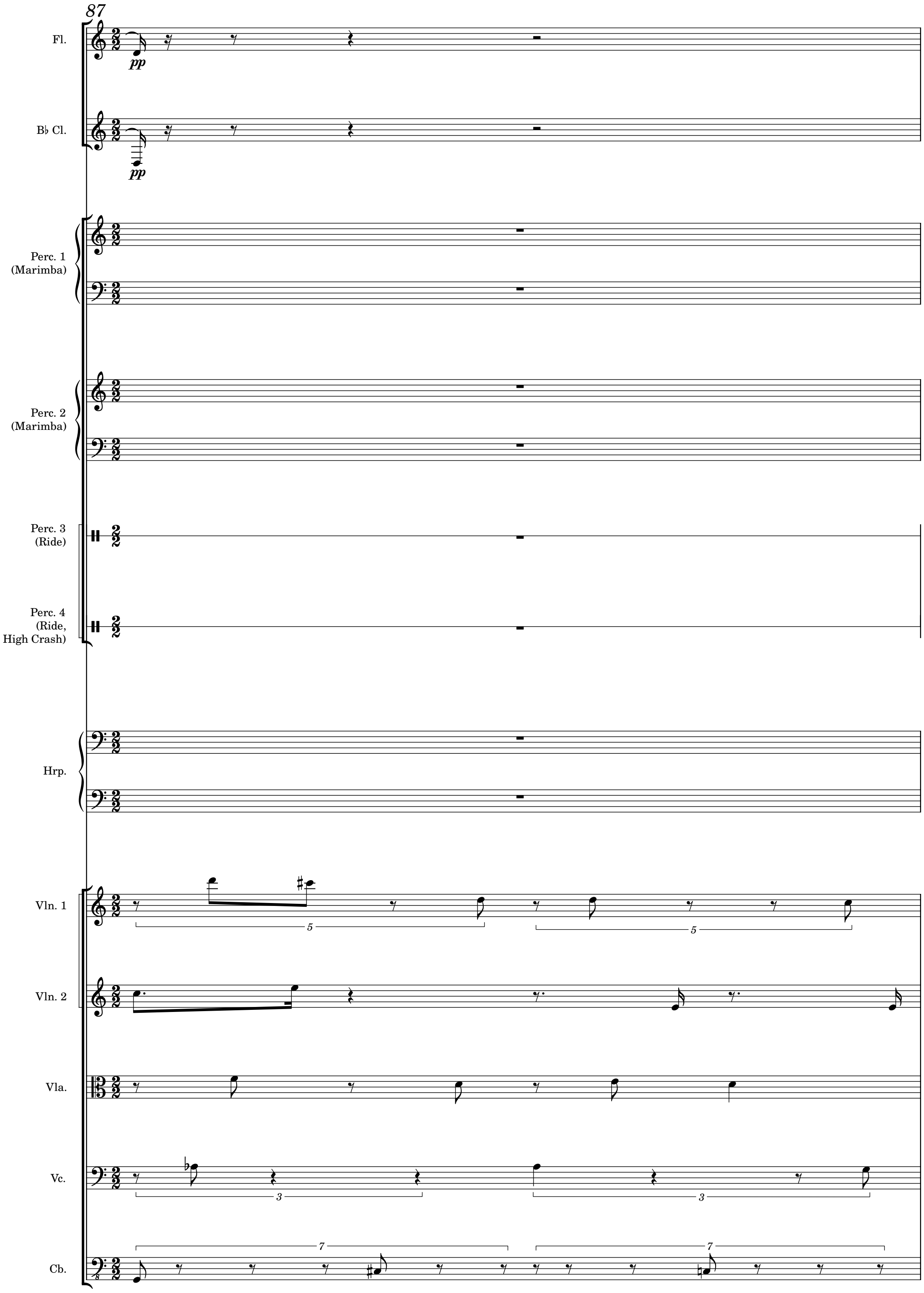

82
(1 + 2 + 2 + 1)
3
Fl.
mf
pp
mf
pp
(1 + 2 + 2 + 1)
B♭ Cl.
mf
pp
mf
pp
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
(3 + 3)
Vln. 2
6
(3 + 3)
Vla.
7
(3 + 3)
Vc.
5
Cb.
4/4

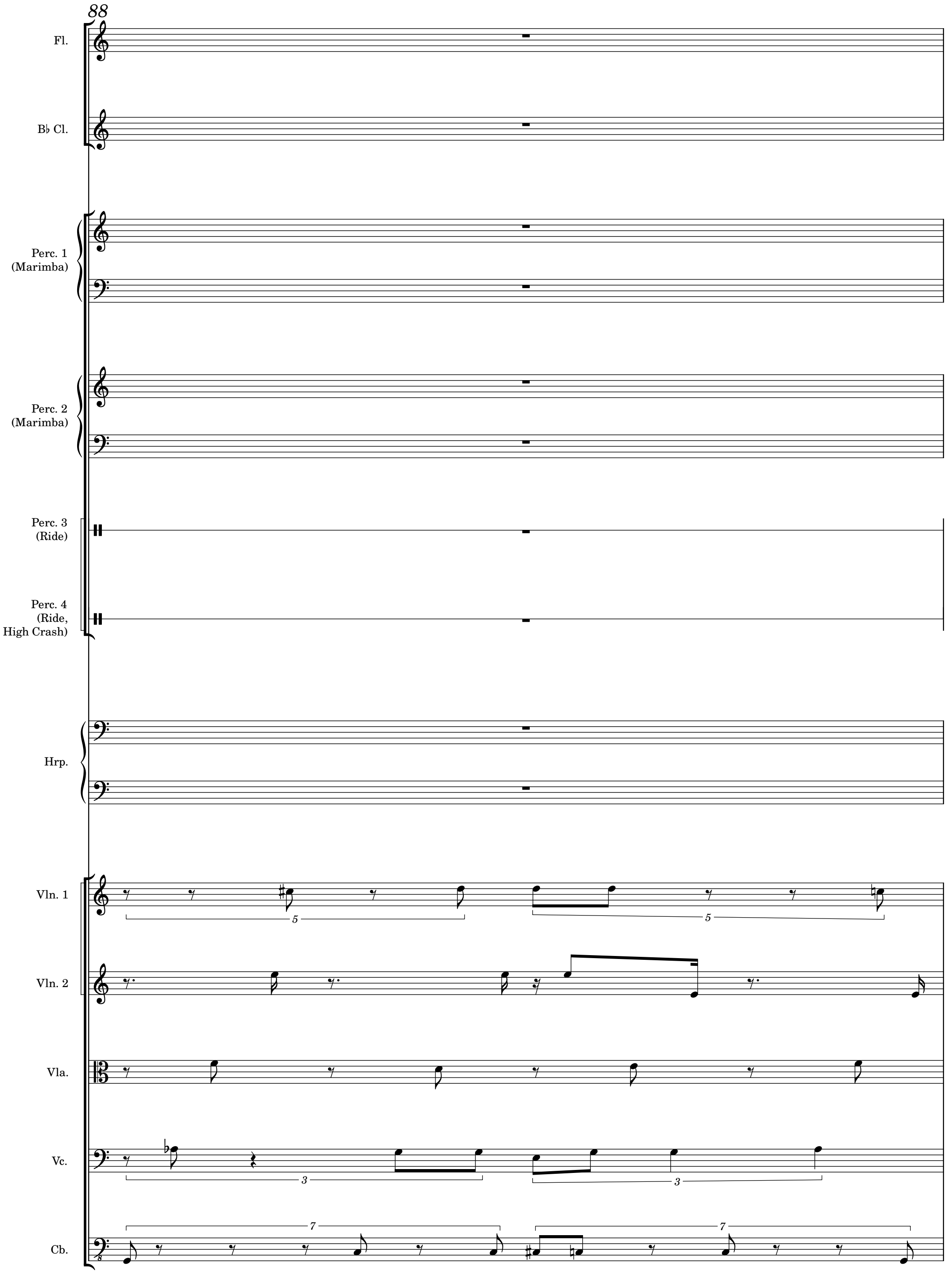

83
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
(2 + 2)
6
(1 + 2 + 1)
7
(1 + 2 + 1)
5

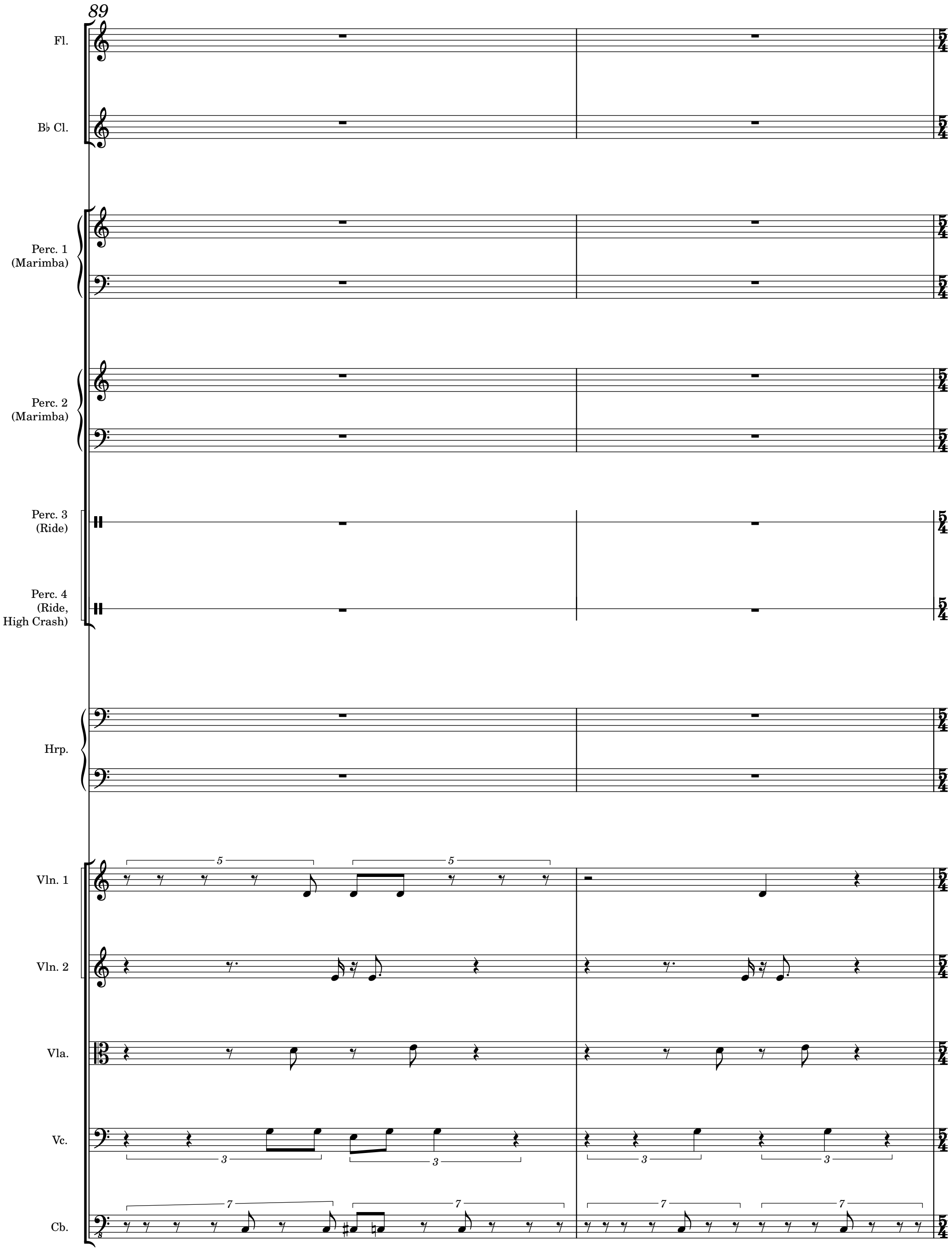

84
(1 + 2 + 4)
3
pp
mf
p
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
(3 + 1 + 3)
7
Vln. 2
(1 + 3 + 3)
5
Vla.
Vc.
4
Cb.

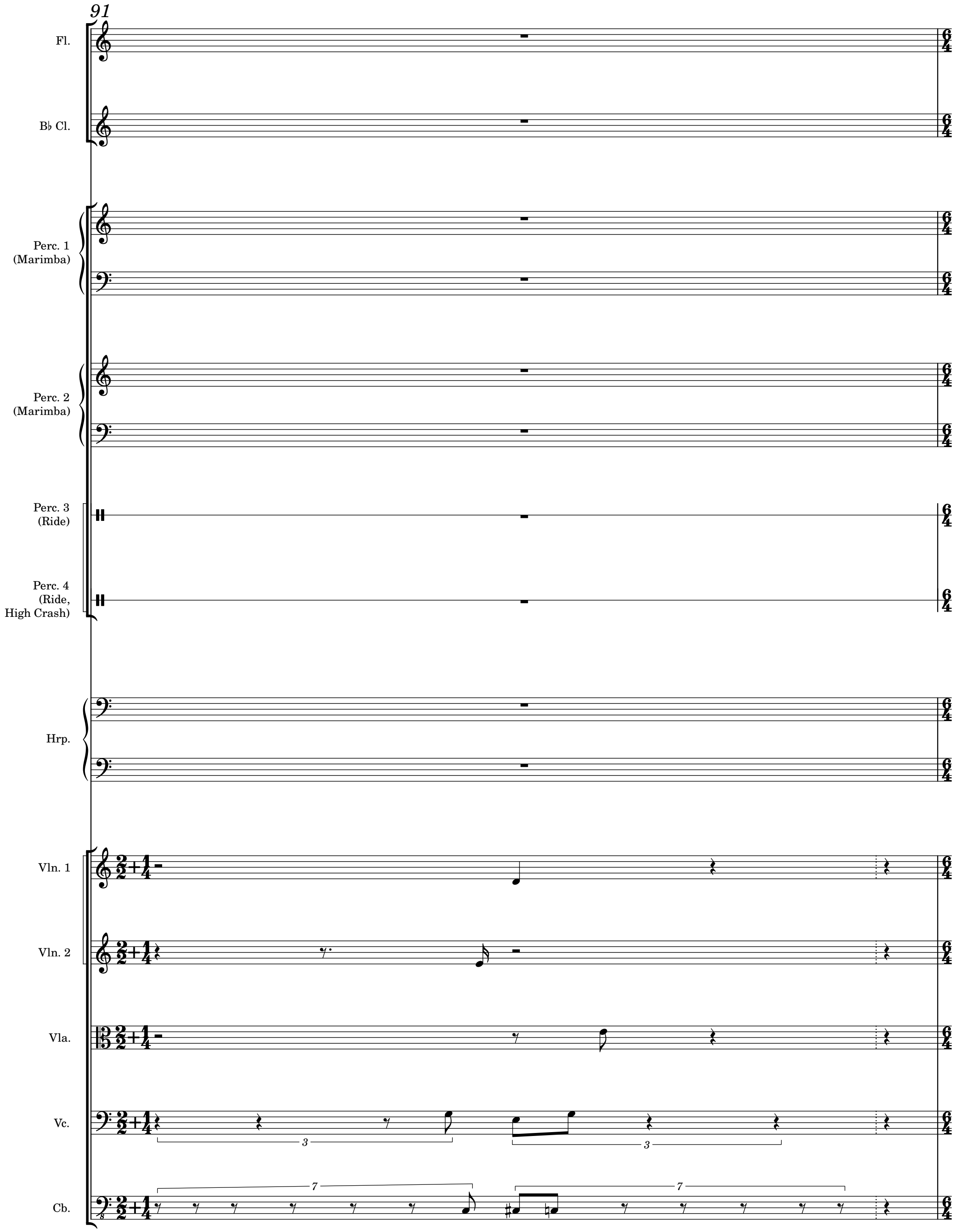

85
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
(3 + 2)
(2 + 3)
(3 + 2)
(3 + 2)
7
7
5
5
4
3

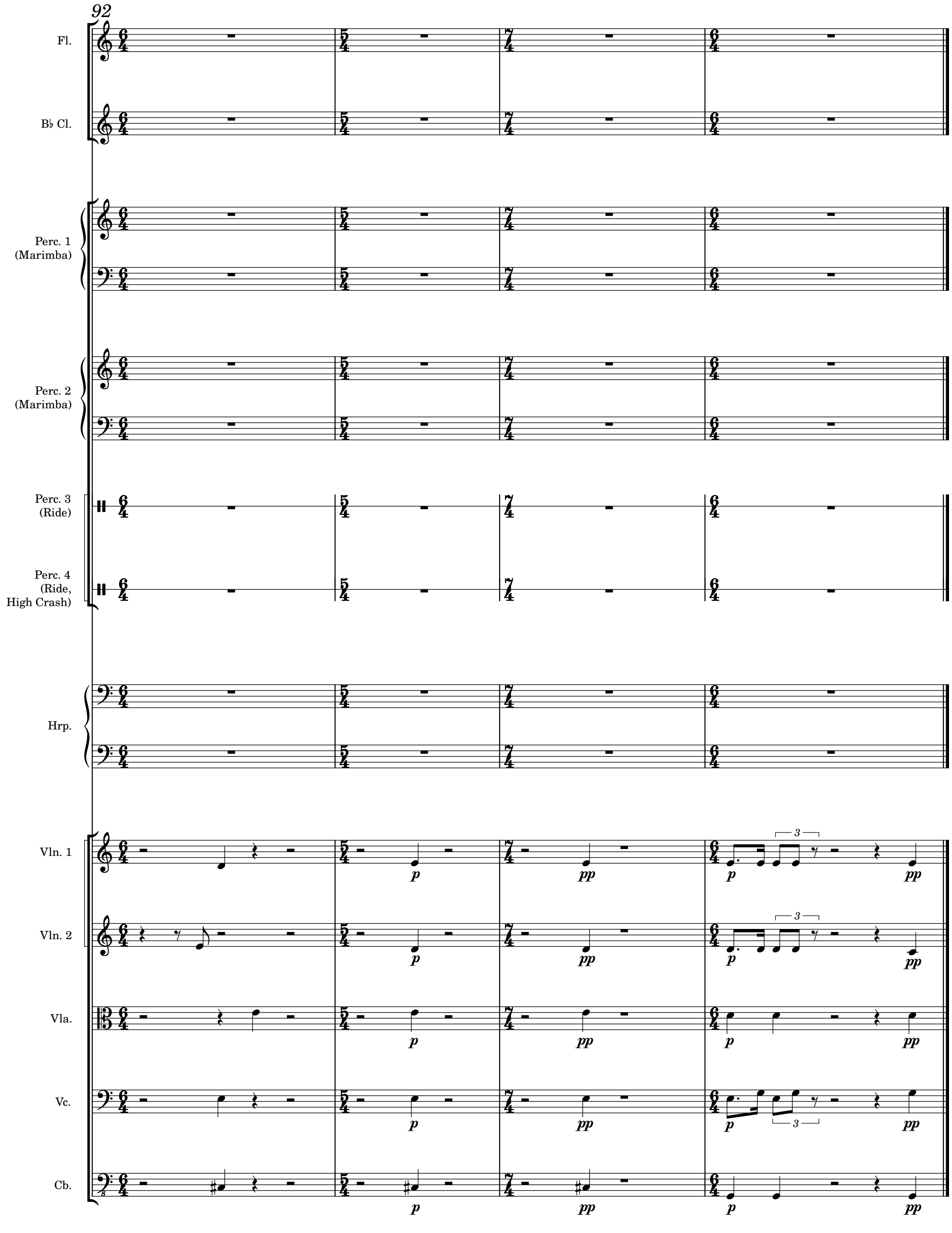

86
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
p
(3 + 2)
(2 + 3)
7
5
4
3


87
Fl.
pp
B♭ Cl.
pp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
5
5
Vln. 2
Vla.
Vc.
3
3
Cb.
7
7

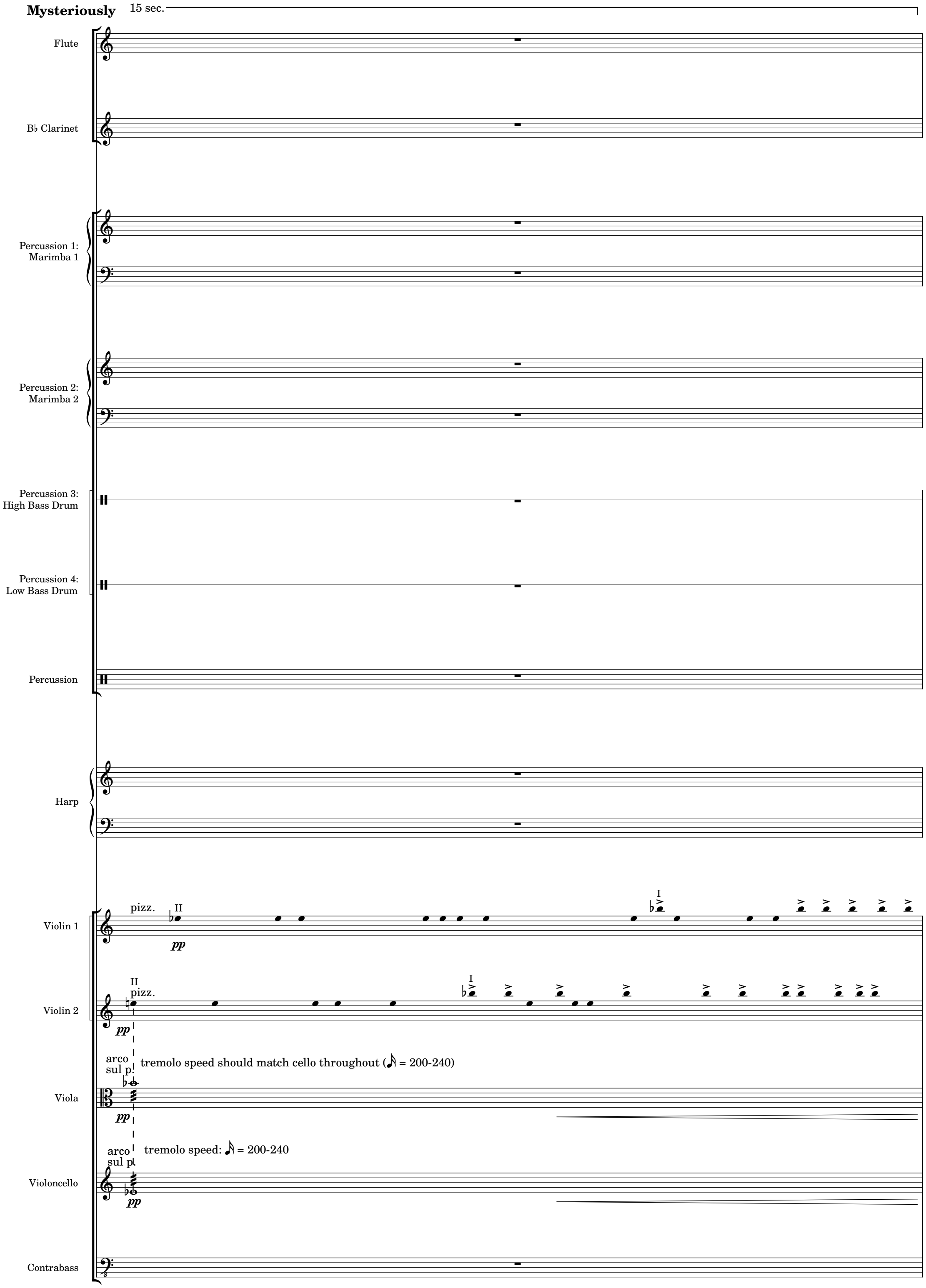

88
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
5
5
3
3
7
7

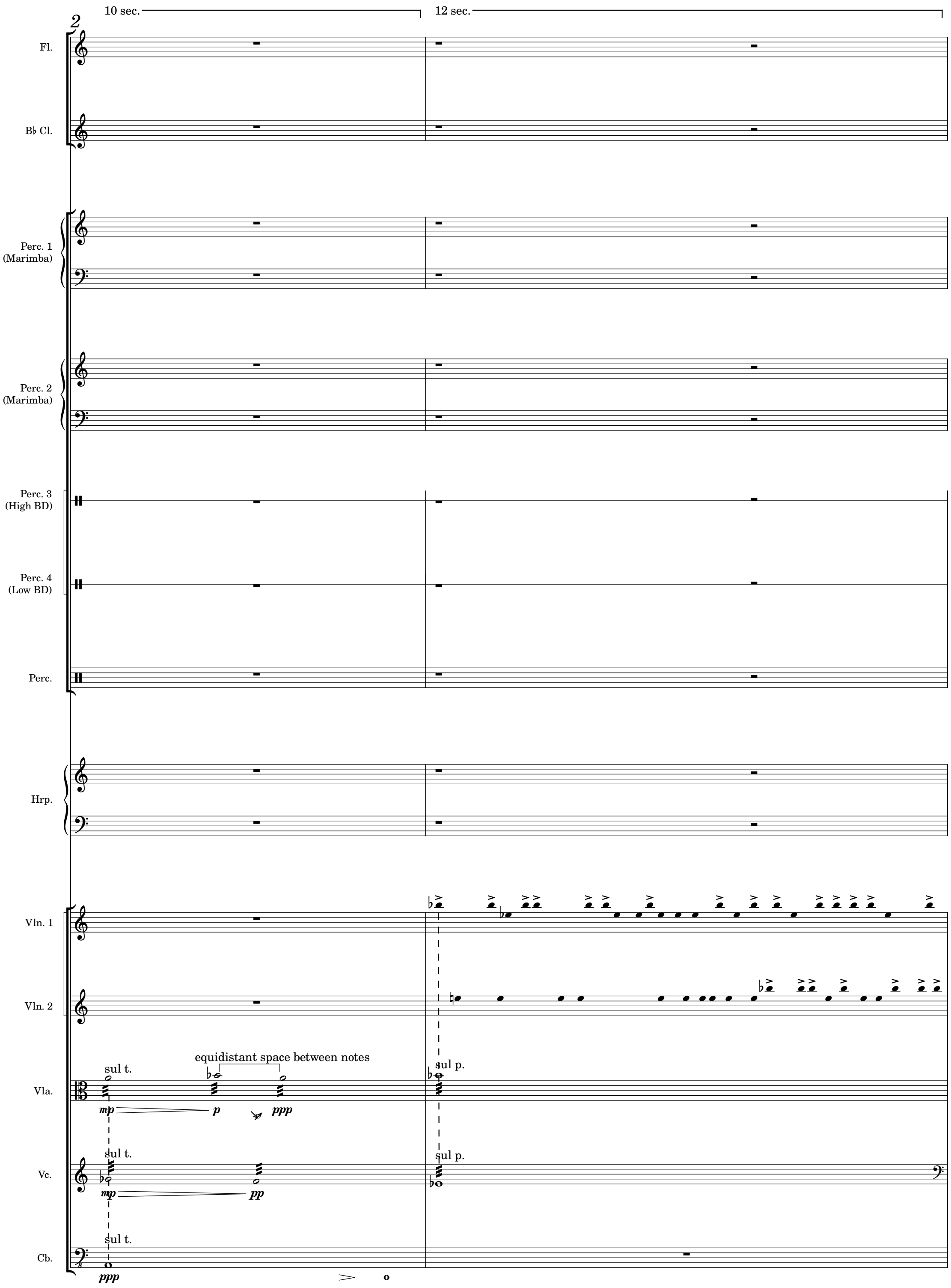

89
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
5
3
7

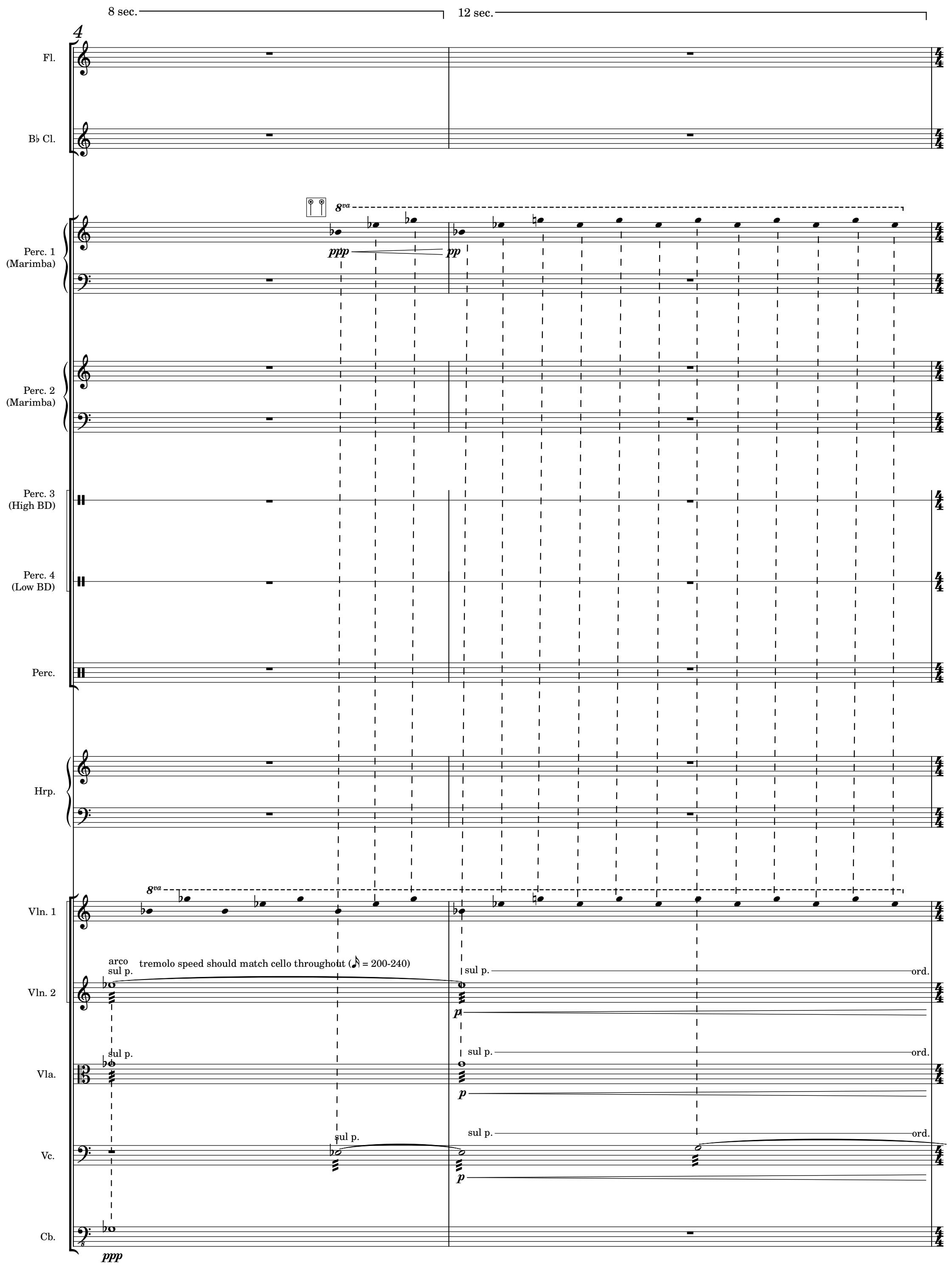

91
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Ride)
Perc. 4
(Ride,
High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
3
7

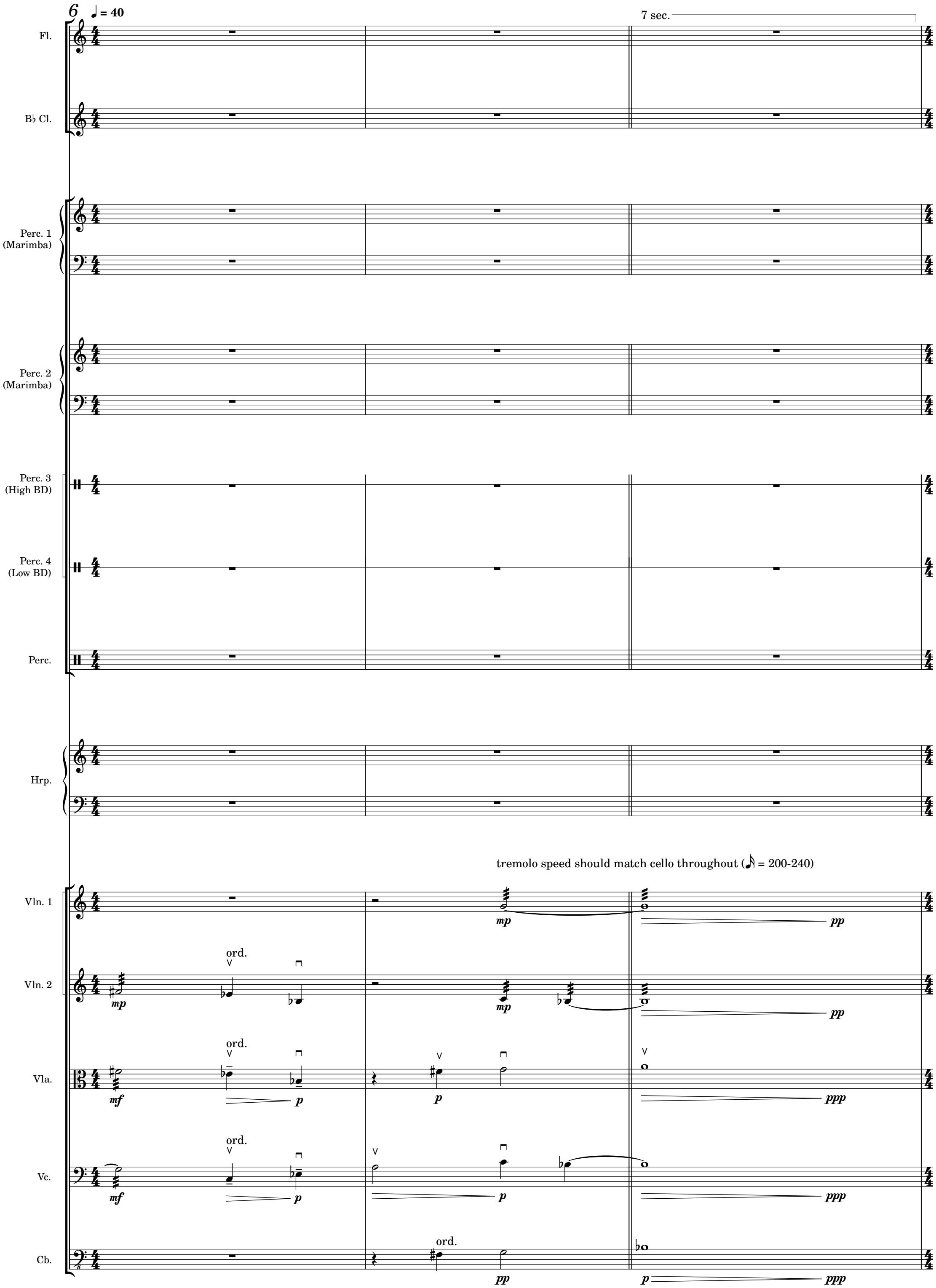

92
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Ride)
Perc. 4 (Ride, High Crash)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
pp
3

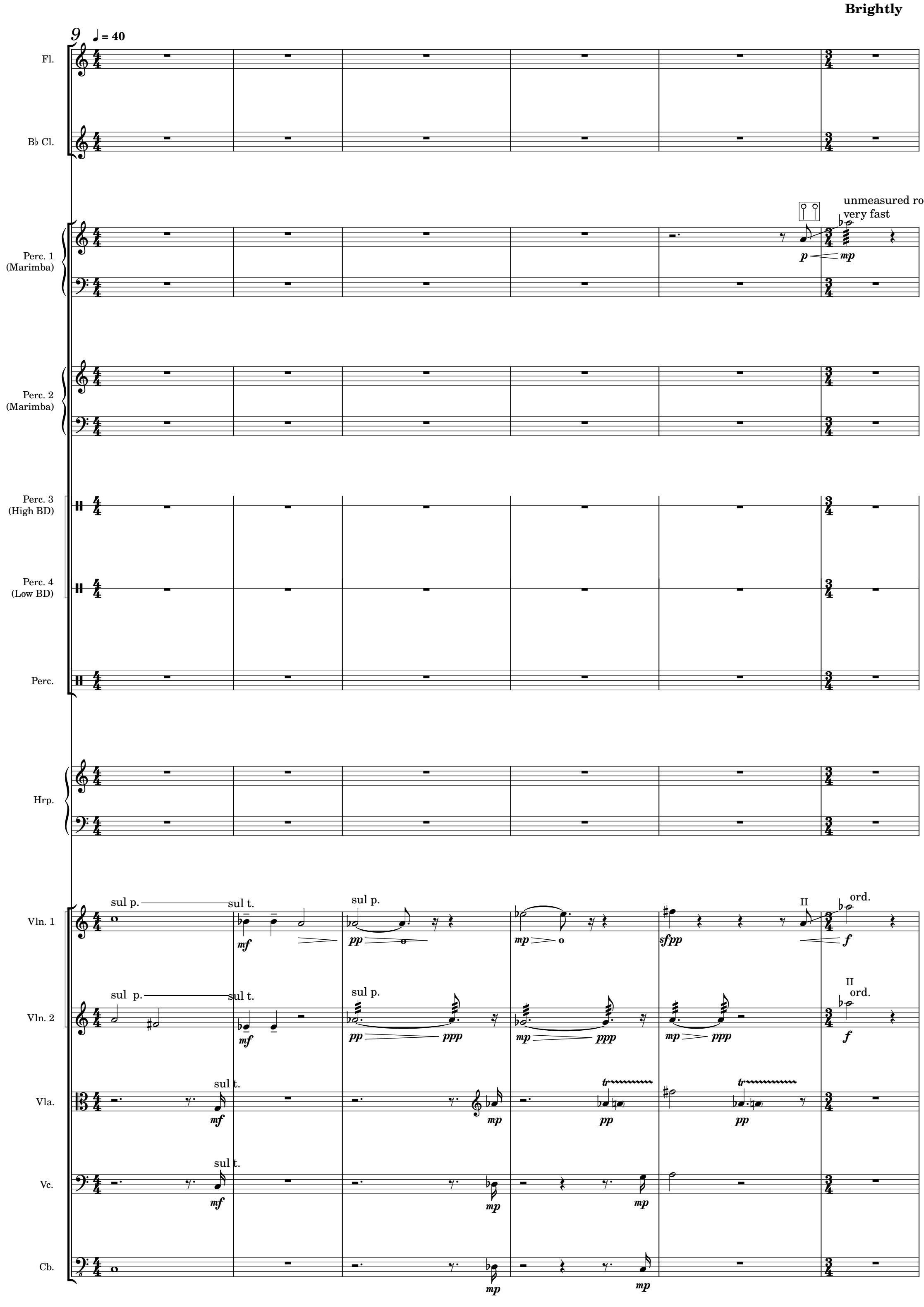
II. Pulling on Heartstrings

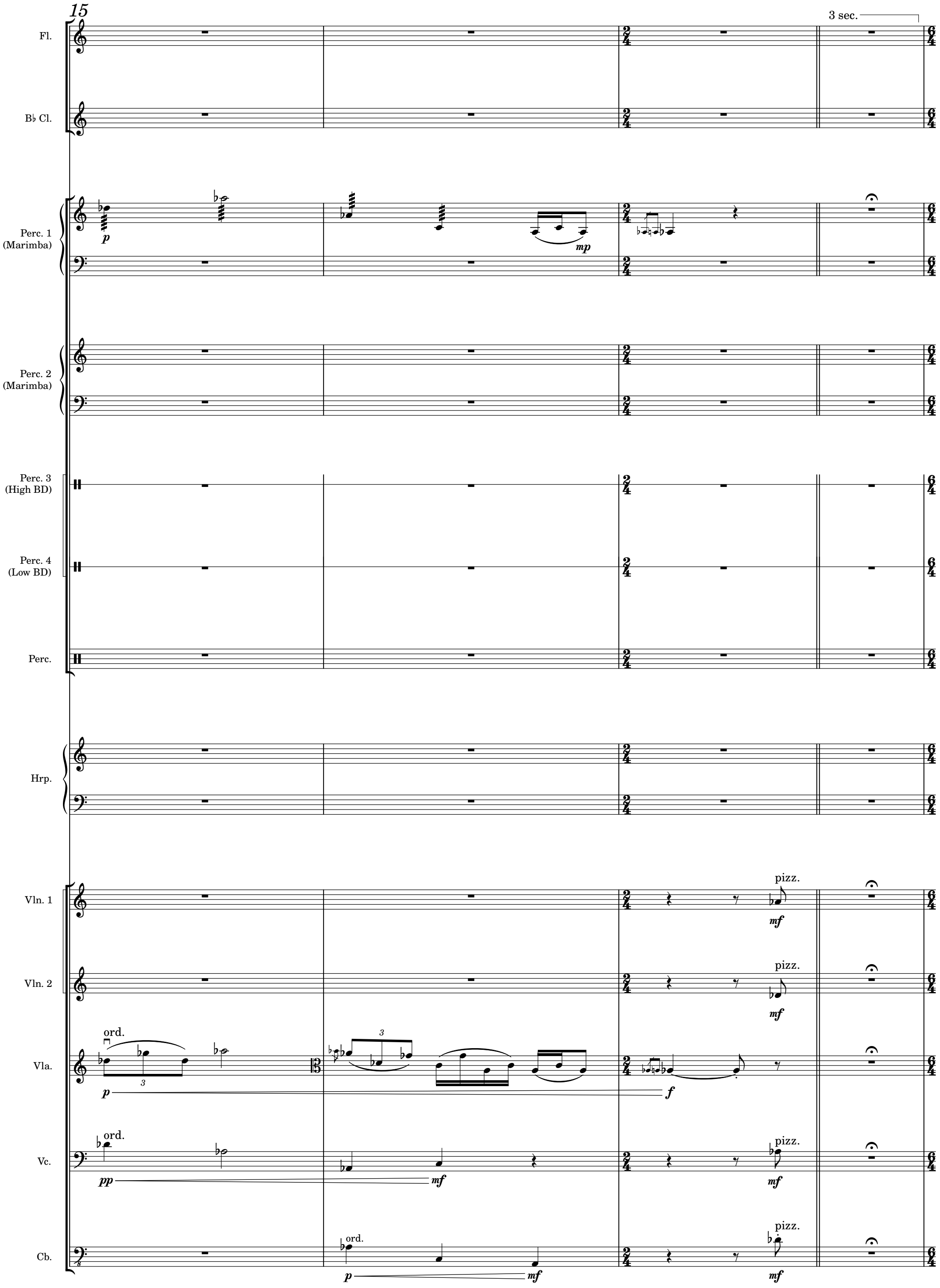

Mysteriously
15 sec.
Flute
B♭ Clarinet
Percussion 1: Marimba 1
Percussion 2: Marimba 2
Percussion 3: High Bass Drum
Percussion 4: Low Bass Drum
Percussion
Harp
Violin 1
pizz.
II
pp
I
Violin 2
II
pizz.
pp
I
arco
sul p.
tremolo speed should match cello throughout (♪ = 200-240)
Viola
pp
arco
sul p.
tremolo speed: ♪ = 200-240
Violoncello
pp
Contrabass

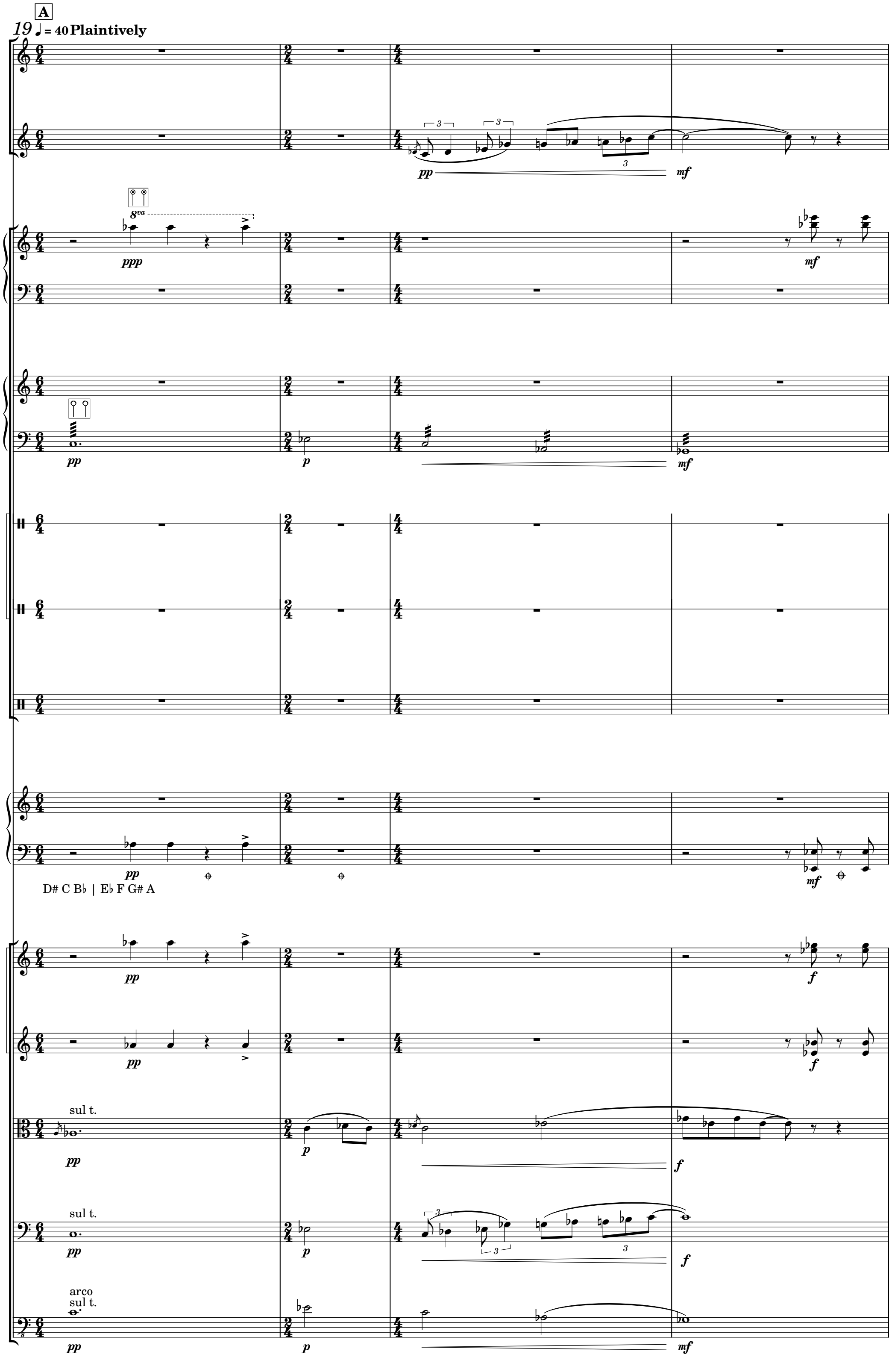

10 sec.
12 sec.
2
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
sul t.
equidistant space between notes
mp
p
ppp
sul p.
sul t.
mp
pp
sul p.
sul t.
ppp

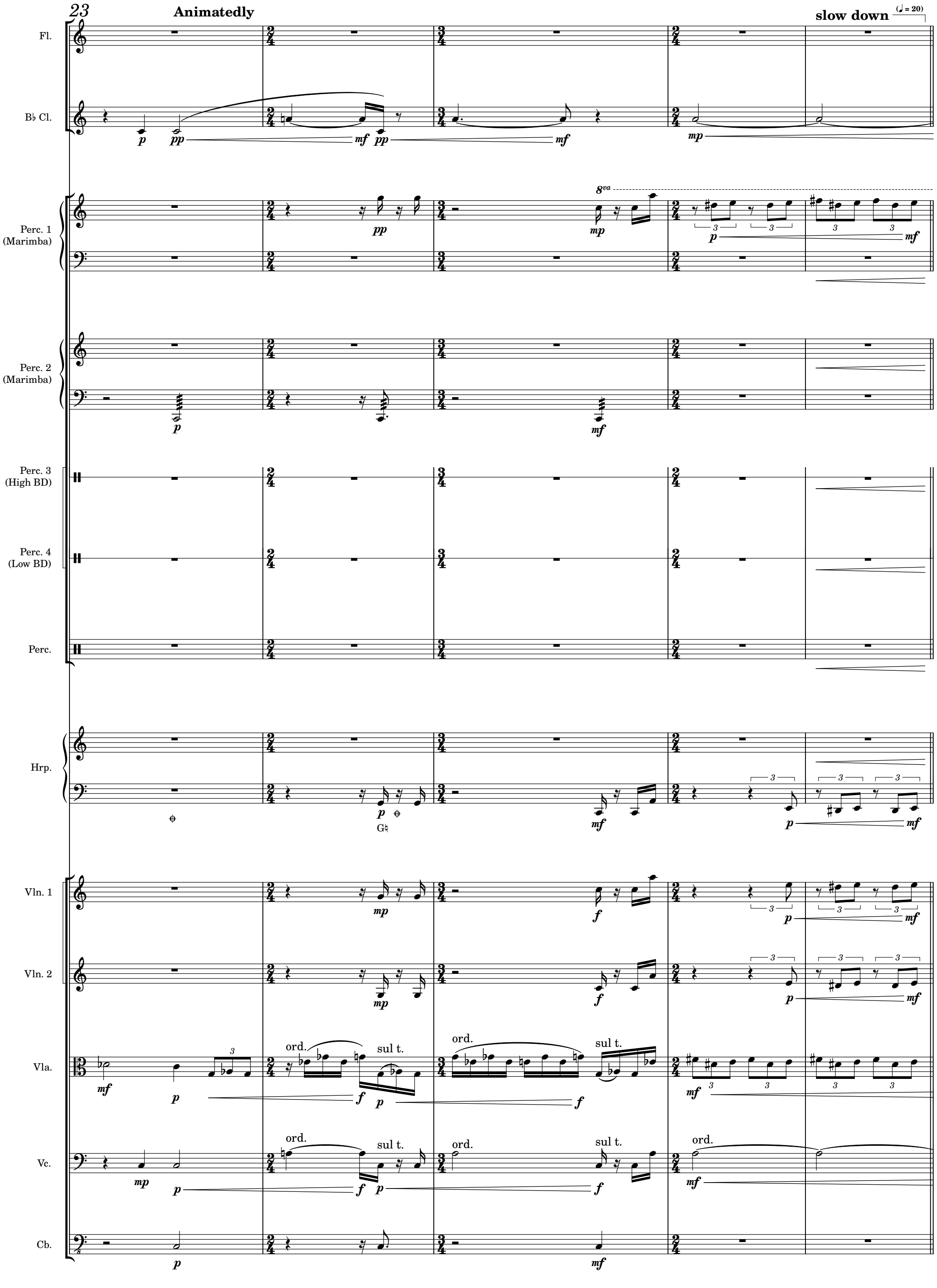

8 sec.
12 sec.
4
Fl.
B♭ Cl.
Perc. 1 (Marimba)
8va
ppp
pp
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
8va
Vln. 2
arco
sul p.
tremolo speed should match cello throughout (𝅘𝅥𝅮 = 200-240)
sul p.
ord.
p
Vla.
sul p.
sul p.
ord.
p
Vc.
sul p.
sul p.
ord.
p
Cb.
ppp

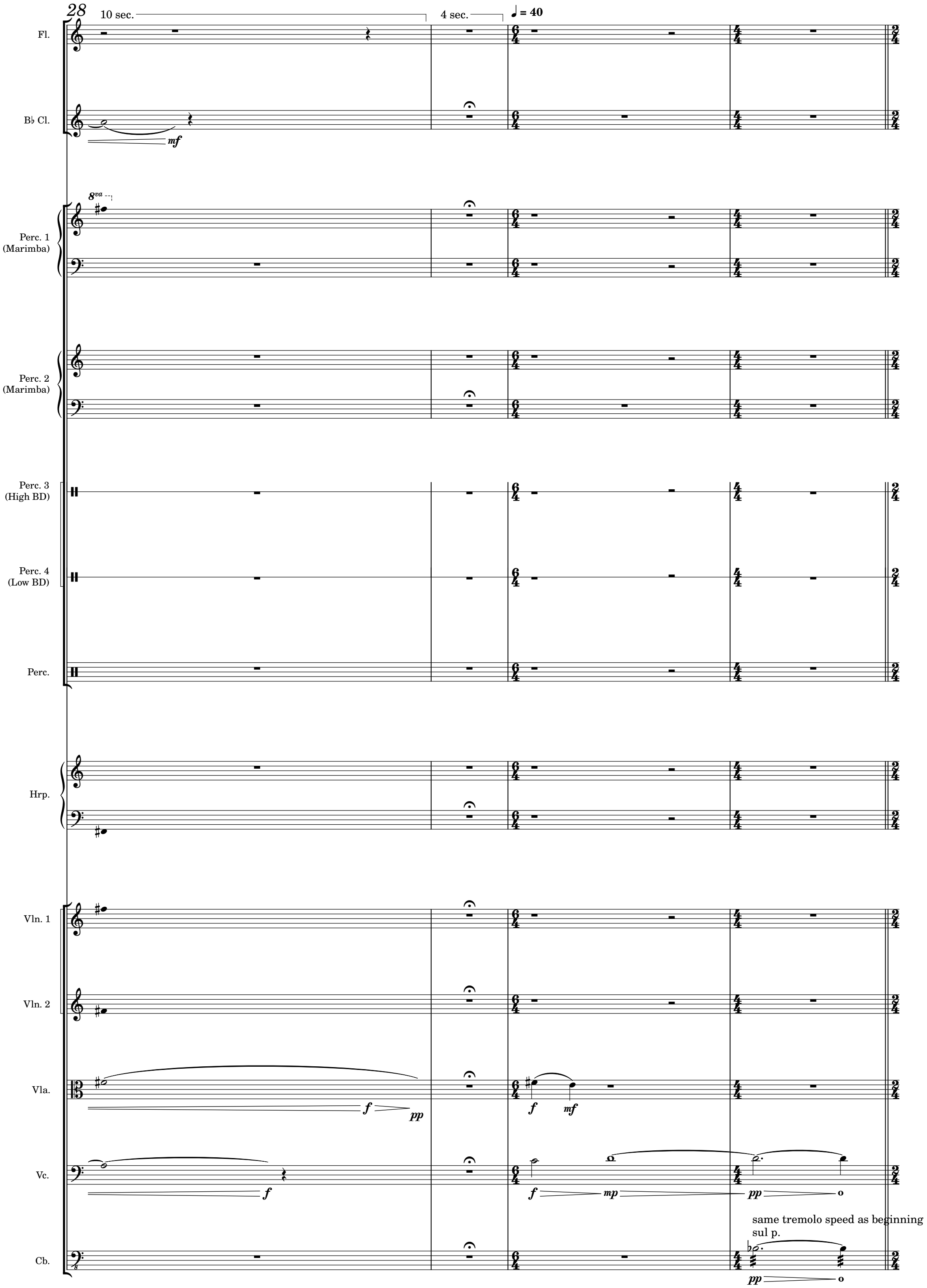

6
♩ = 40
7 sec.
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
tremolo speed should match cello throughout (𝅘𝅥𝅮 = 200-240)
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
ord.
mp
mf
p
pp
ppp

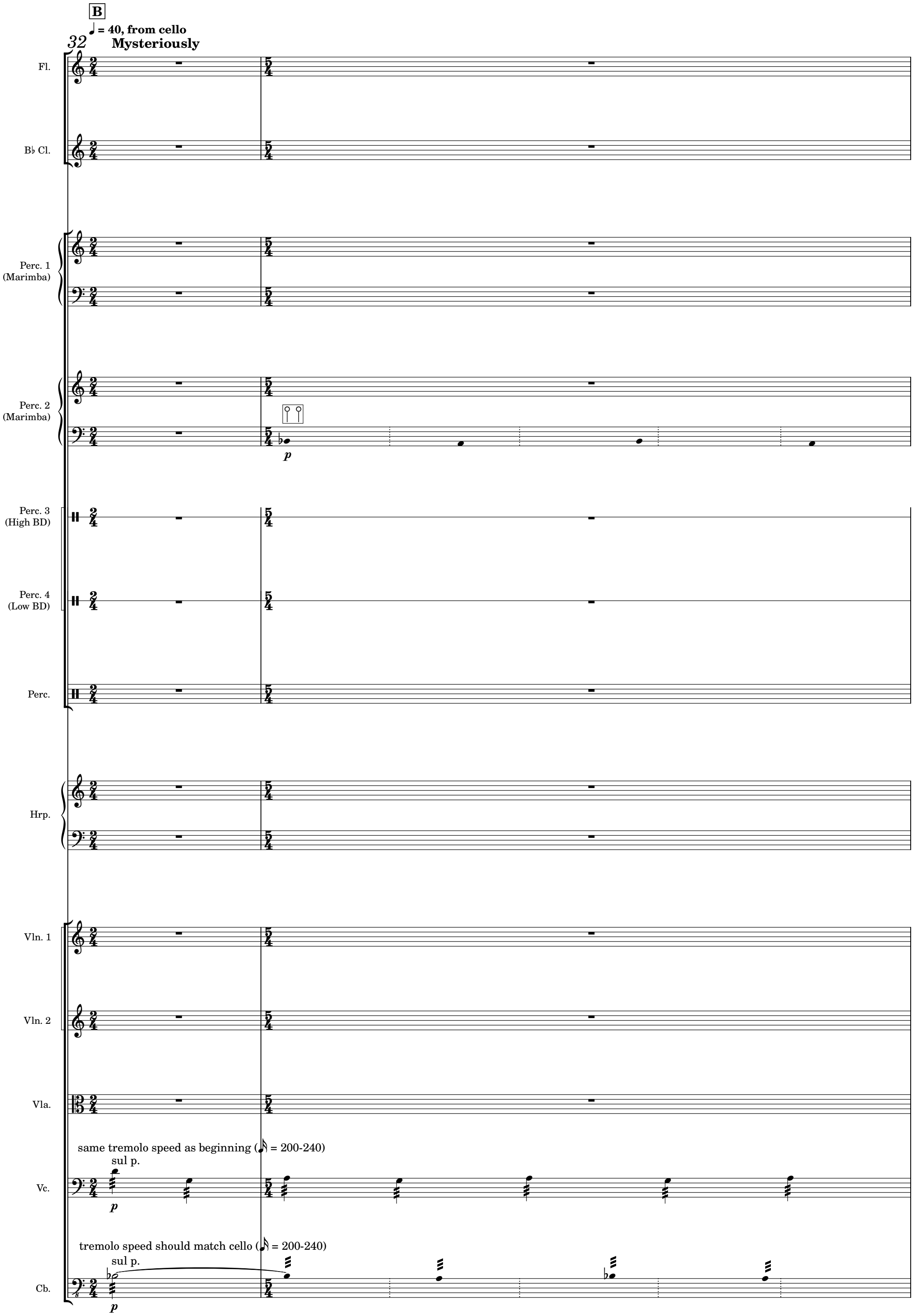

Brightly
9
♩ = 40
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
unmeasured roll, very fast
sul p.
sul t.
ord.
II
sul t.
tr
mf
pp
mp
sfpp
p
f
ppp

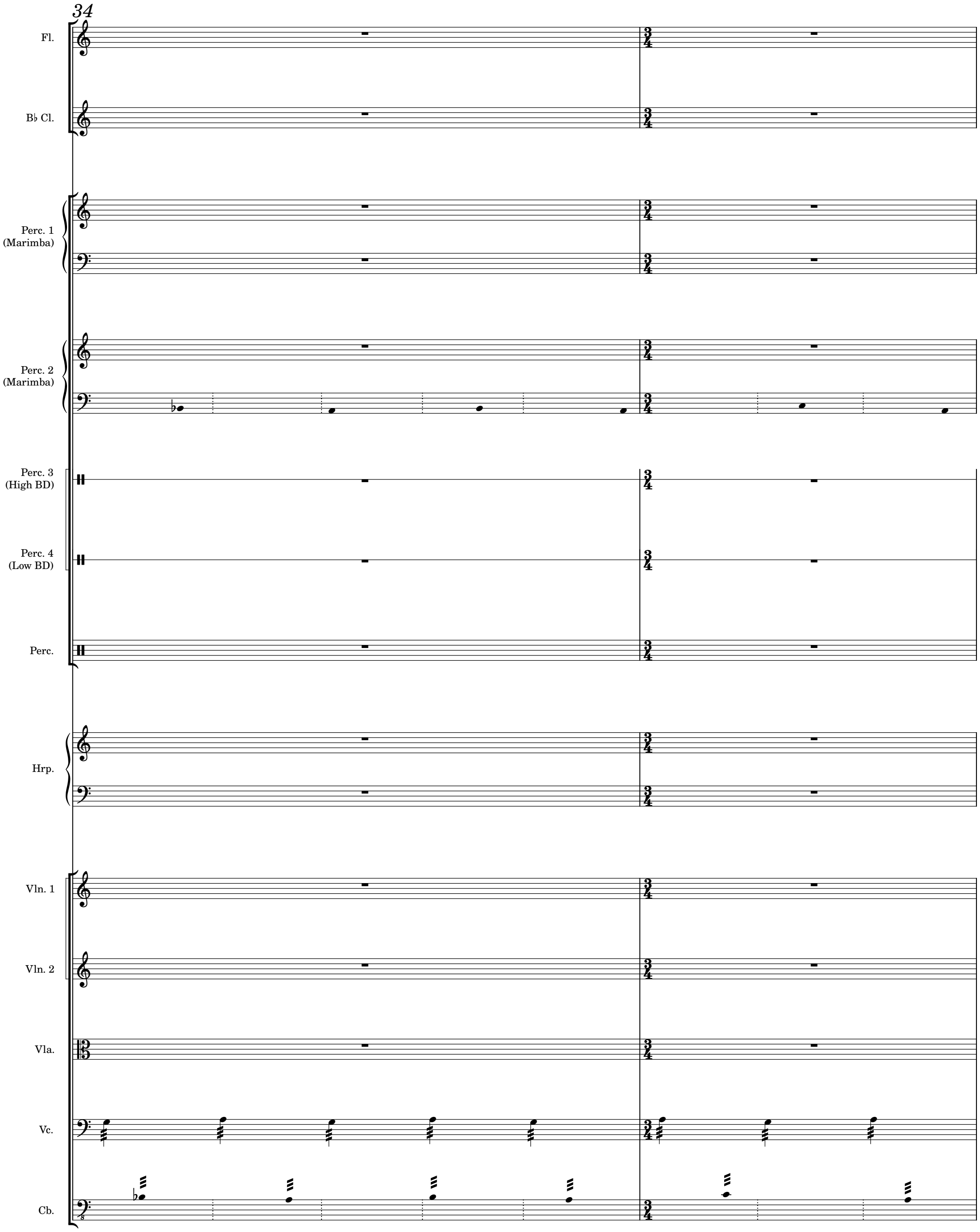

15
3 sec.
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
mp
pizz.
mf
ord.
3
f
pp
mf
ord.
p
mf

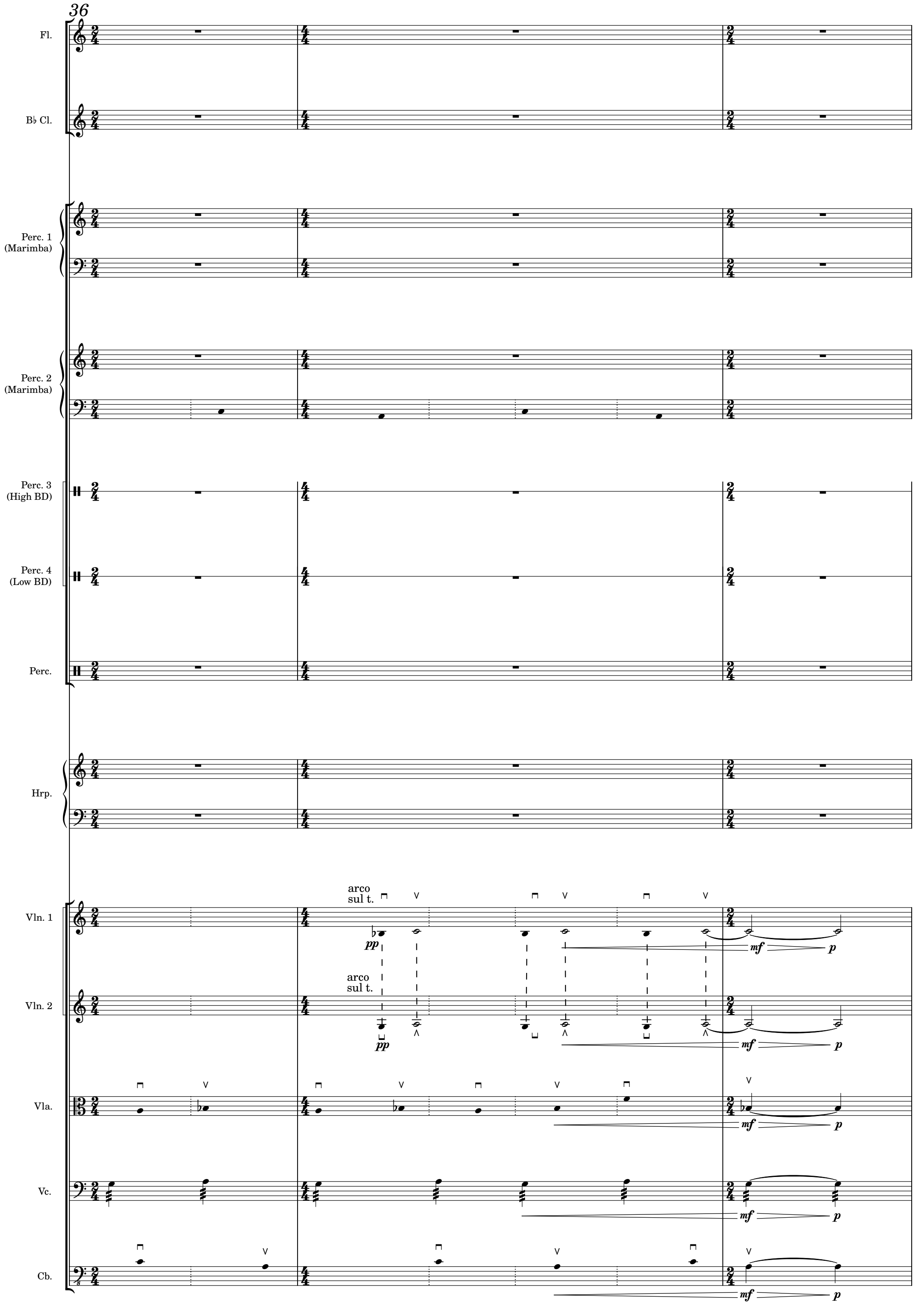

A
19
♩ = 40 Plaintively
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
D♯ C B♭ | E♭ F G♯ A
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
8va
sul t.
sul t.
arco
sul t.
ppp
pp
p
mf
f
3

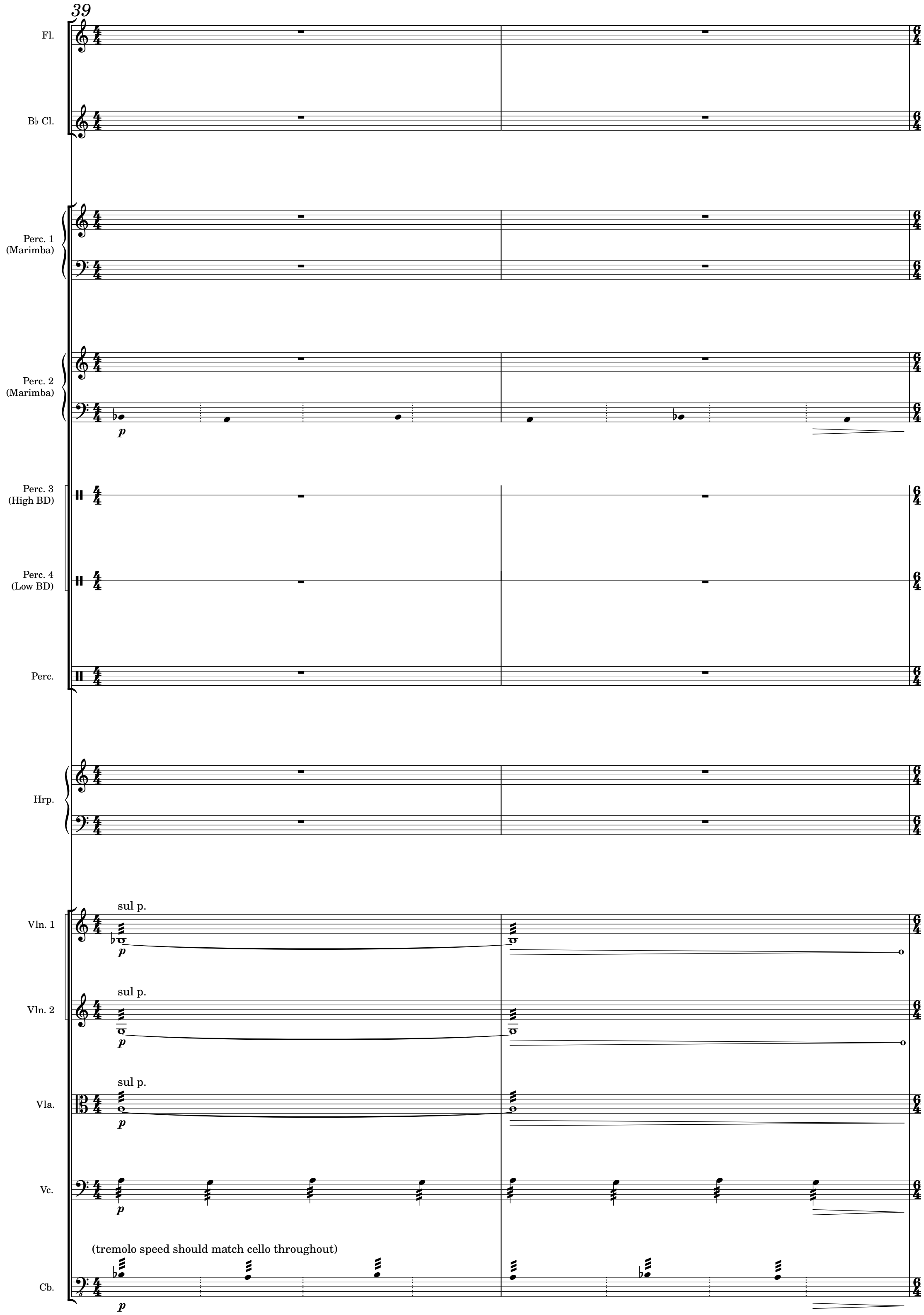

23
Animatedly
slow down
(♩= 20)
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
G♮
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
8va
ord.
sul t.
p
pp
mf
mp
f

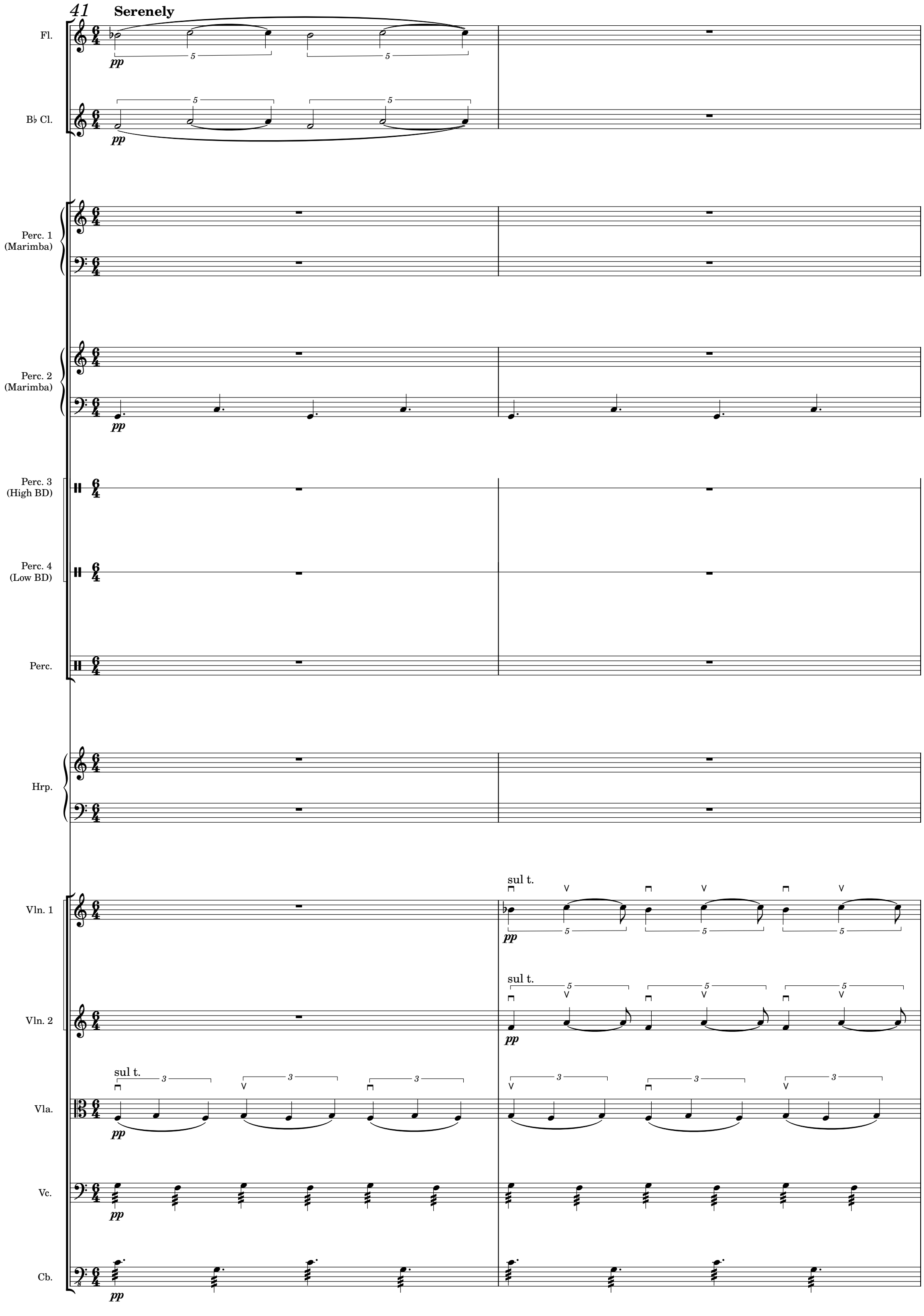

28
10 sec.
4 sec.
♩ = 40
Fl.
B♭ Cl.
mf
8va
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
f
pp
f
mf
Vc.
f
f
mp
pp
o
same tremolo speed as beginning
sul p.
Cb.
pp
o

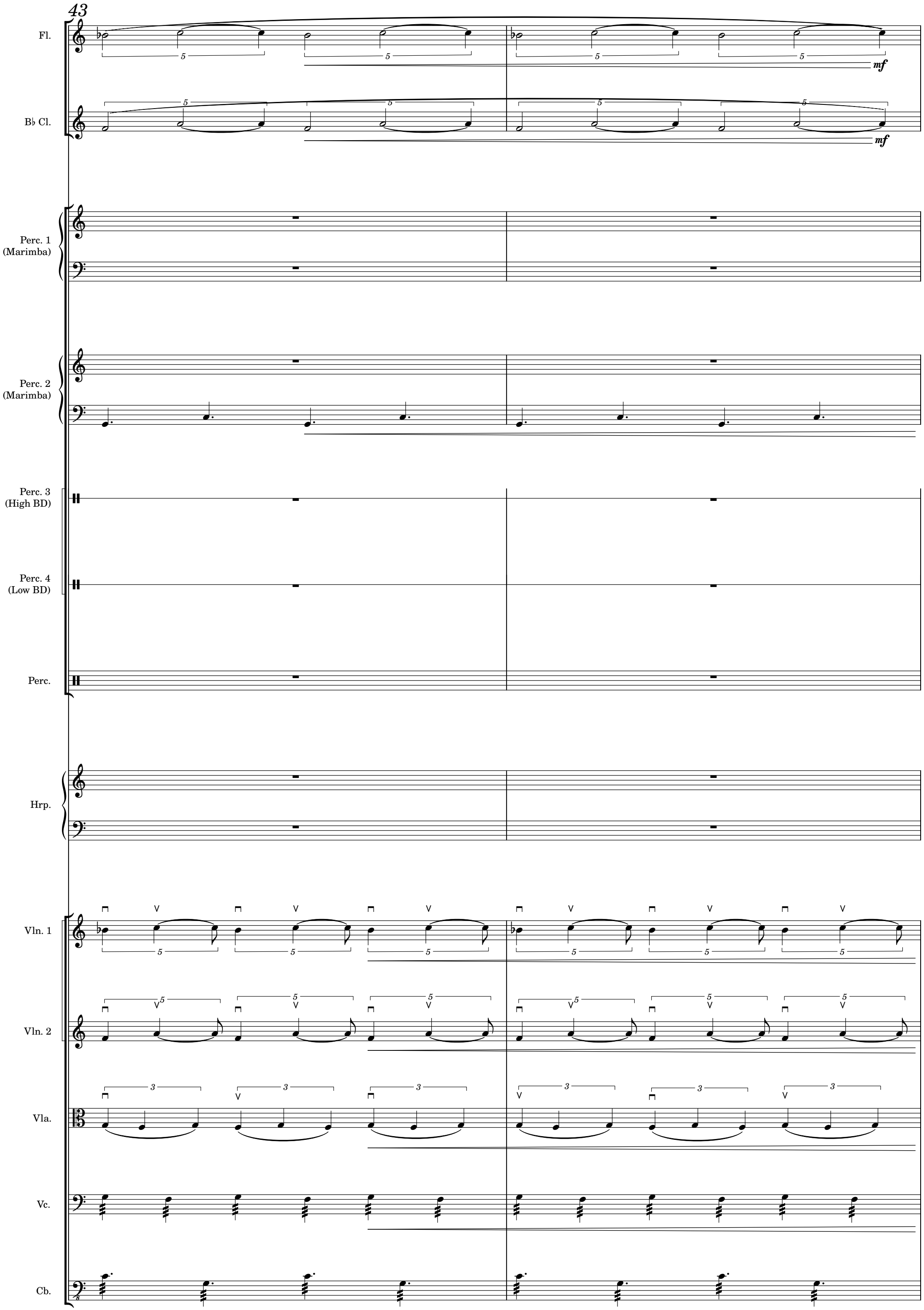
B
♩ = 40, from cello
32
Mysteriously
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
p
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
same tremolo speed as beginning (𝅘𝅥𝅮 = 200-240)
sul p.
p
Vc.
tremolo speed should match cello (𝅘𝅥𝅮 = 200-240)
sul p.
p
Cb.

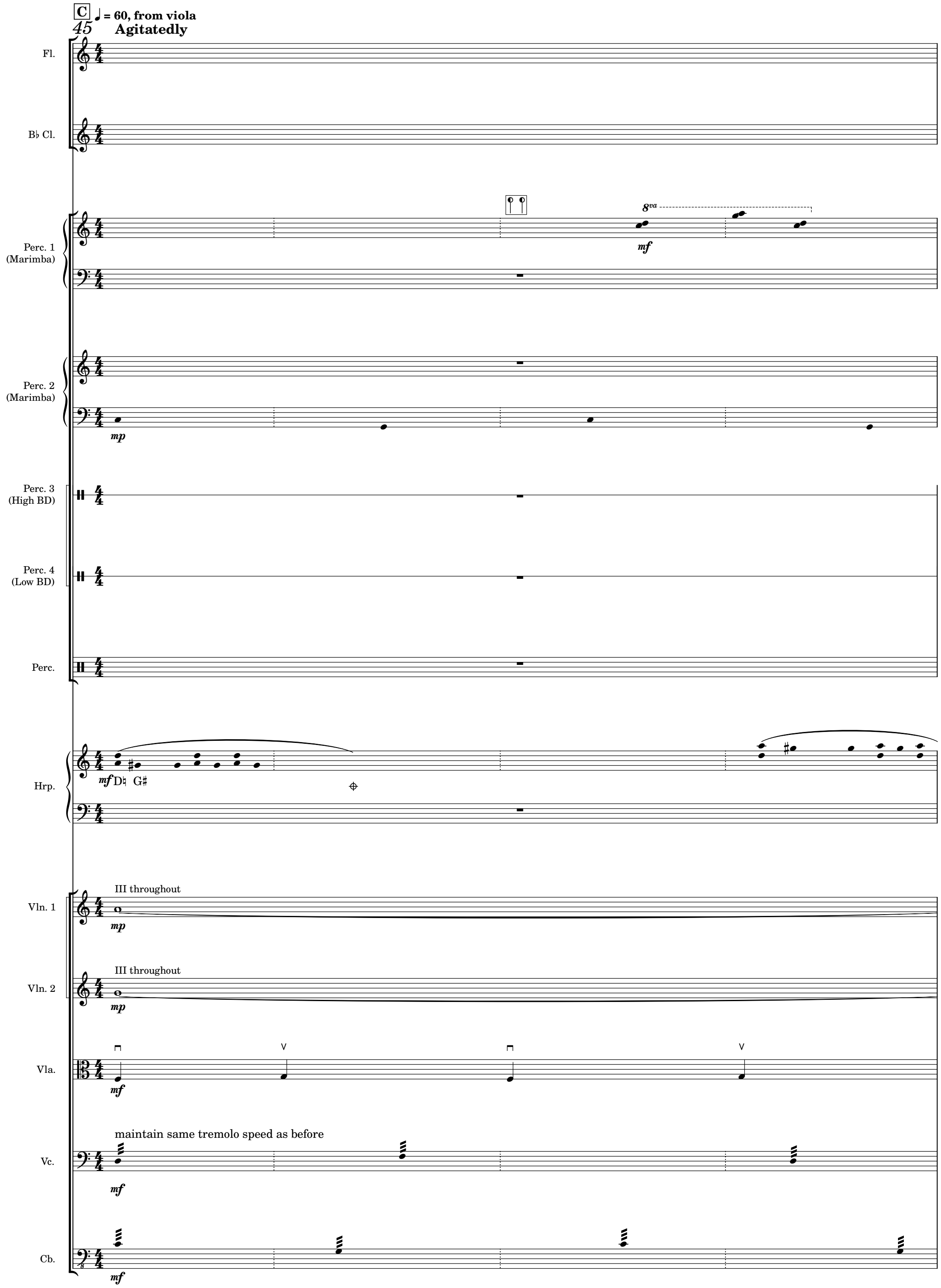

34
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

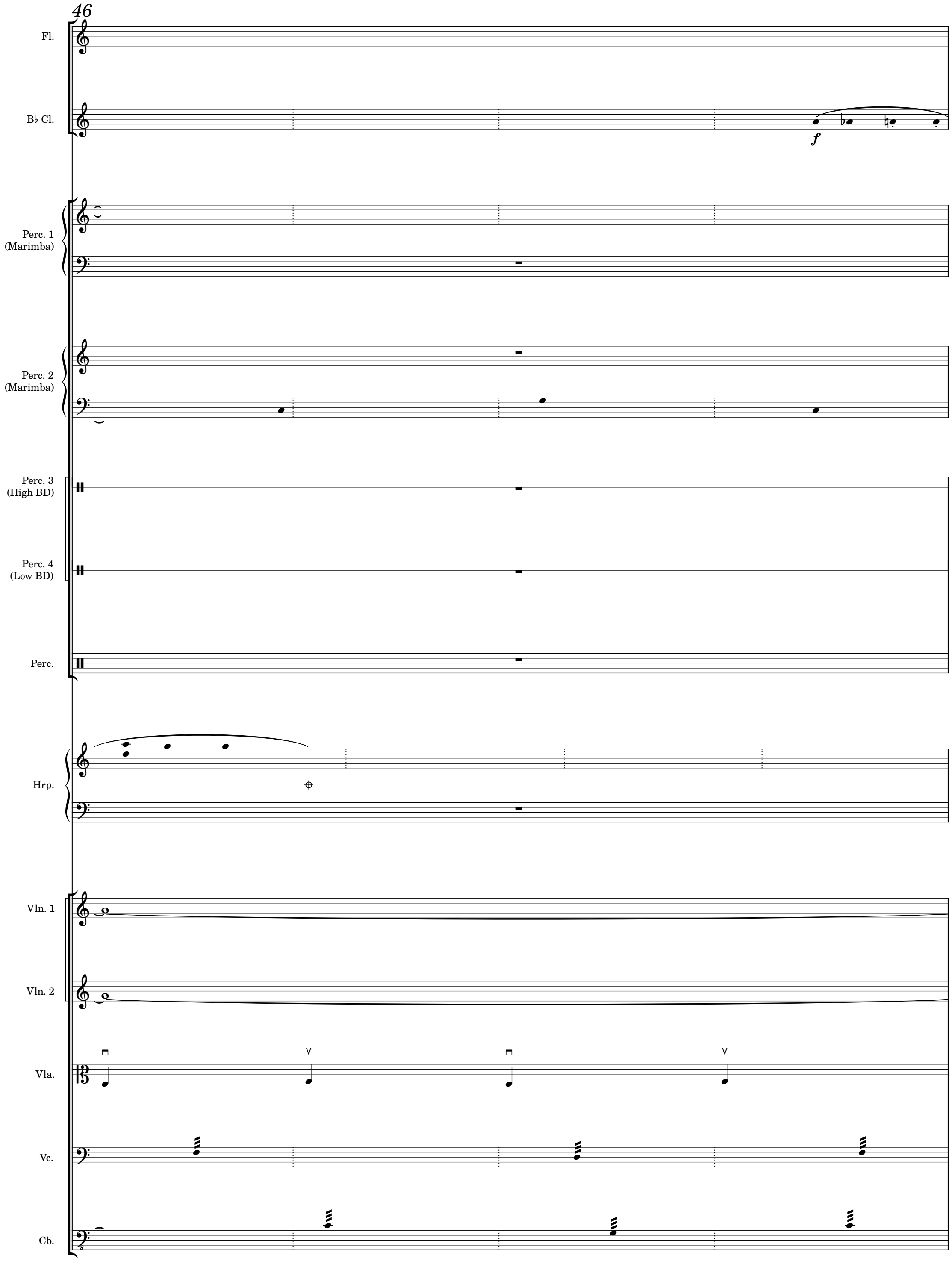

36
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
arco sul t.
arco sul t.
pp
pp
mf
p

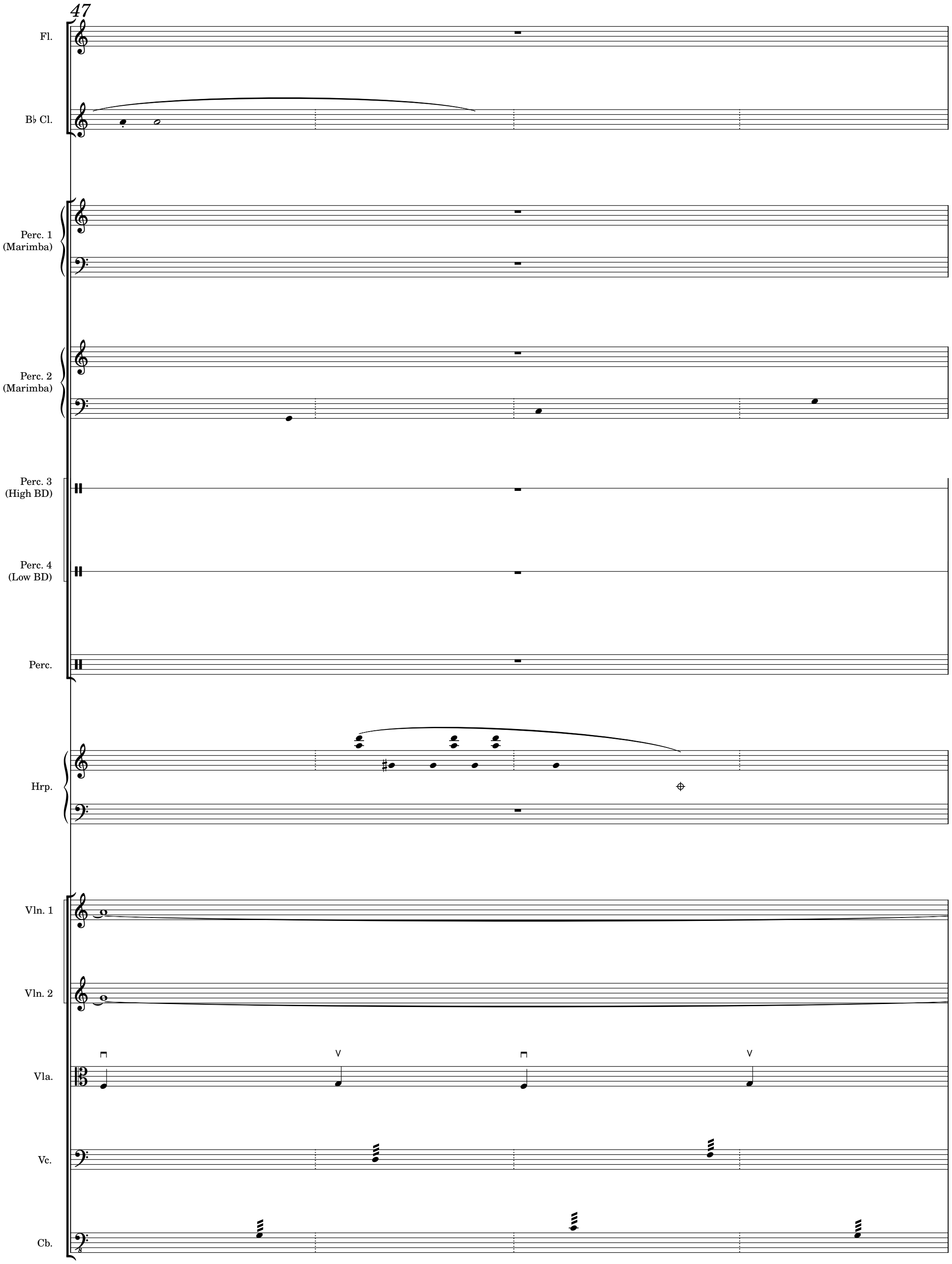

39
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
p
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
sul p.
p
Vln. 2
sul p.
p
Vla.
sul p.
p
Vc.
p
Cb.
(tremolo speed should match cello throughout)
p

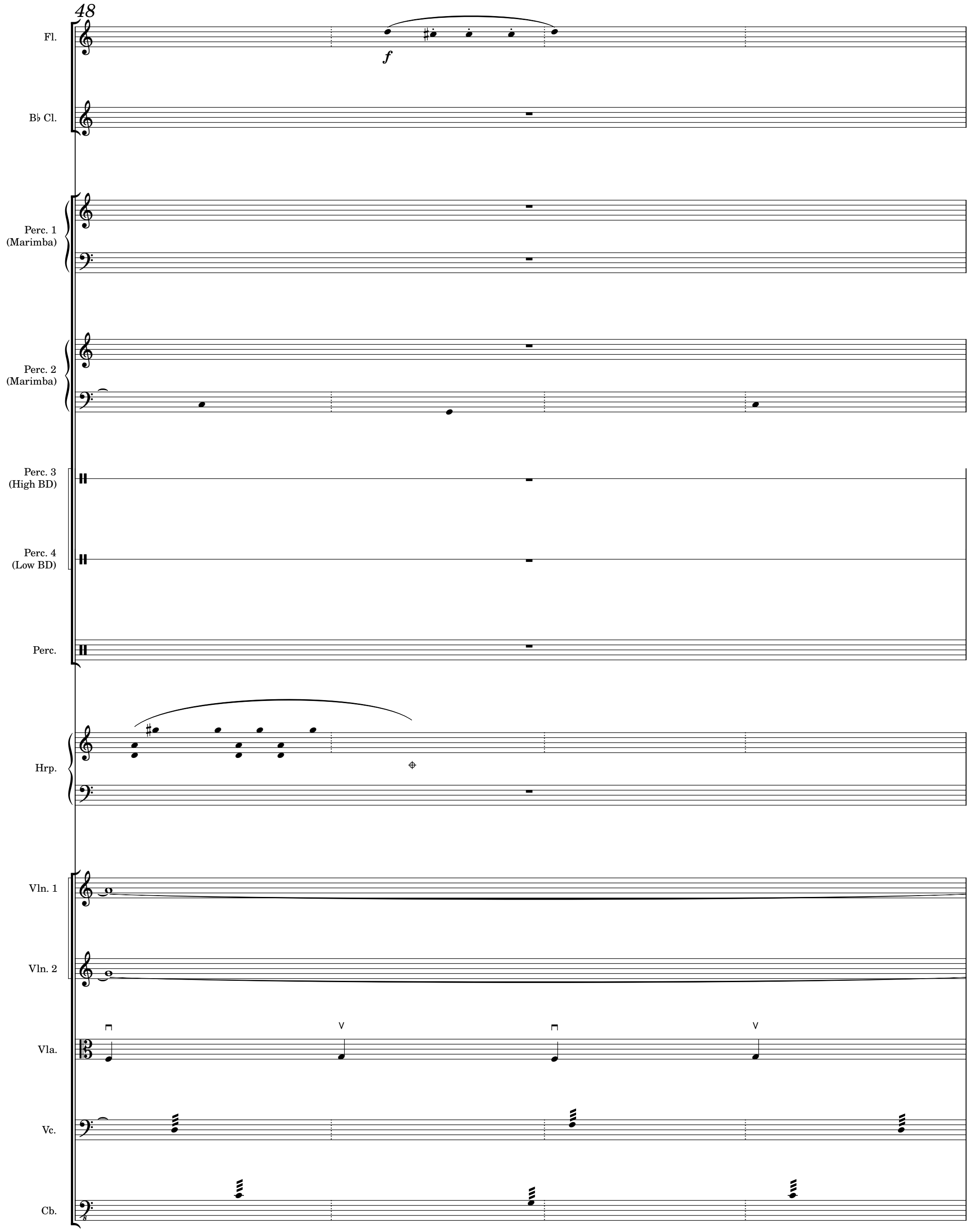

41
Serenely
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
sul t.
5
3

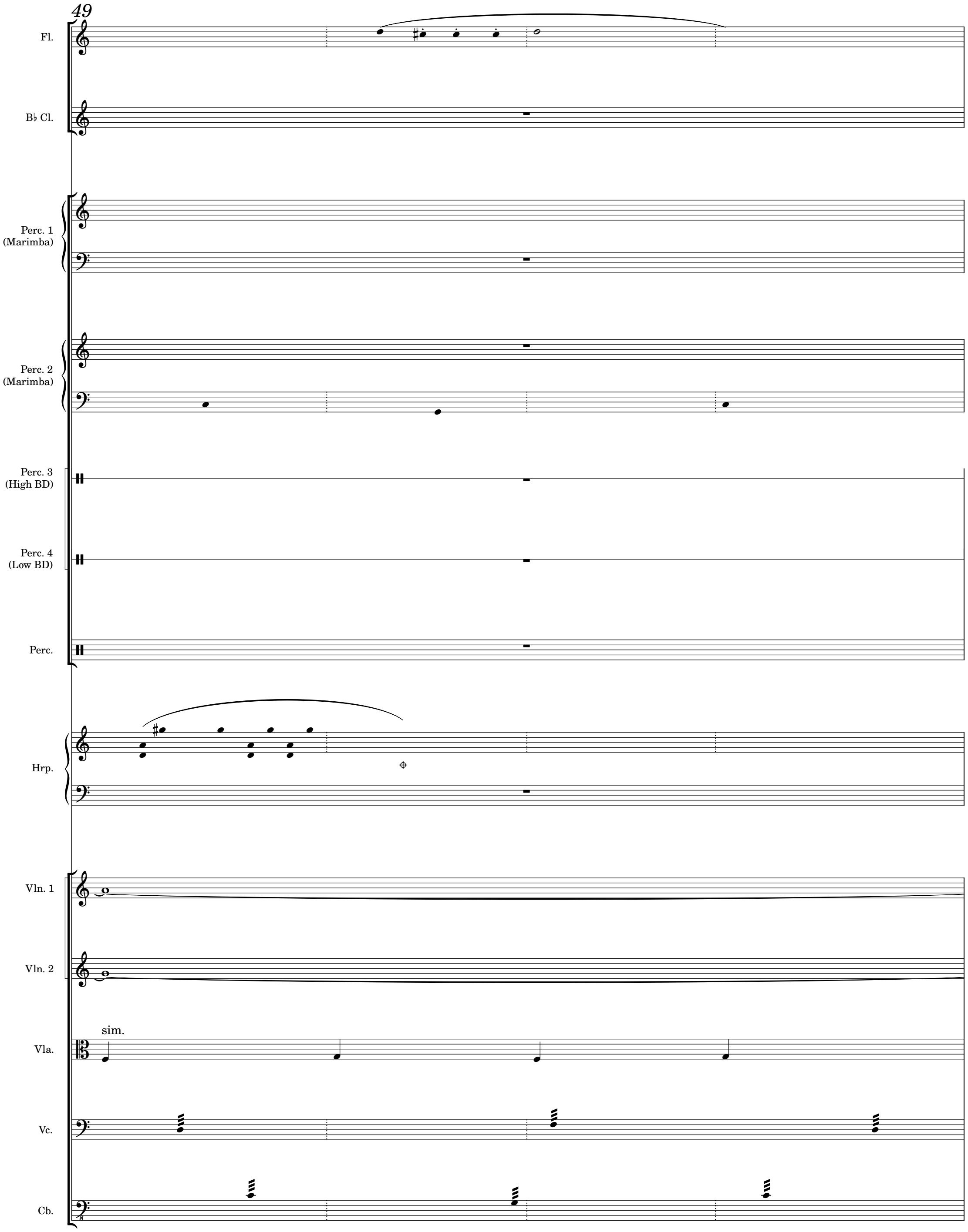

43
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
5
3
mf

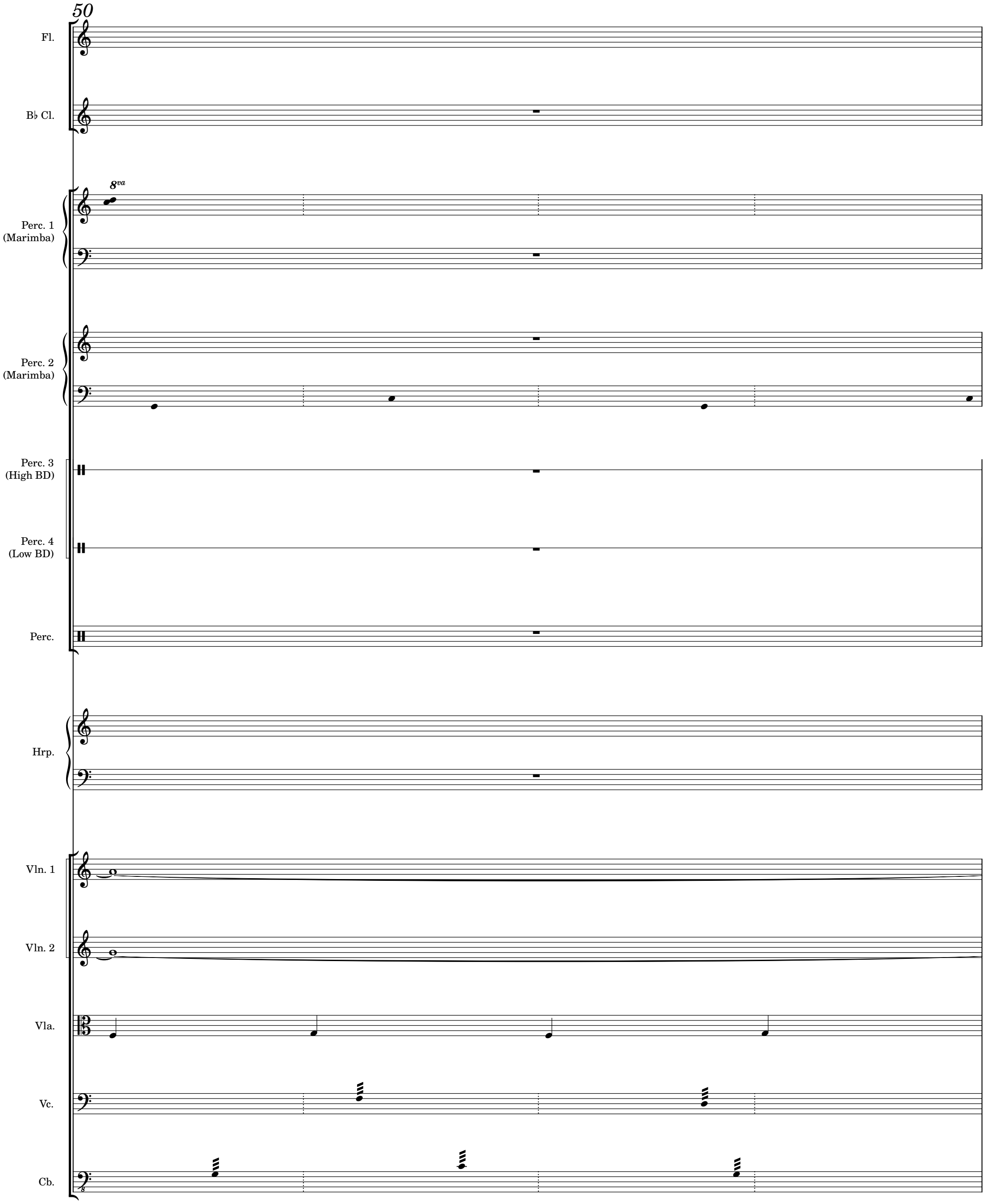

C
♩ = 60, from viola
45
Agitatedly
Fl.
B♭ Cl.
Perc. 1
(Marimba)
8va
mf
Perc. 2
(Marimba)
mp
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
mf
D♮ G♯
Vln. 1
III throughout
mp
Vln. 2
III throughout
mp
Vla.
mf
Vc.
maintain same tremolo speed as before
mf
Cb.
mf

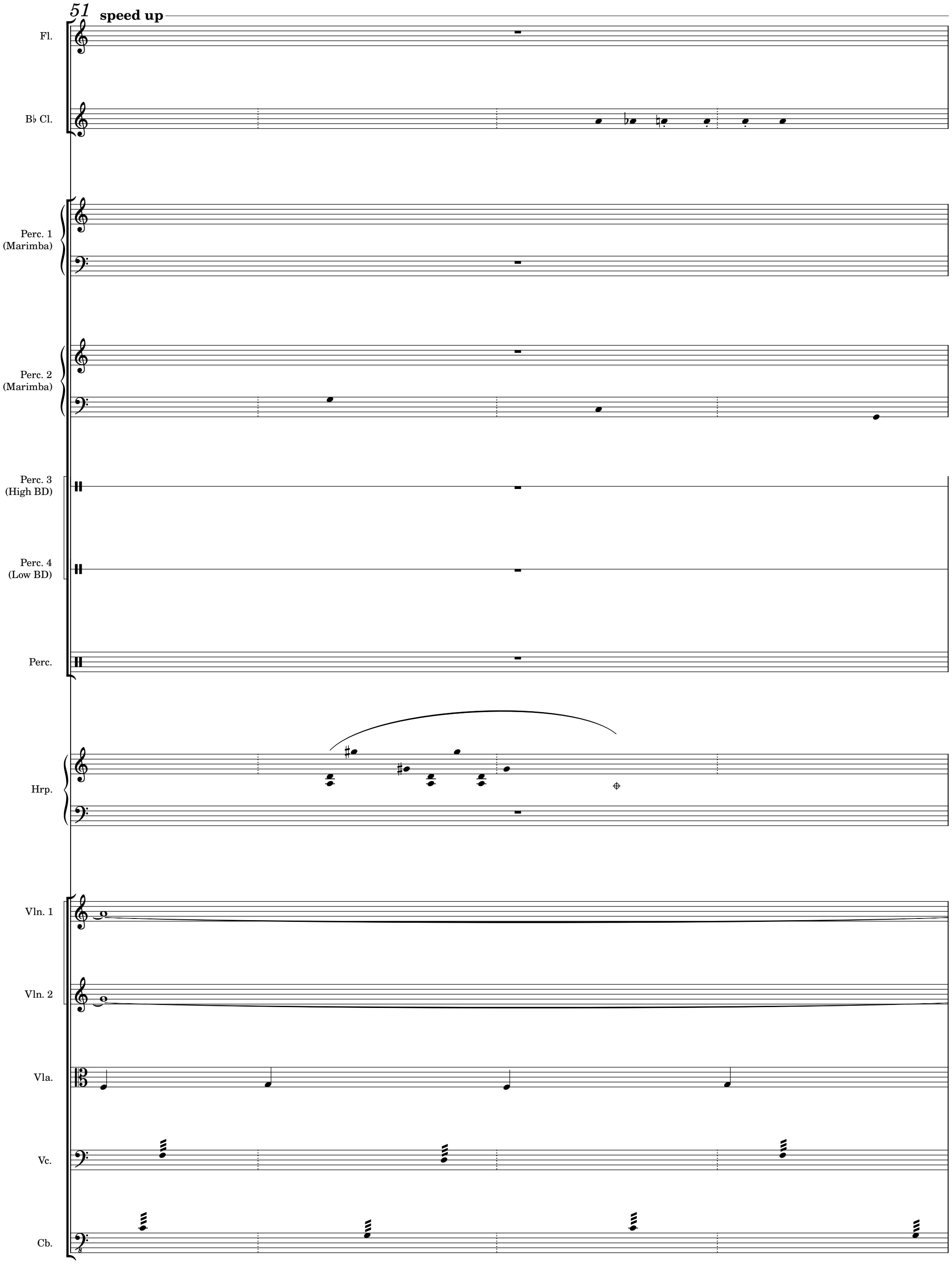

46
Fl.
B♭ Cl.
f
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

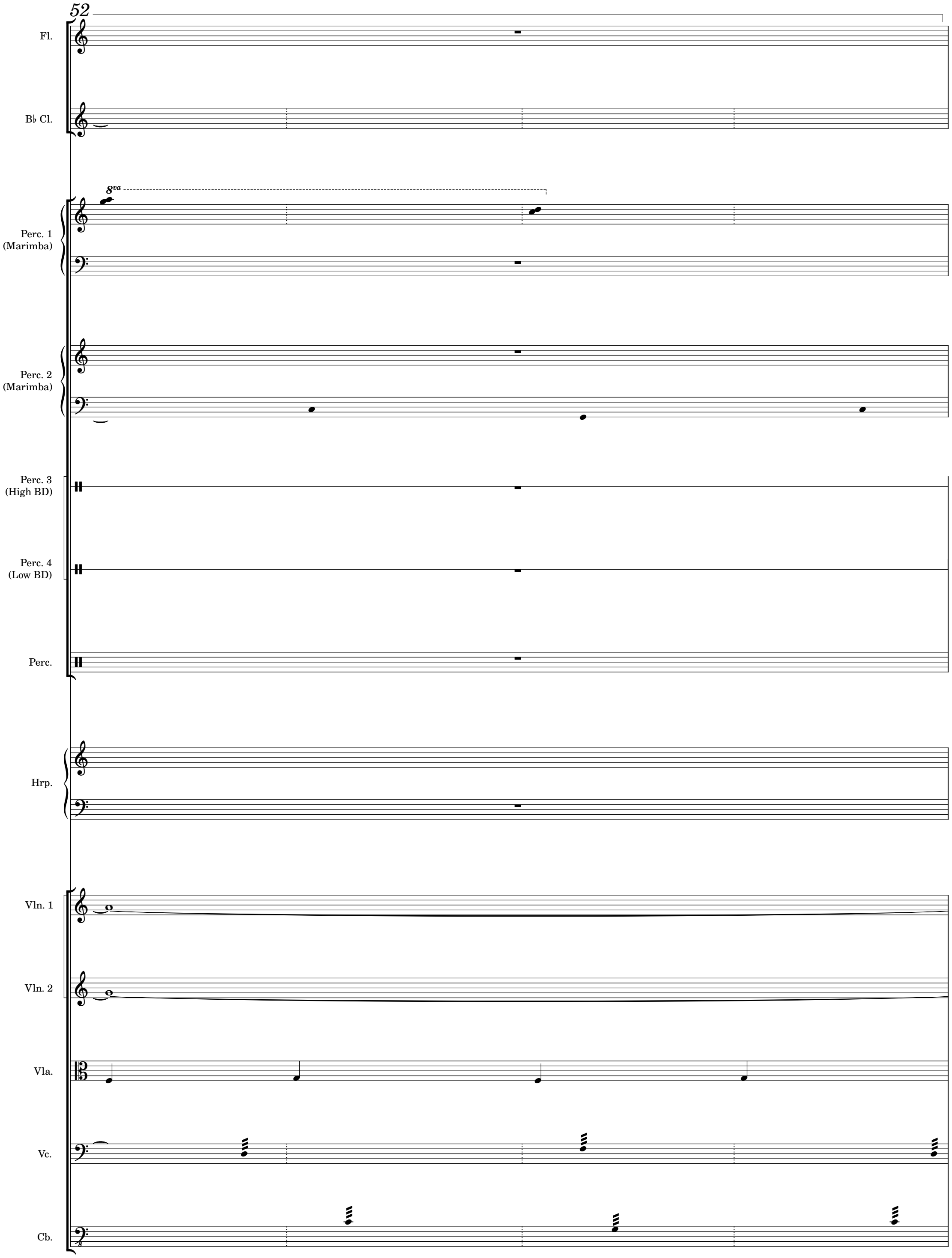

47
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

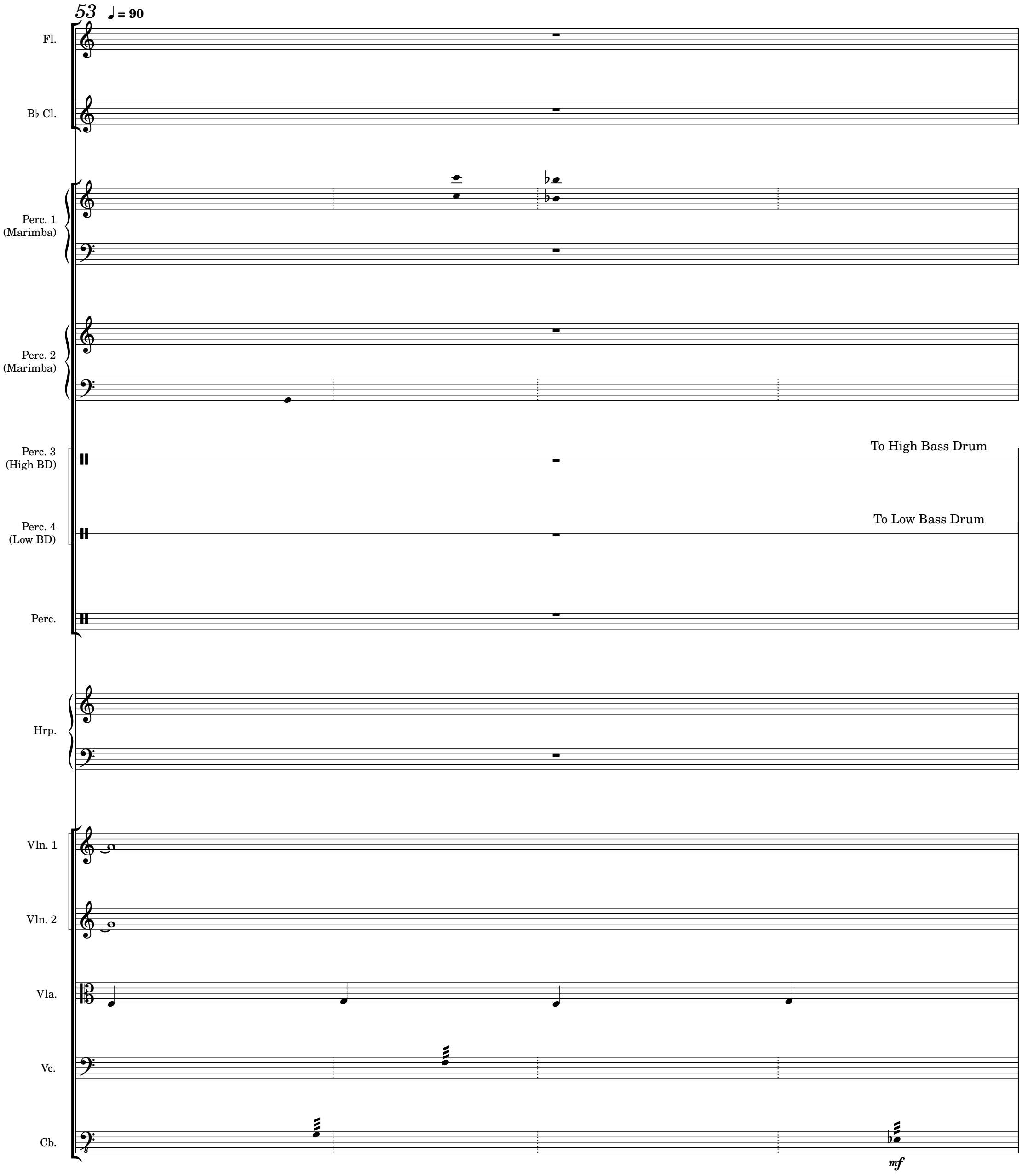

48
Fl.
f
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

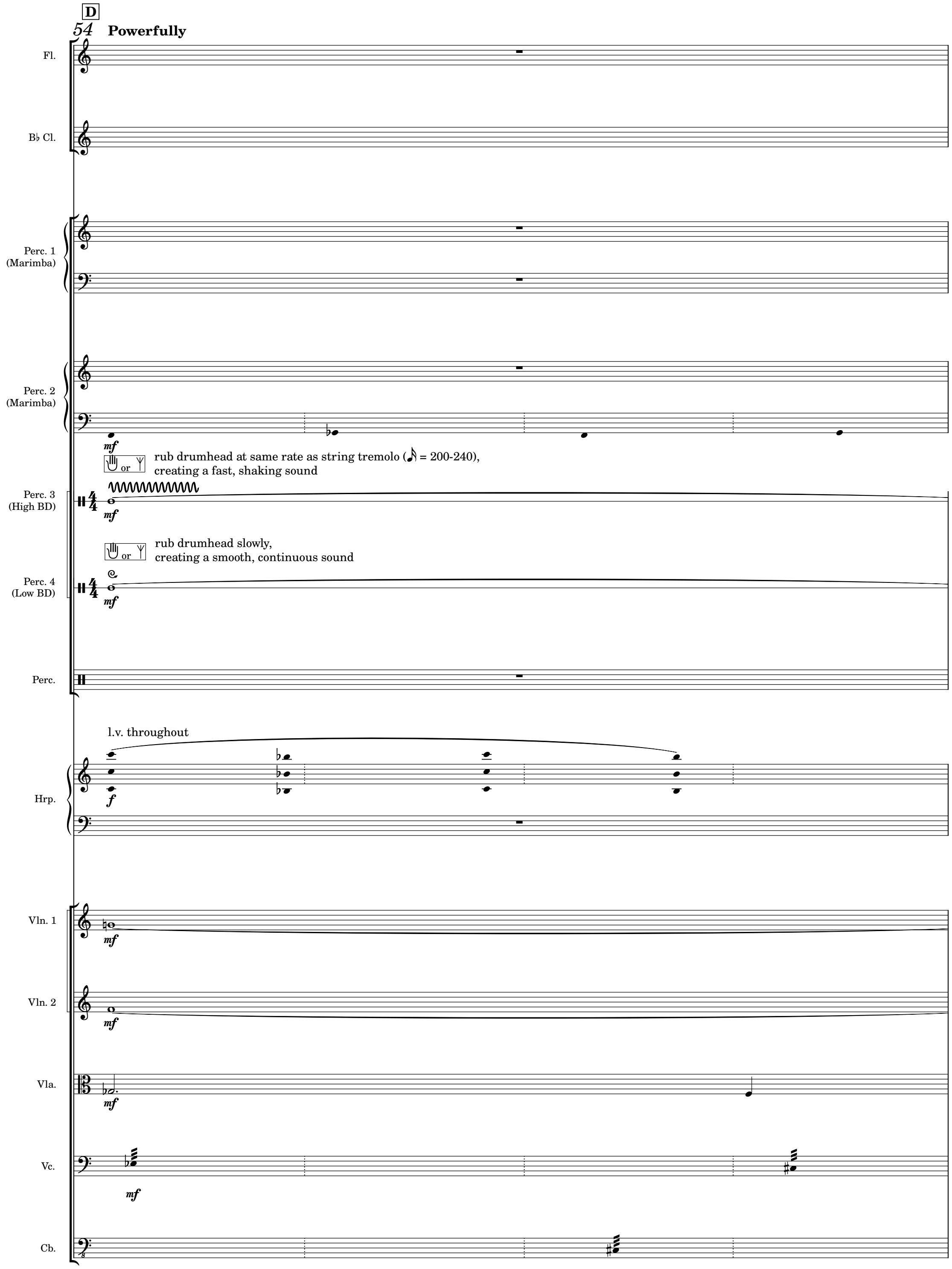

49
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
sim.
Vla.
Vc.
Cb.

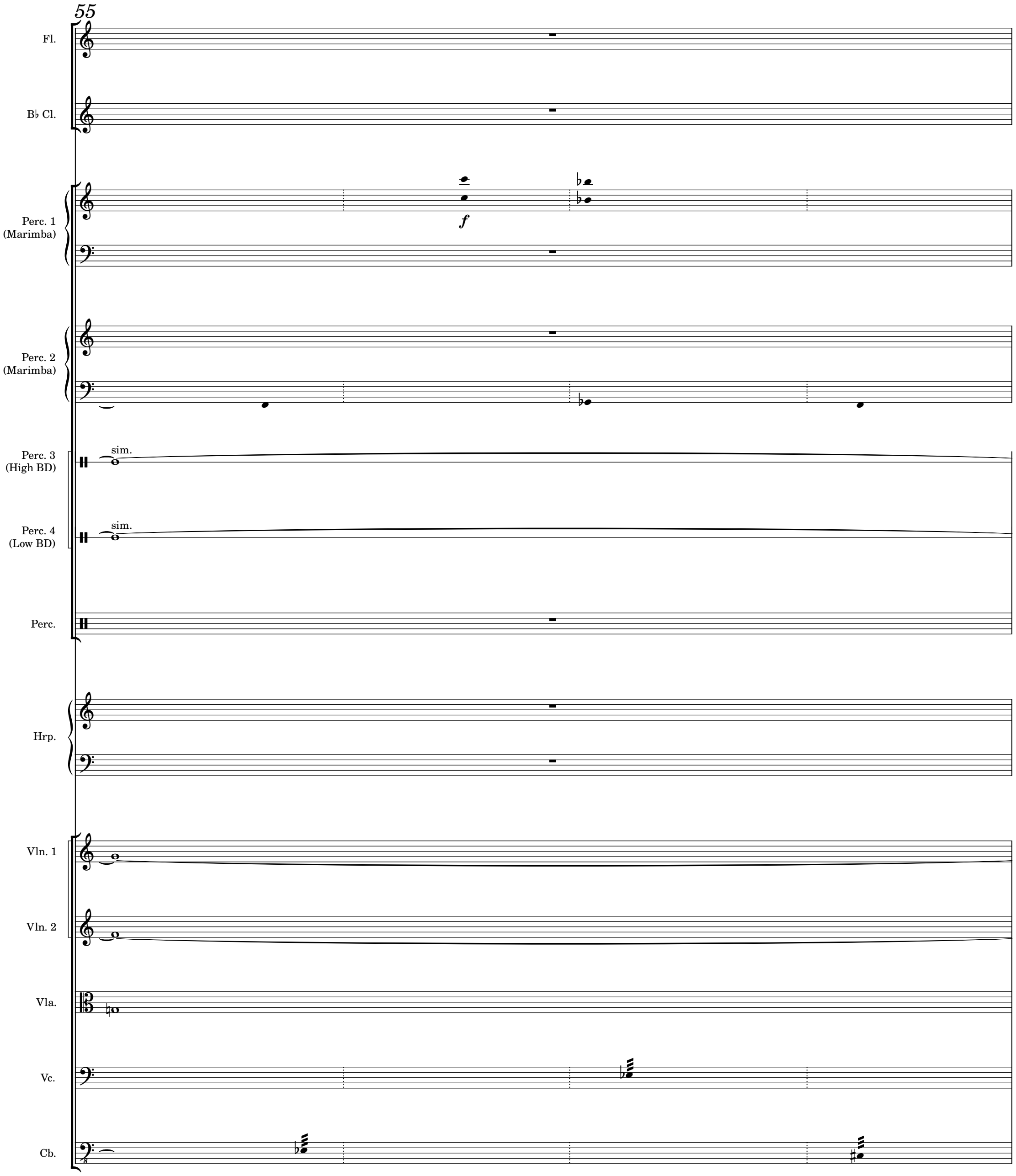

50
Fl.
B♭ Cl.
8va
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

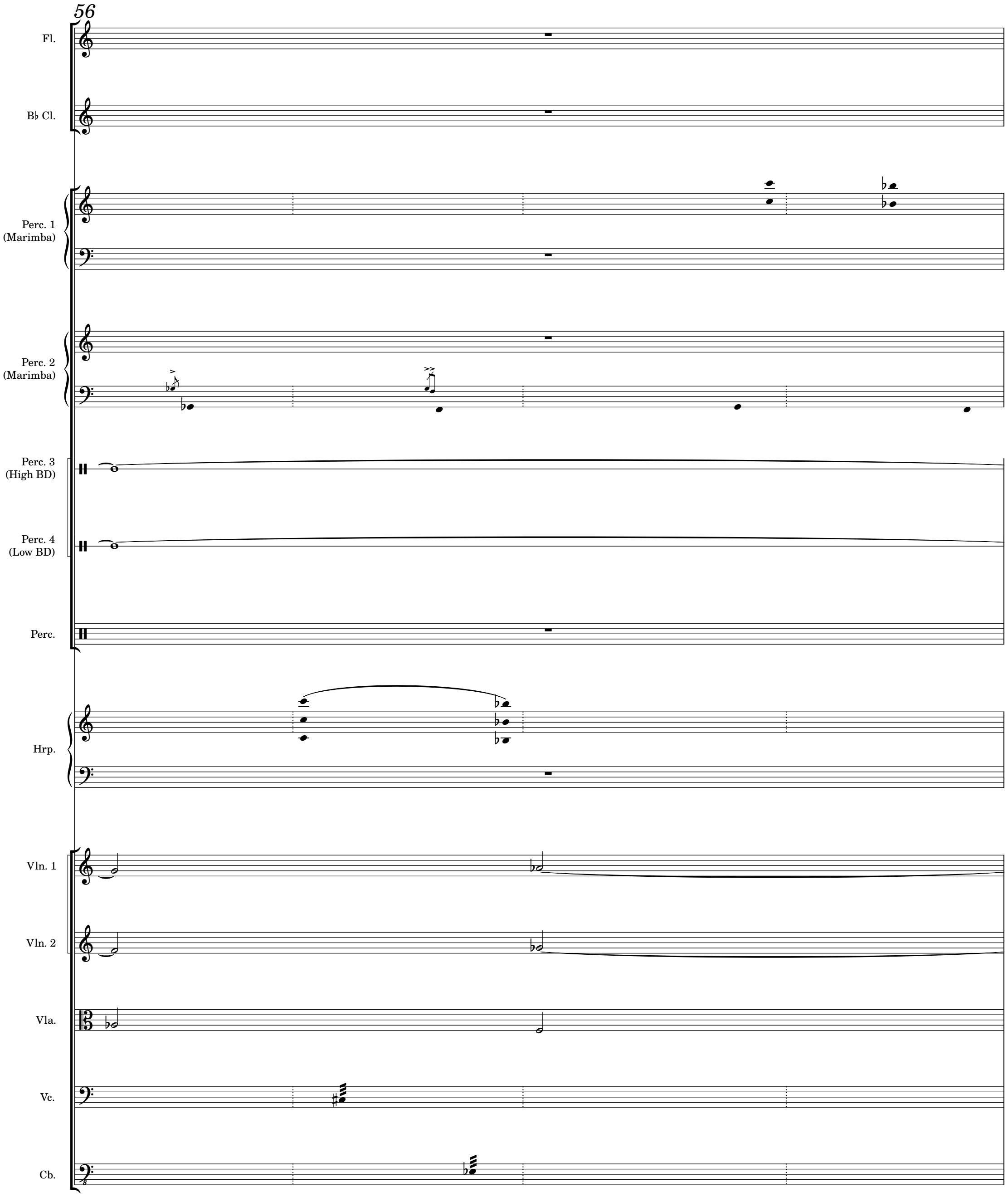

51
speed up
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

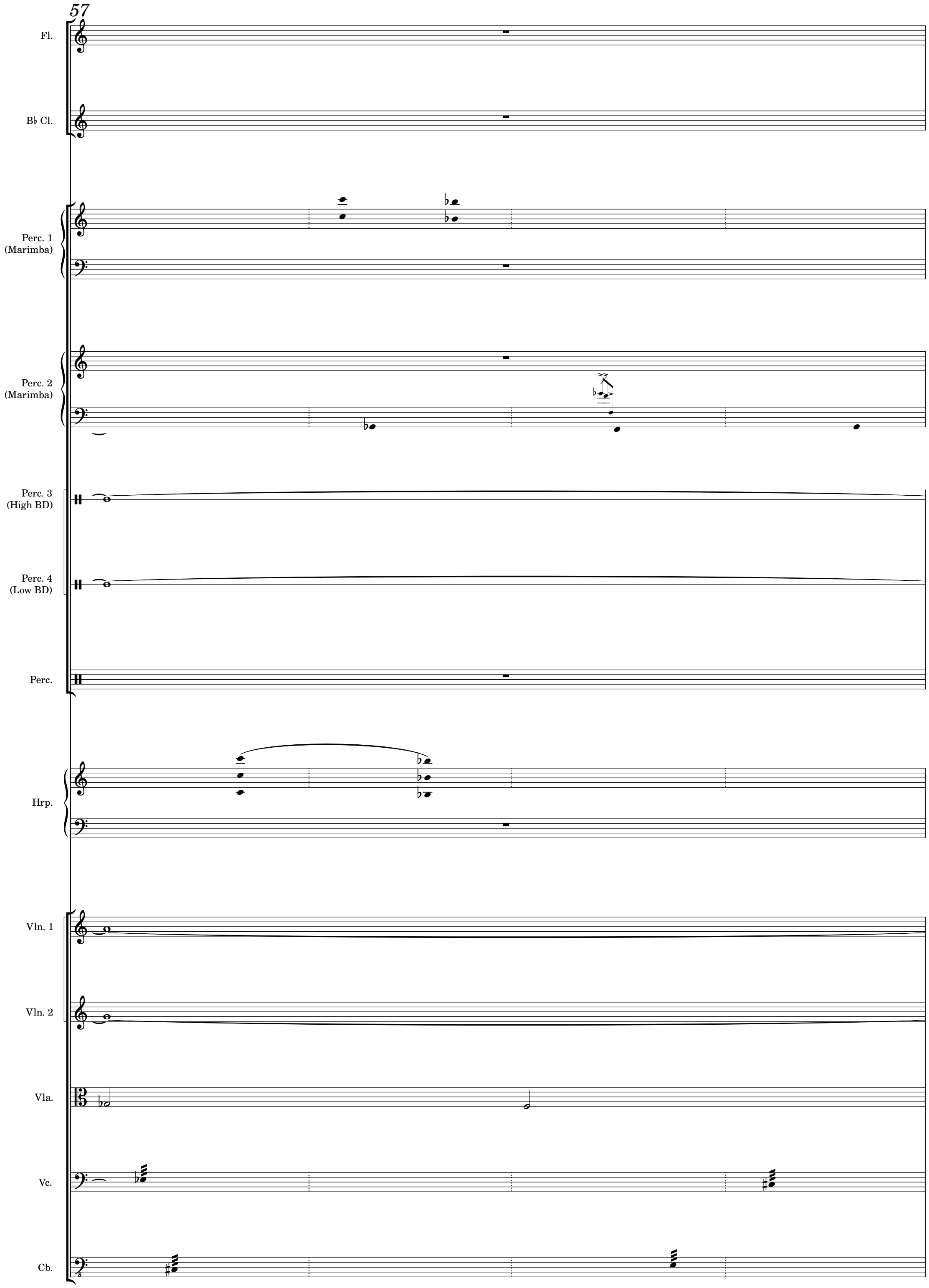

52
Fl.
B♭ Cl.
8va
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

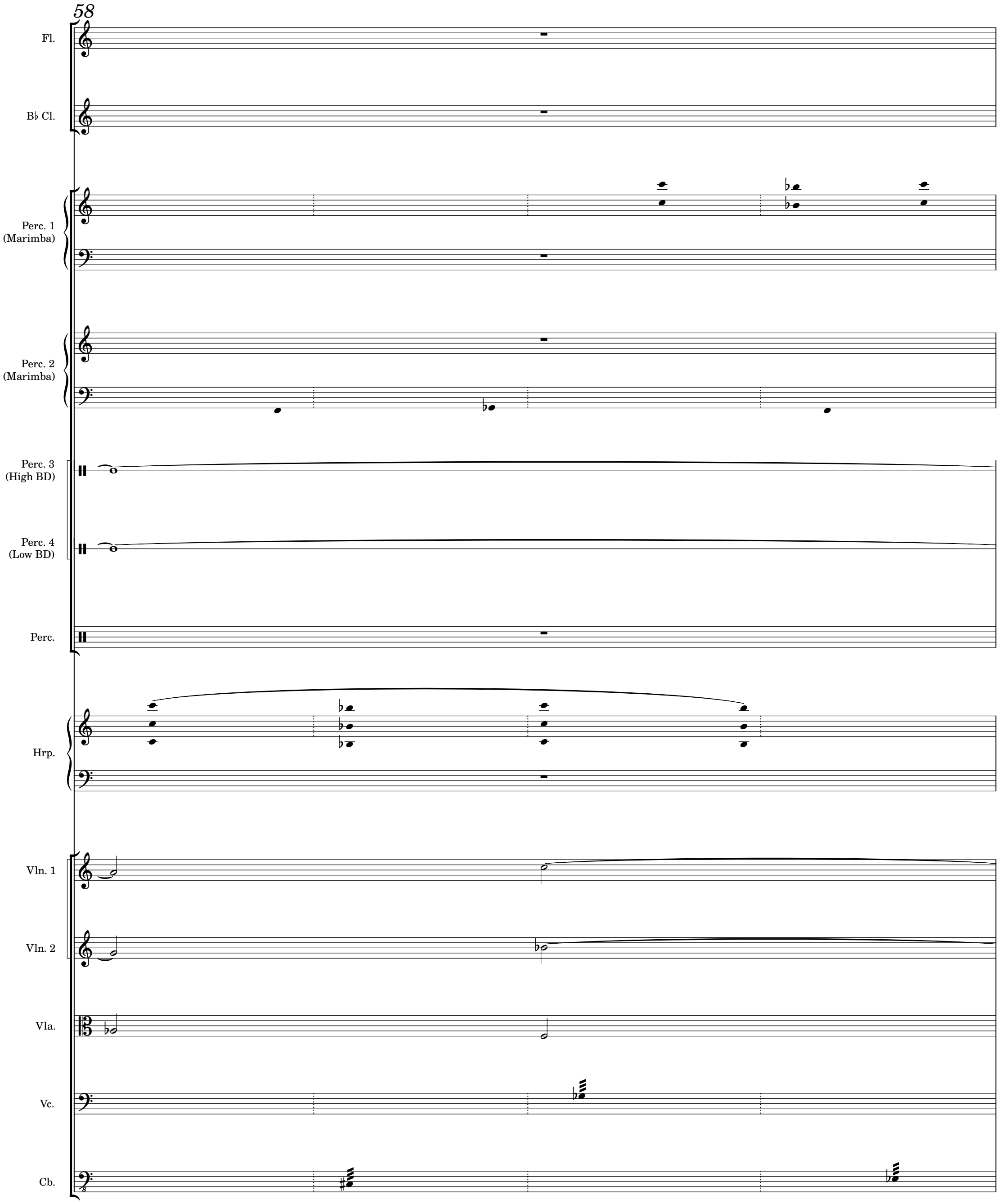

53
♩ = 90
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
To High Bass Drum
Perc. 4
(Low BD)
To Low Bass Drum
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf

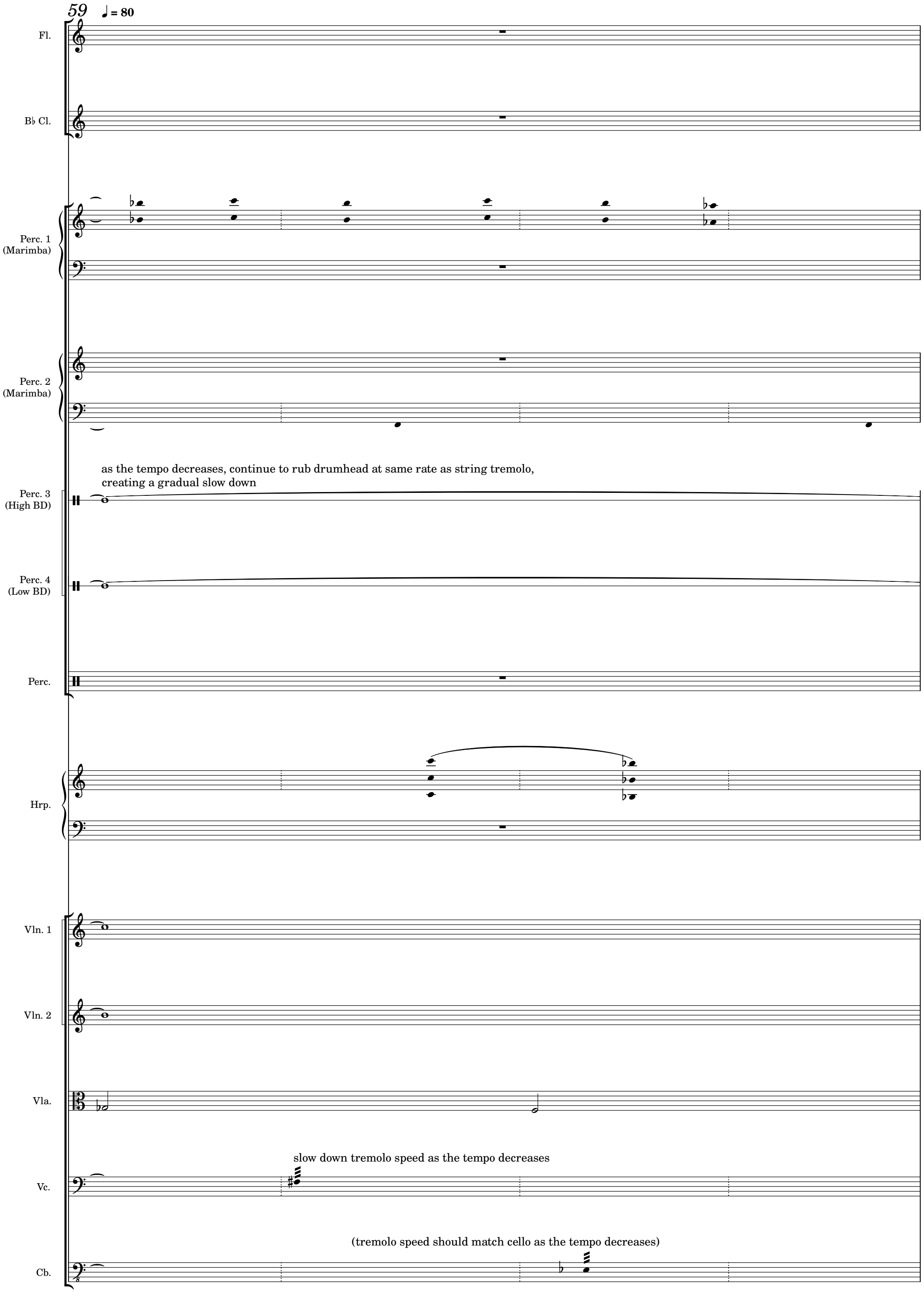

D
54
Powerfully
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
mf
or
rub drumhead at same rate as string tremolo (♪ = 200-240), creating a fast, shaking sound
Perc. 3 (High BD)
mf
or
rub drumhead slowly, creating a smooth, continuous sound
Perc. 4 (Low BD)
mf
Perc.
l.v. throughout
f
Hrp.
Vln. 1
mf
Vln. 2
mf
Vla.
mf
Vc.
mf
Cb.

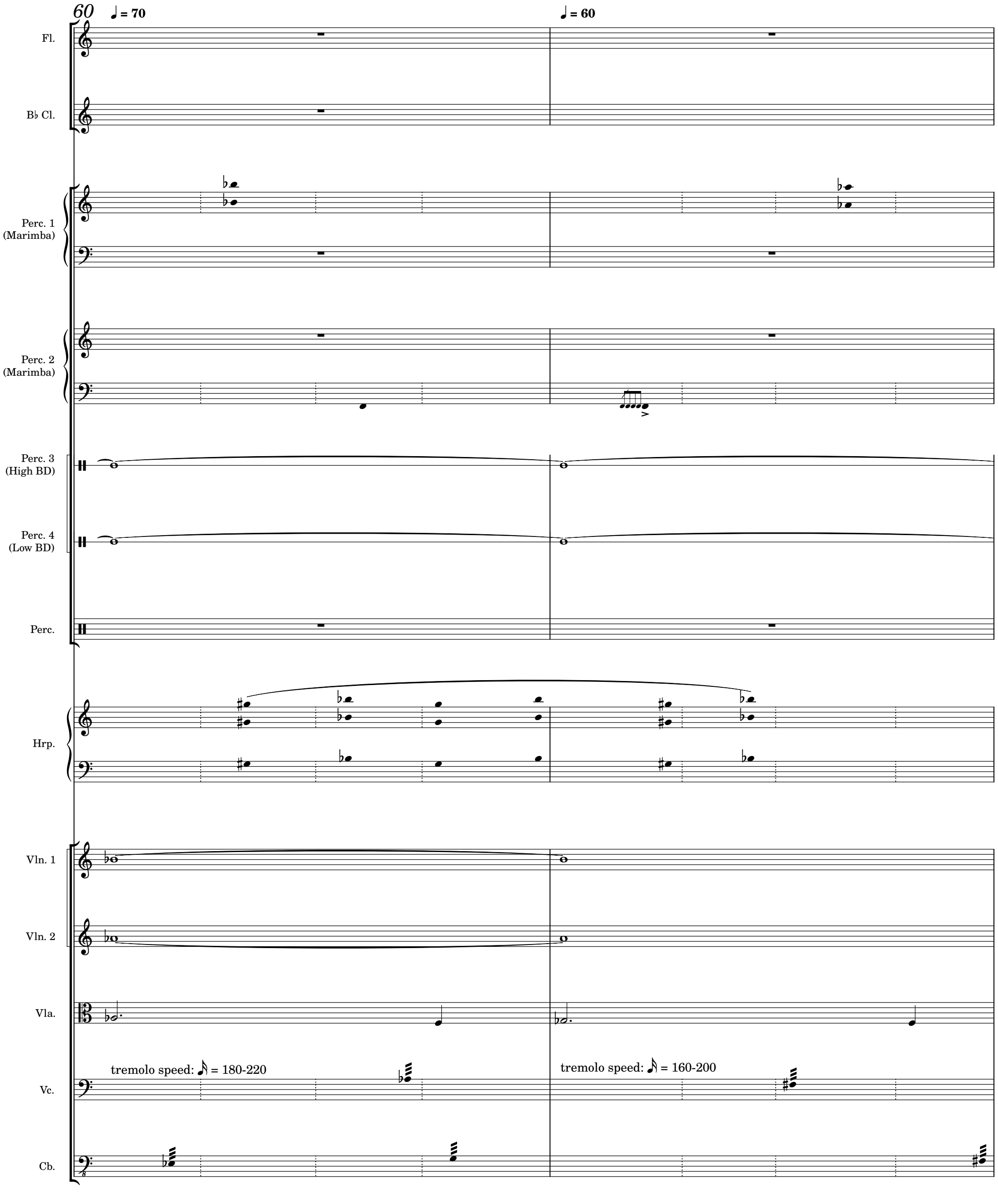

55
Fl.
B♭ Cl.
Perc. 1 (Marimba)
f
Perc. 2 (Marimba)
Perc. 3 (High BD)
sim.
Perc. 4 (Low BD)
sim.
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

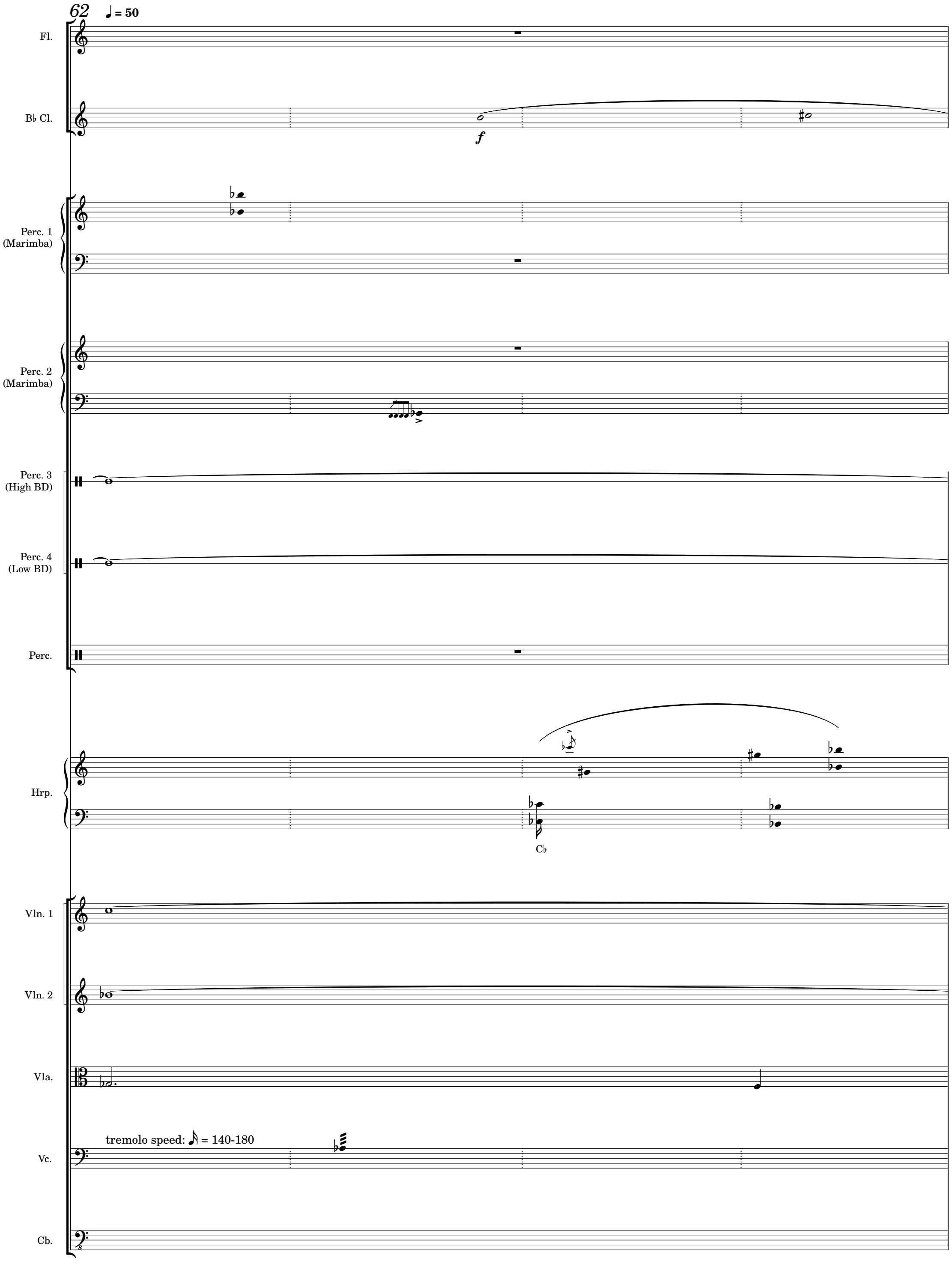

56
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

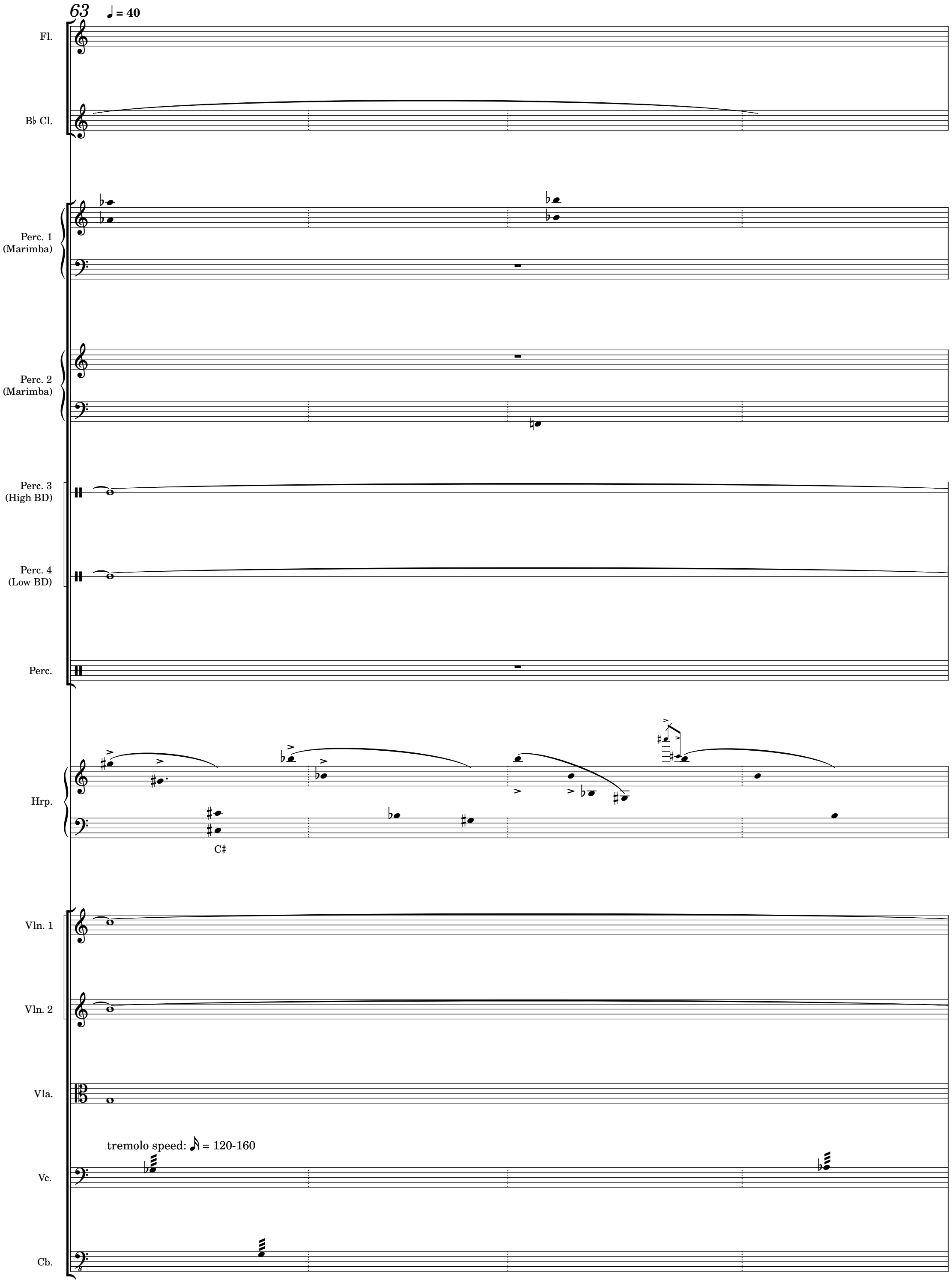

57
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

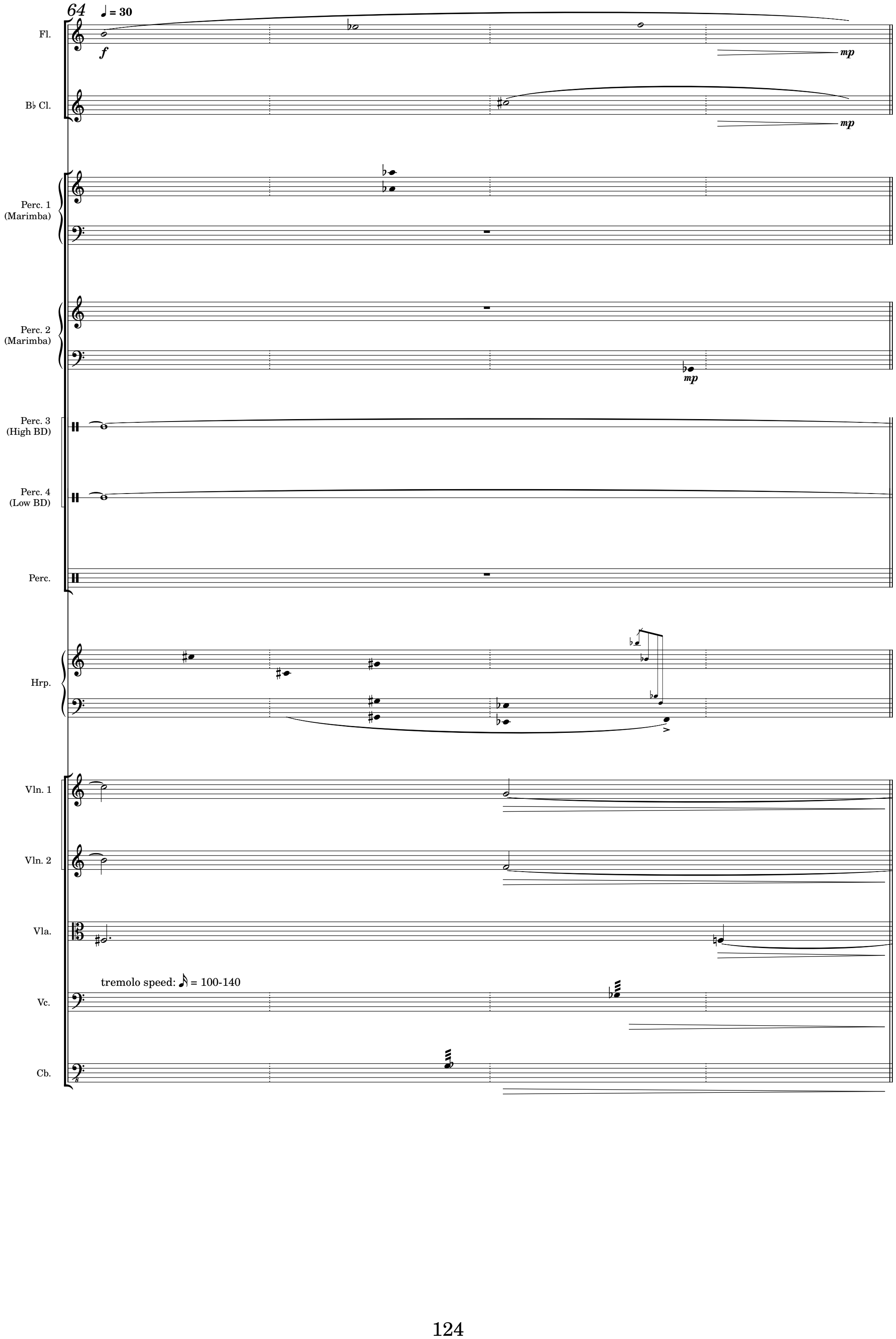

58
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

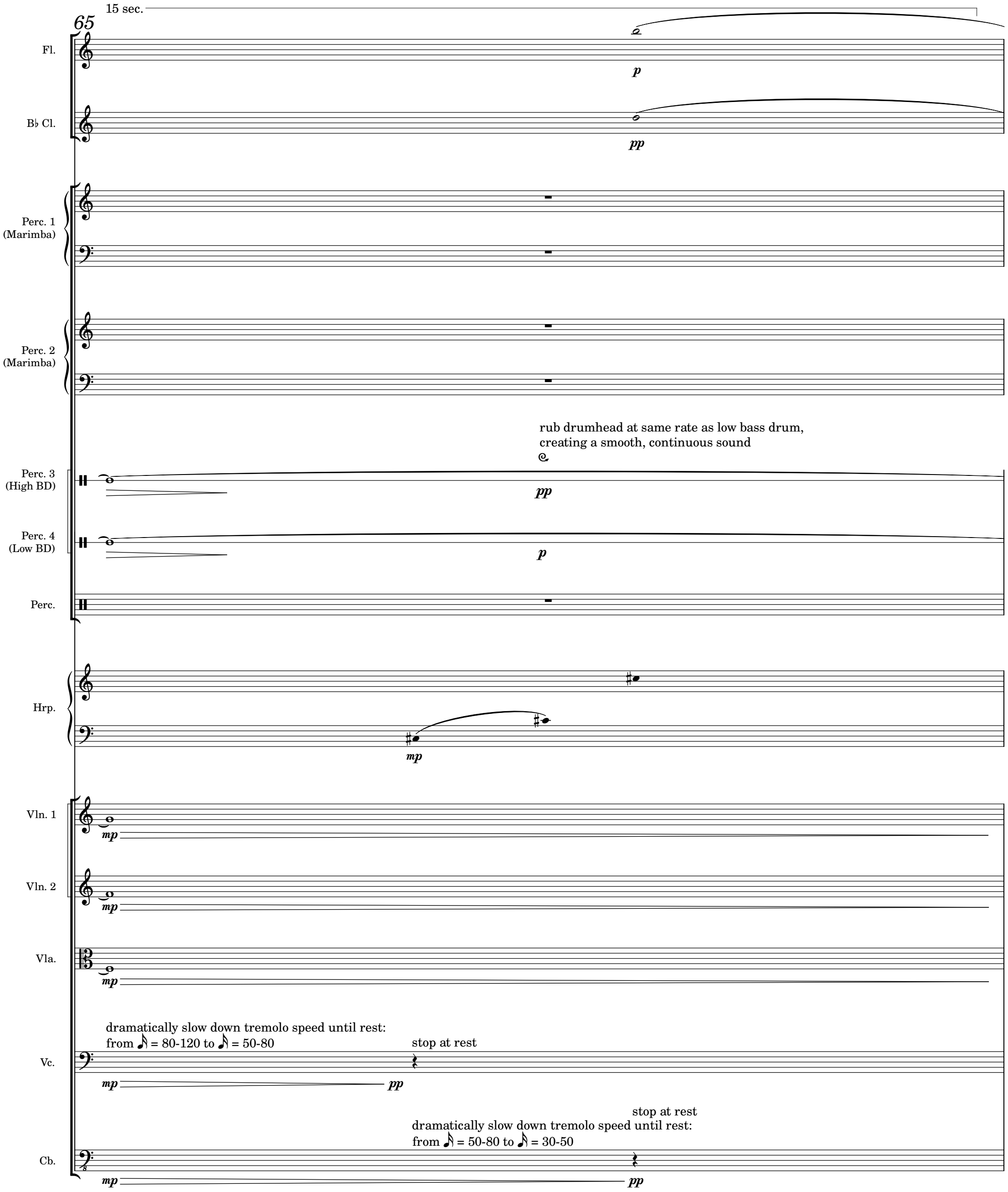

59
♩ = 80
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
as the tempo decreases, continue to rub drumhead at same rate as string tremolo,
creating a gradual slow down
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
slow down tremolo speed as the tempo decreases
Vc.
(tremolo speed should match cello as the tempo decreases)
Cb.

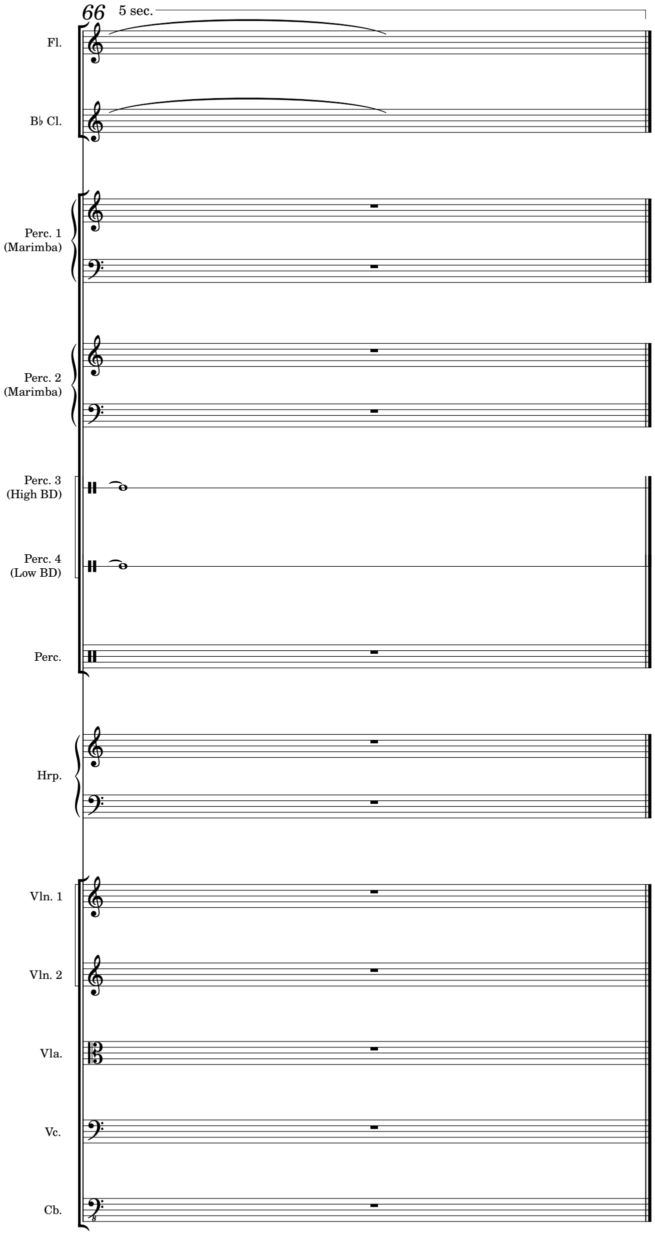

60
♩ = 70
♩ = 60
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
tremolo speed: 𝅘𝅥𝅮 = 180-220
tremolo speed: 𝅘𝅥𝅮 = 160-200


62
♩ = 50
Fl.
B♭ Cl.
f
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
C♭
Vln. 1
Vln. 2
Vla.
tremolo speed: 𝅘𝅥𝅮 = 140-180
Vc.
Cb.

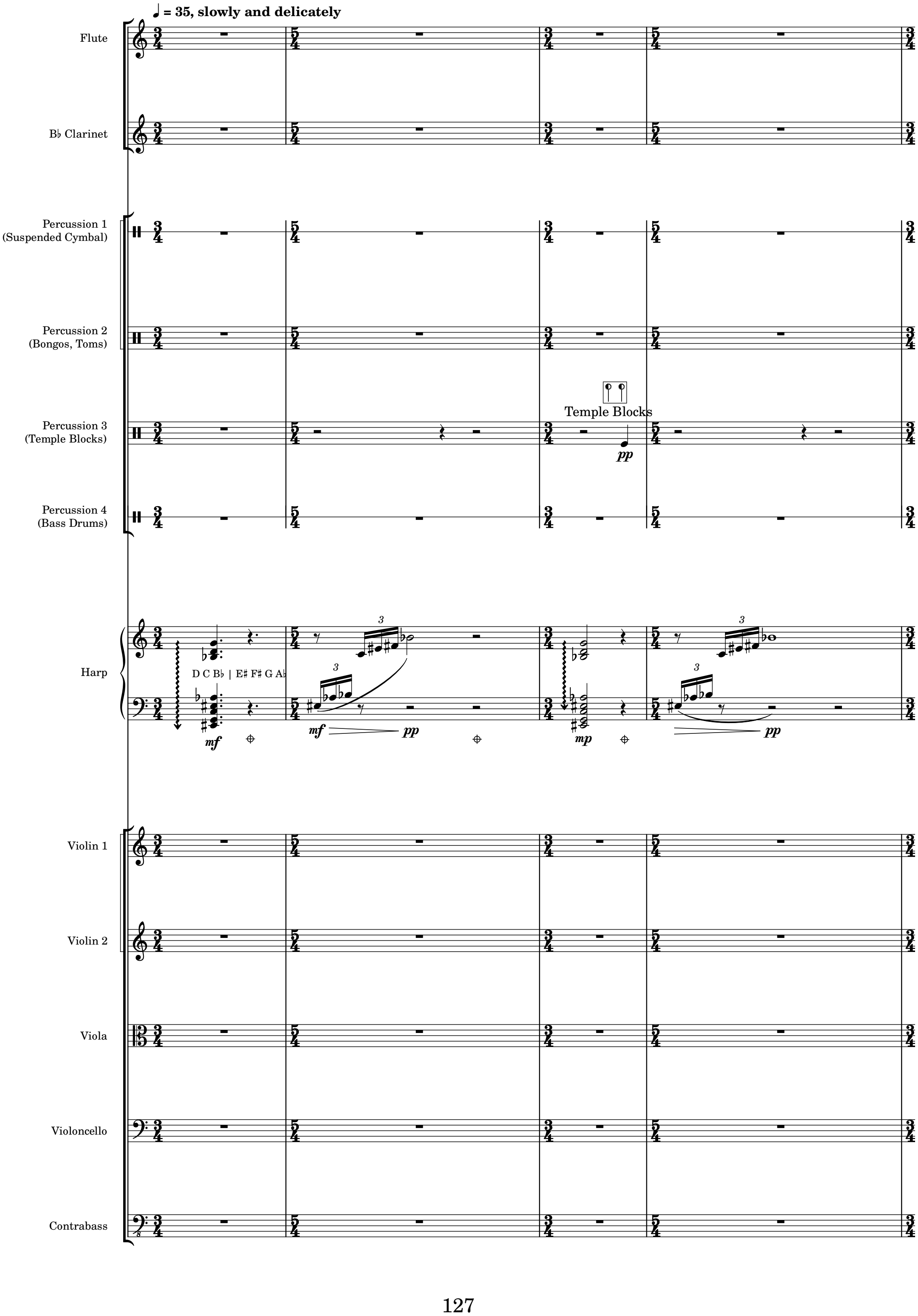

63
♩ = 40
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (High BD)
Perc. 4 (Low BD)
Perc.
Hrp.
C♯
Vln. 1
Vln. 2
Vla.
tremolo speed: 𝅘𝅥𝅮 = 120-160
Vc.
Cb.


64
♩ = 30
Fl.
f
mp
B♭ Cl.
mp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
mp
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
tremolo speed: 𝅘𝅥𝅮 = 100-140
Vc.
Cb.

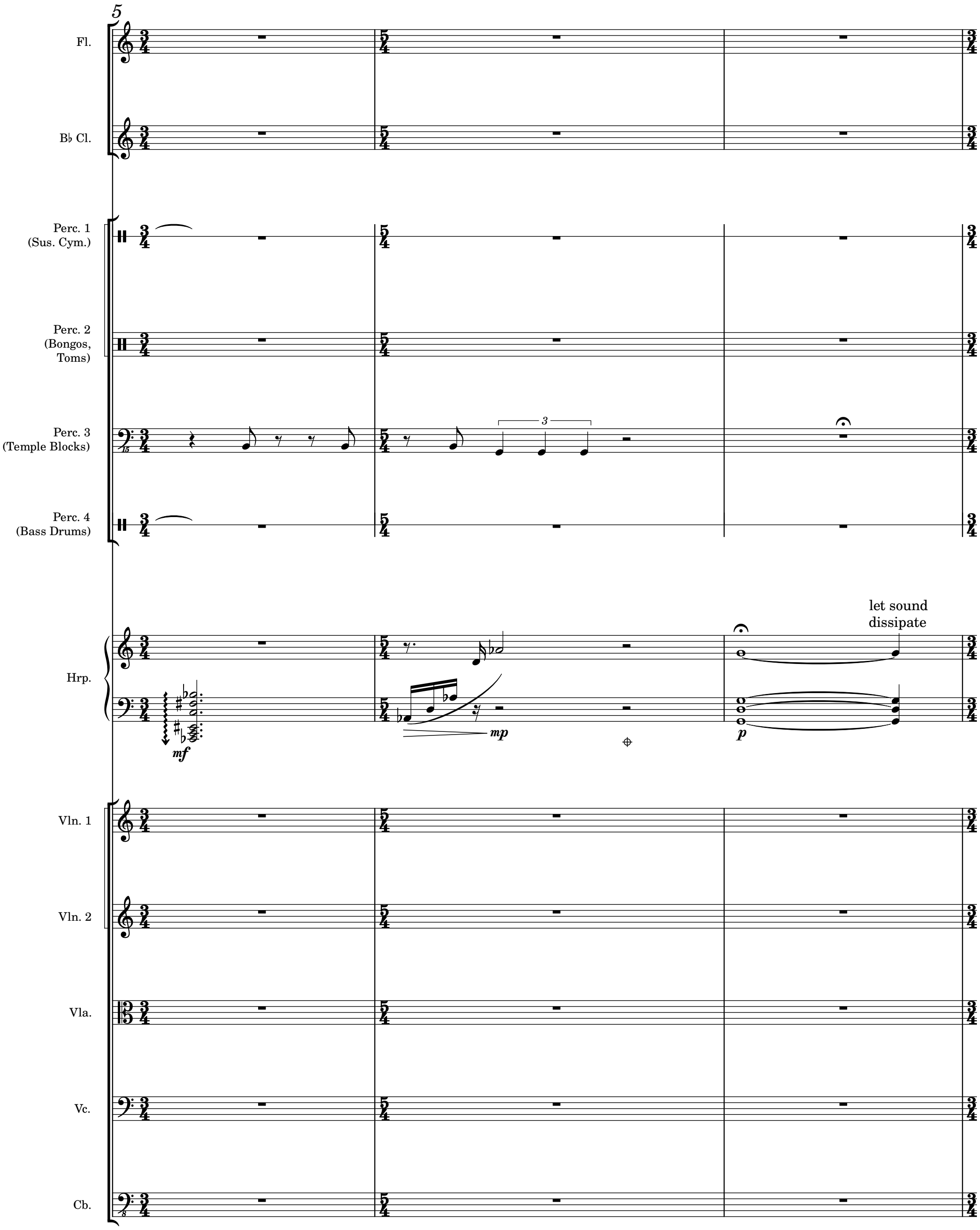

15 sec.
65
Fl.
p
B♭ Cl.
pp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
rub drumhead at same rate as low bass drum,
creating a smooth, continuous sound
Perc. 3
(High BD)
pp
Perc. 4
(Low BD)
p
Perc.
Hrp.
mp
Vln. 1
mp
Vln. 2
mp
Vla.
mp
dramatically slow down tremolo speed until rest:
from 𝅘𝅥𝅮 = 80-120 to 𝅘𝅥𝅮 = 50-80
stop at rest
Vc.
mp
pp
stop at rest
dramatically slow down tremolo speed until rest:
from 𝅘𝅥𝅮 = 50-80 to 𝅘𝅥𝅮 = 30-50
Cb.
mp
pp

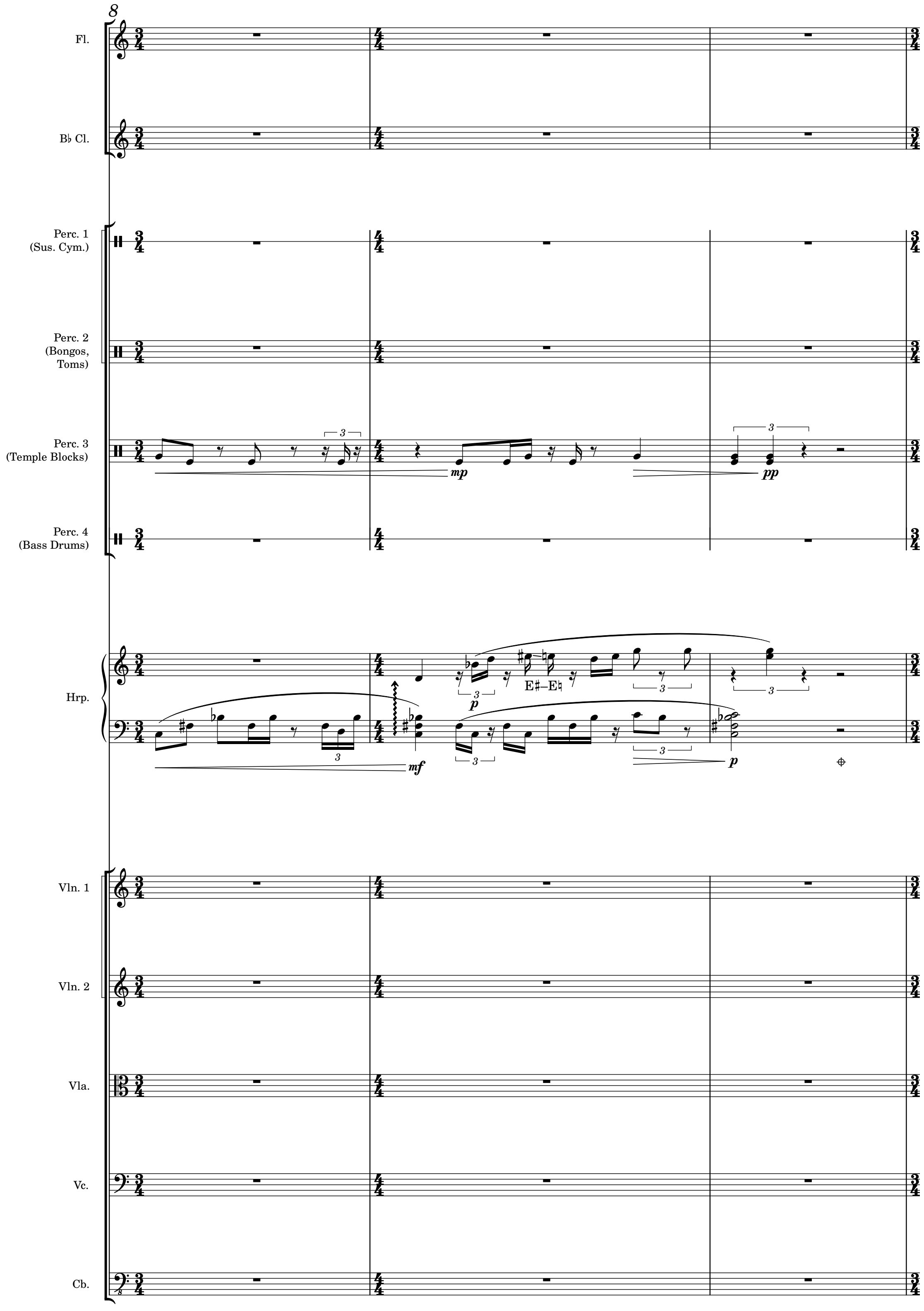

66
5 sec.
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(High BD)
Perc. 4
(Low BD)
Perc.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

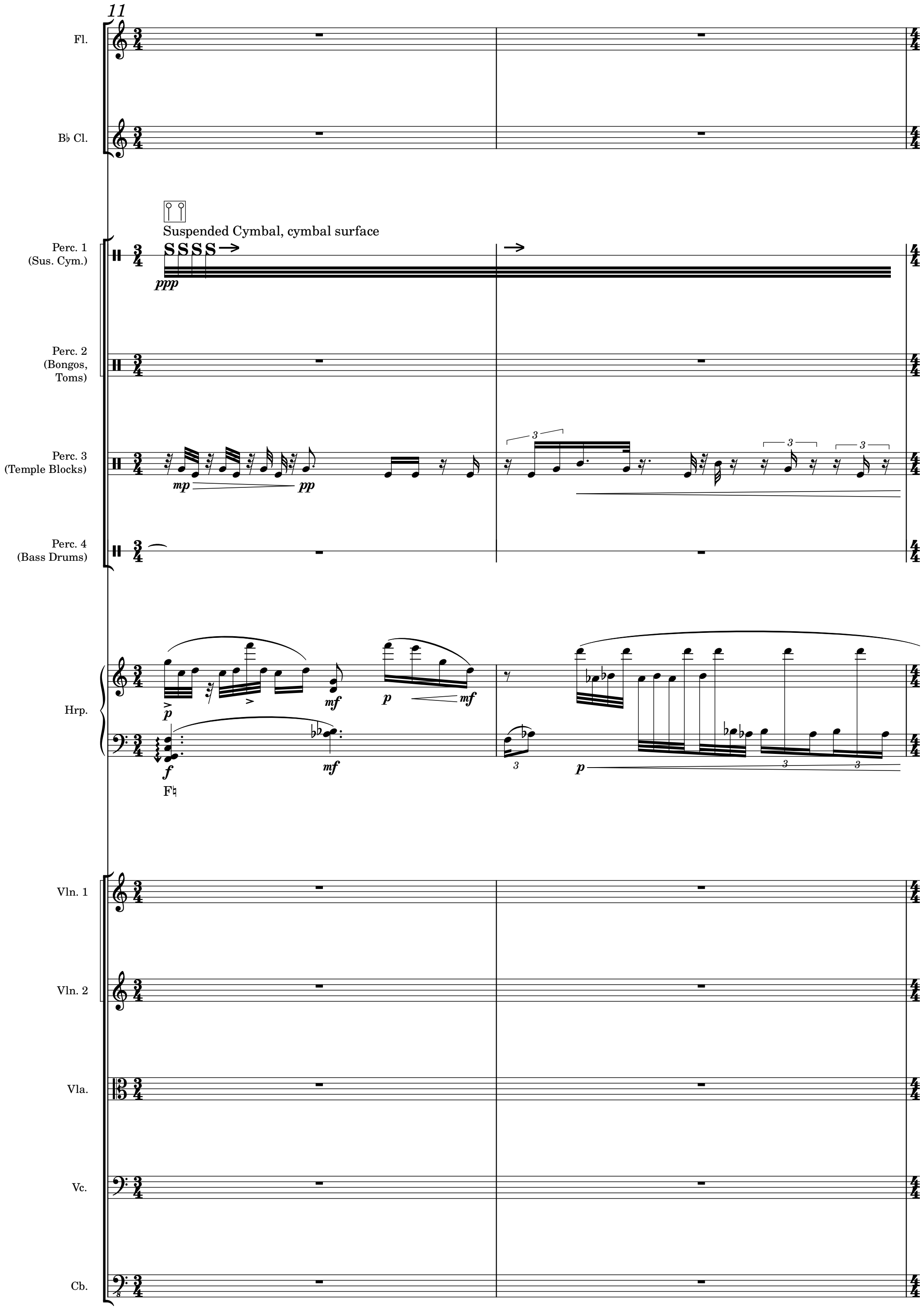
III. Bounds on the Crest

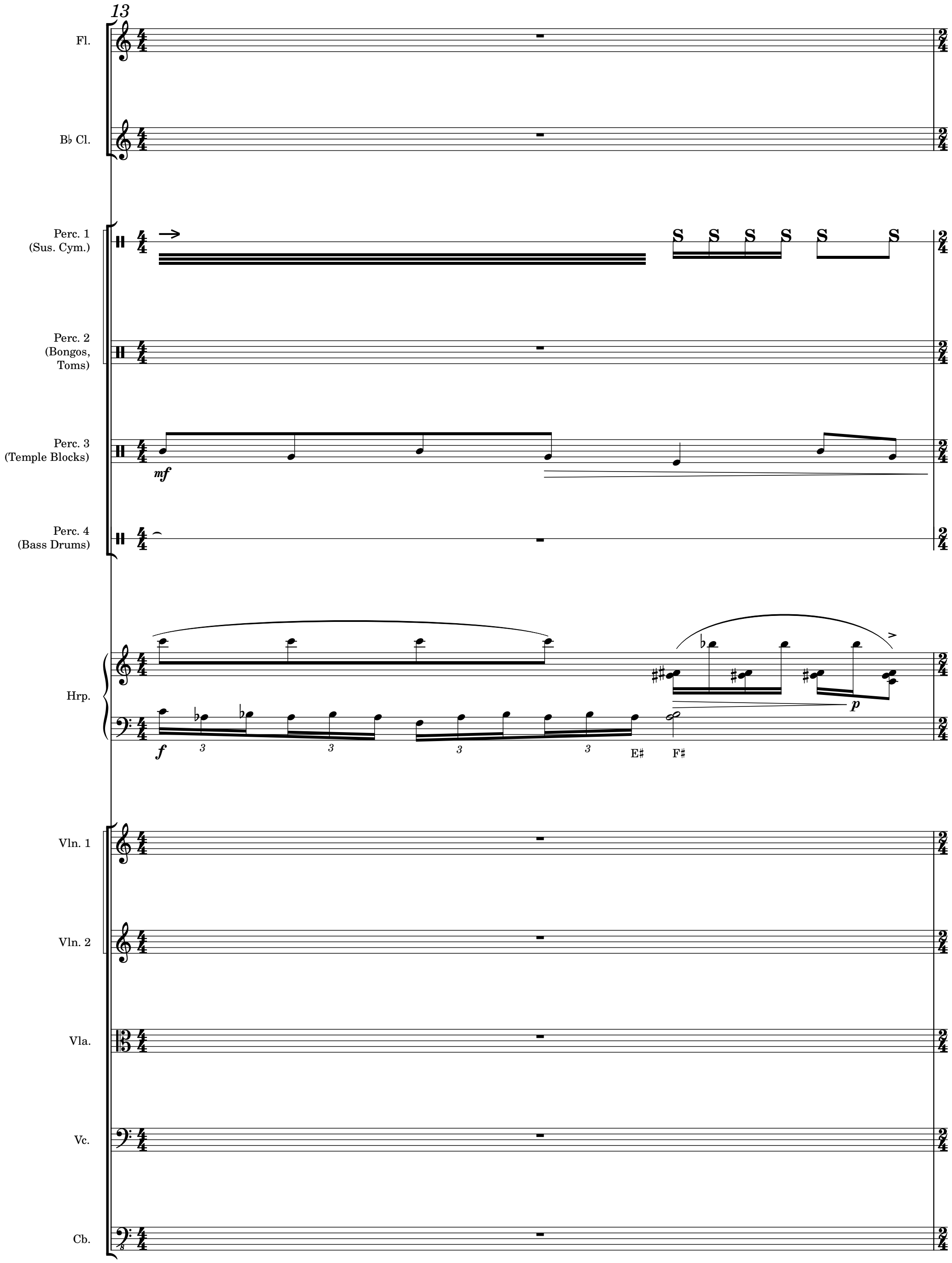


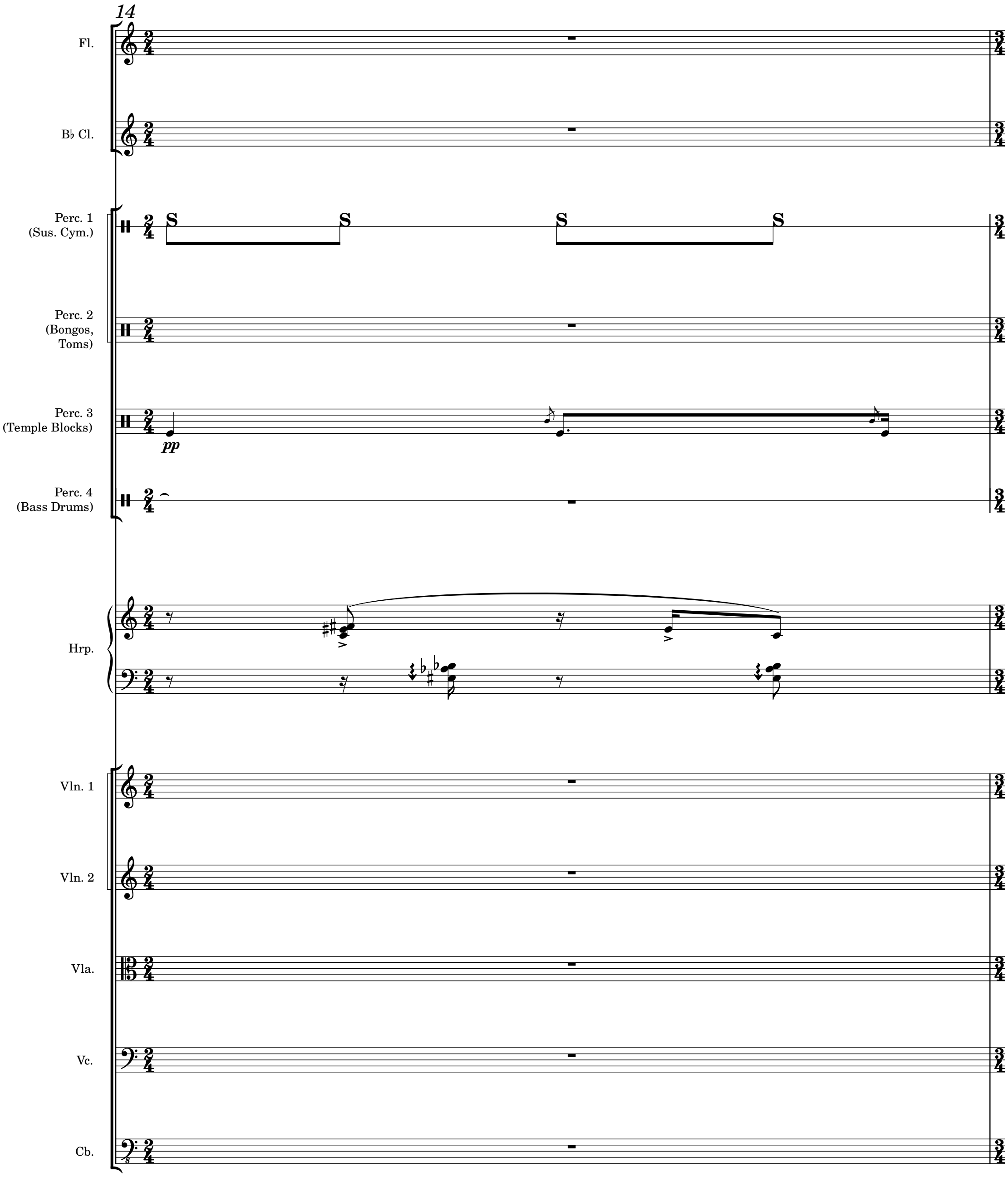
♩ = 35, slowly and delicately
Flute
B♭ Clarinet
Percussion 1 (Suspended Cymbal)
Percussion 2 (Bongos, Toms)
Percussion 3 (Temple Blocks)
Percussion 4 (Bass Drums)
Temple Blocks
pp
Harp
D C B♭ | E♯ F♯ G A♭
mf
mp
pp
3
Violin 1
Violin 2
Viola
Violoncello
Contrabass

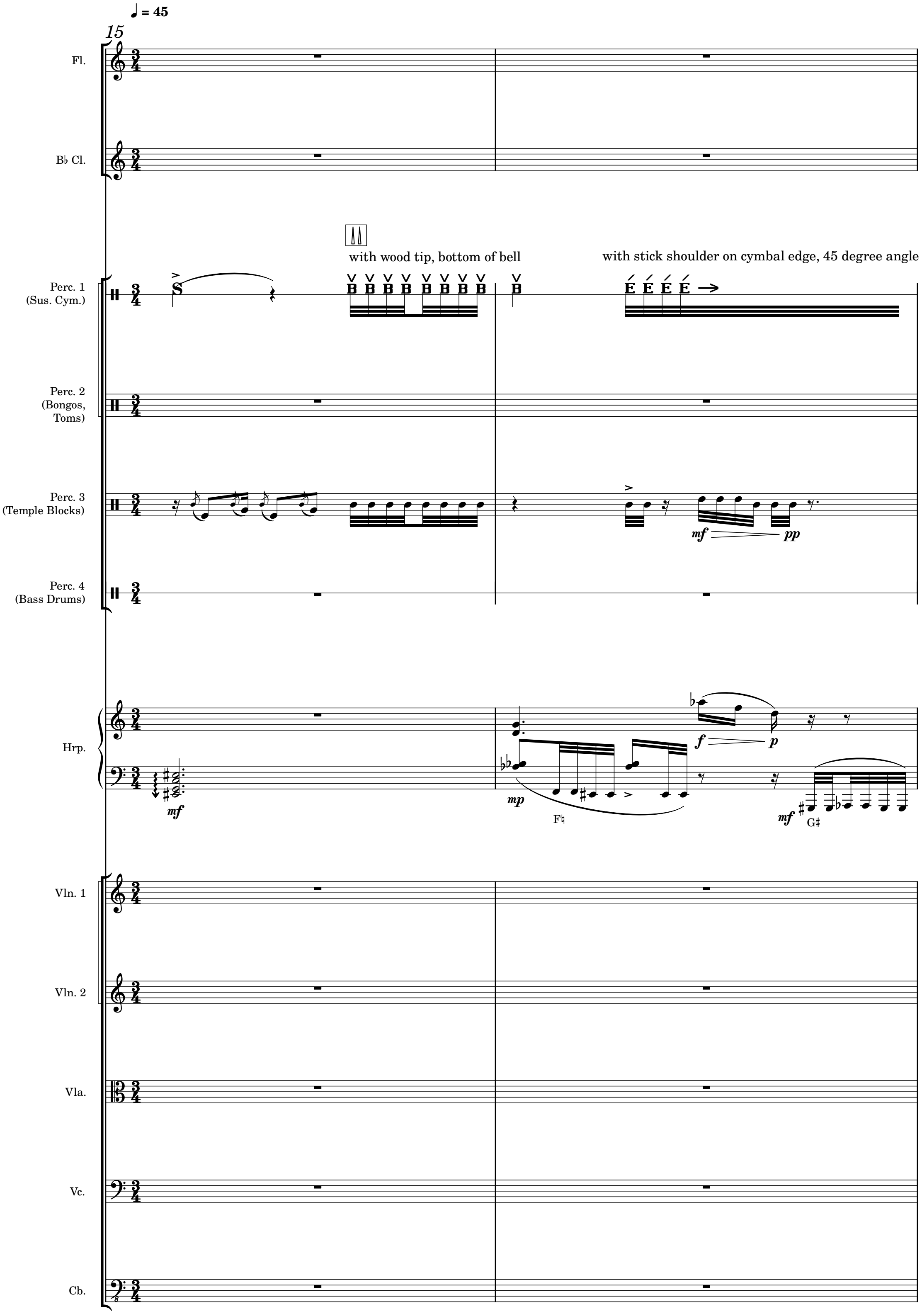

5
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
mp
p
3
let sound dissipate

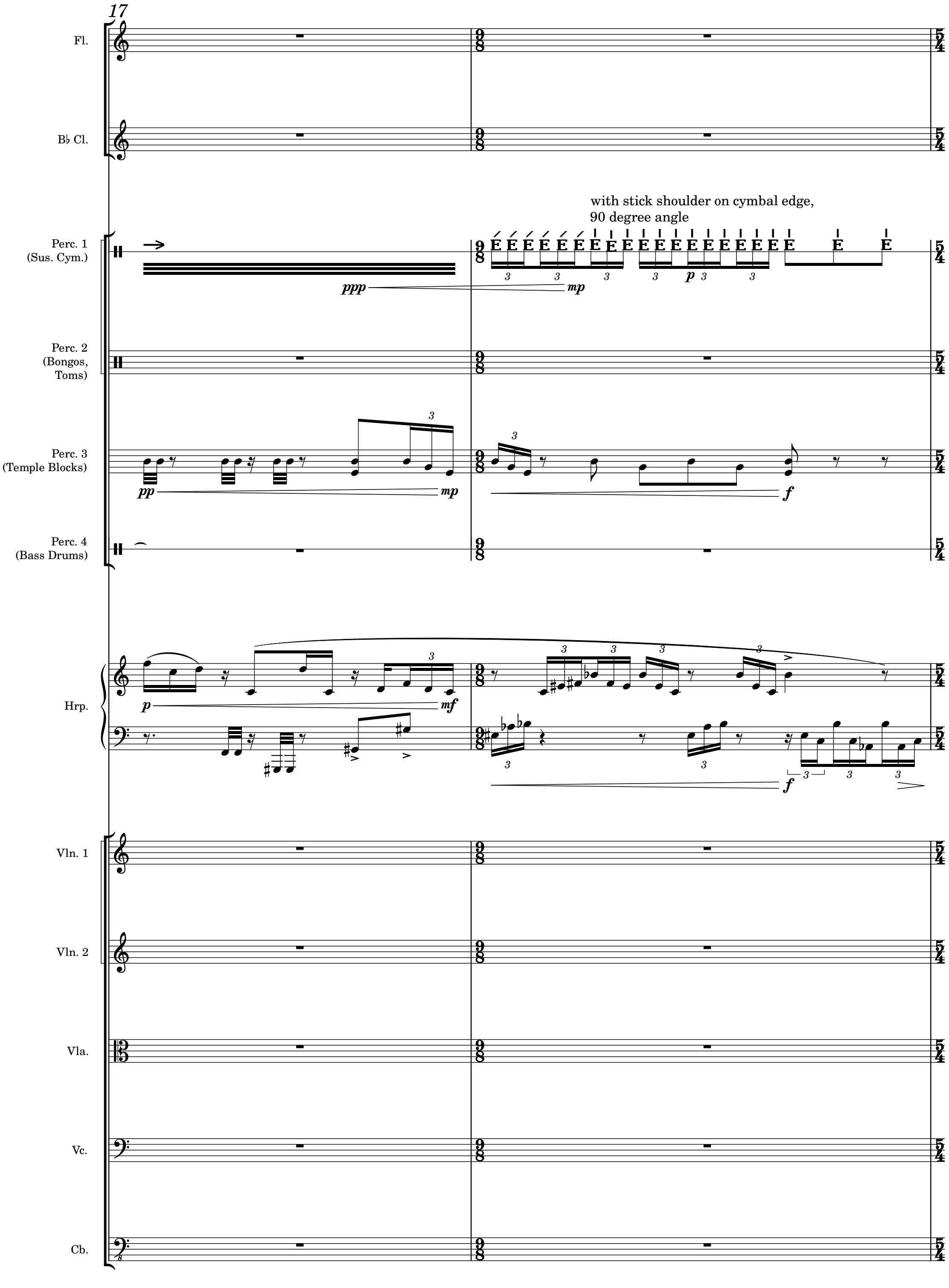

8
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mp
pp
p
E♯–E♮
mf
p

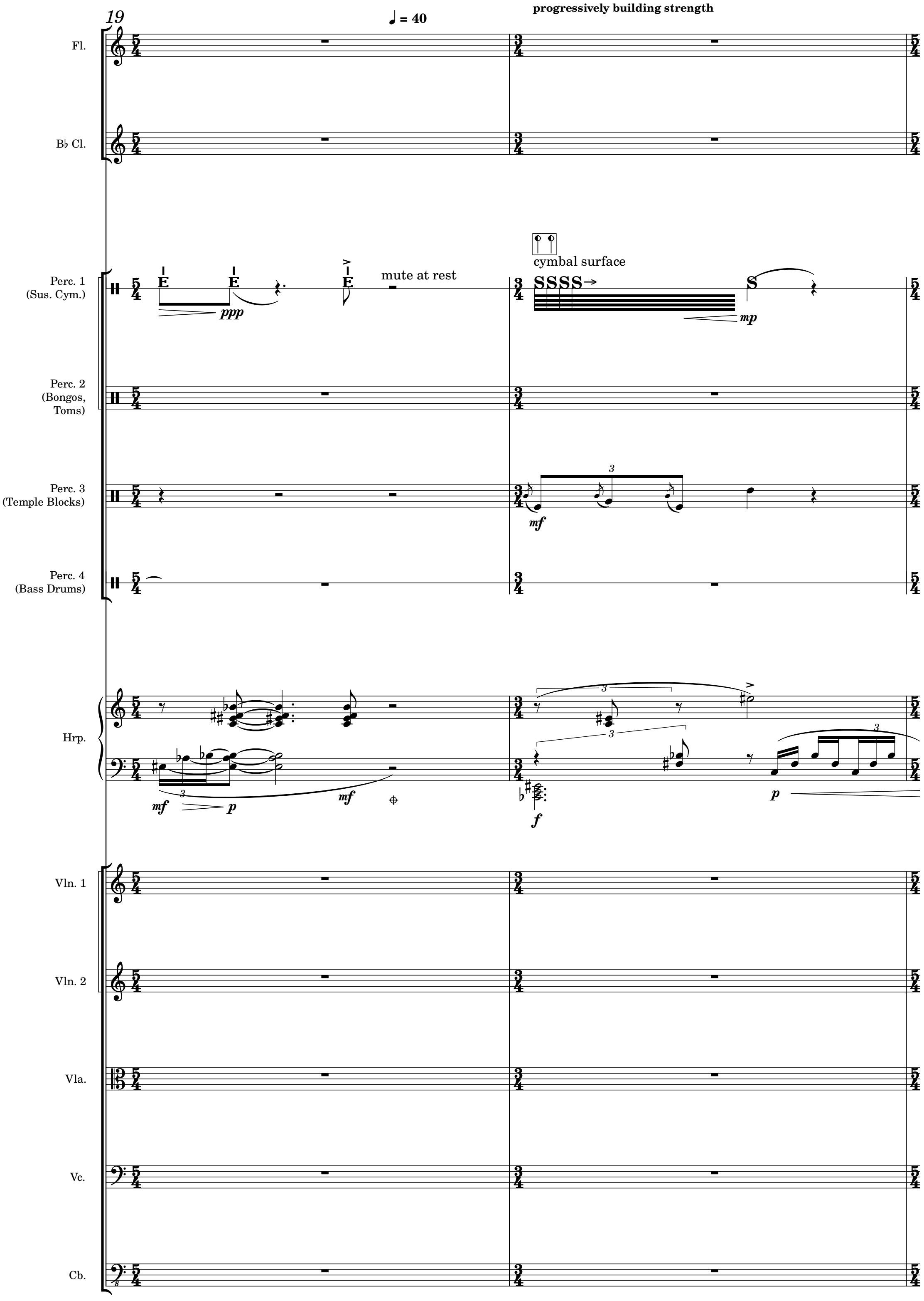

11
Fl.
B♭ Cl.
Suspended Cymbal, cymbal surface
Perc. 1 (Sus. Cym.)
ppp
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
mp
pp
3
Perc. 4 (Bass Drums)
Hrp.
p
mf
f
F♮
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

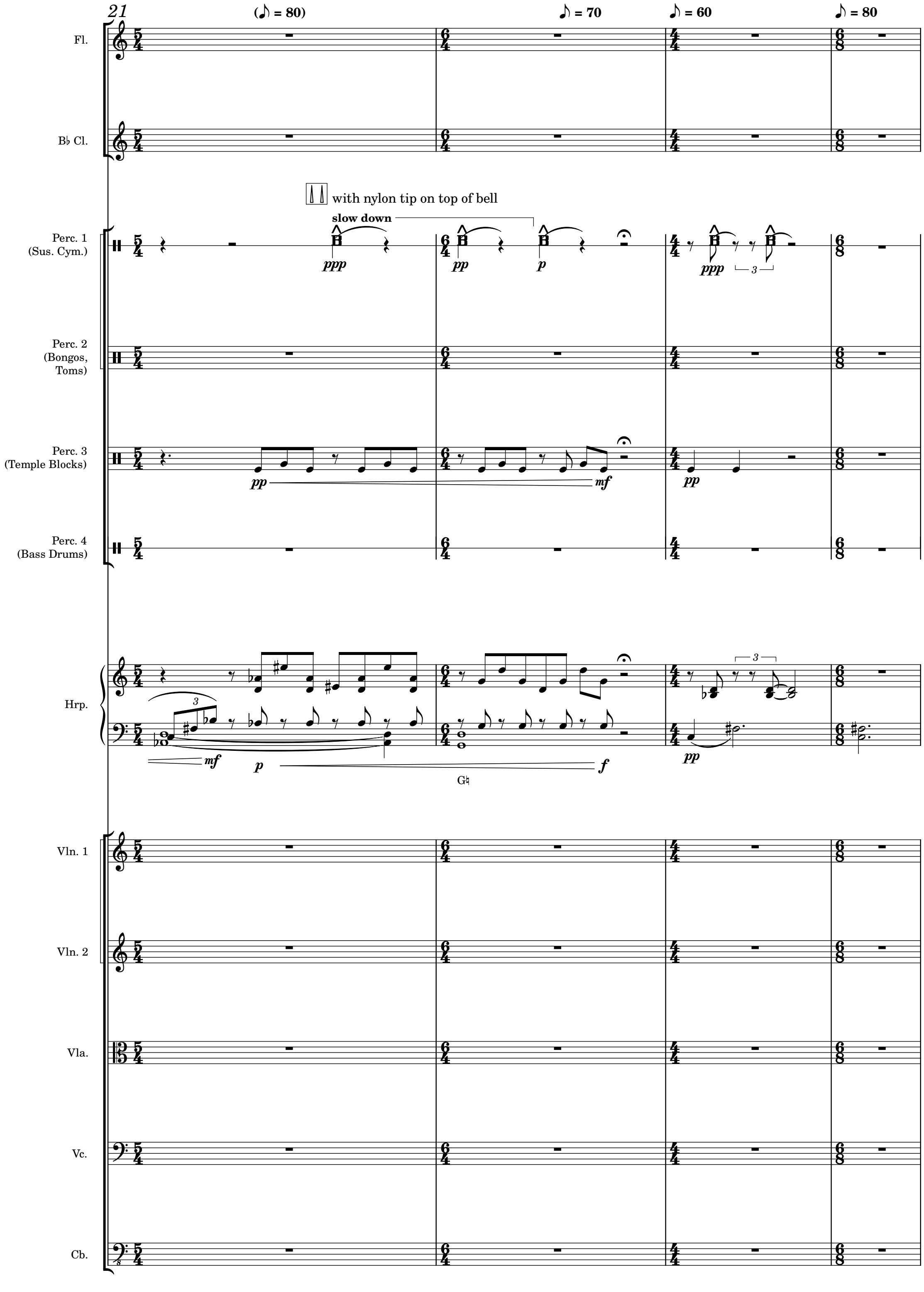

13
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
mf
Perc. 4 (Bass Drums)
Hrp.
f
p
E♯
F♯
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

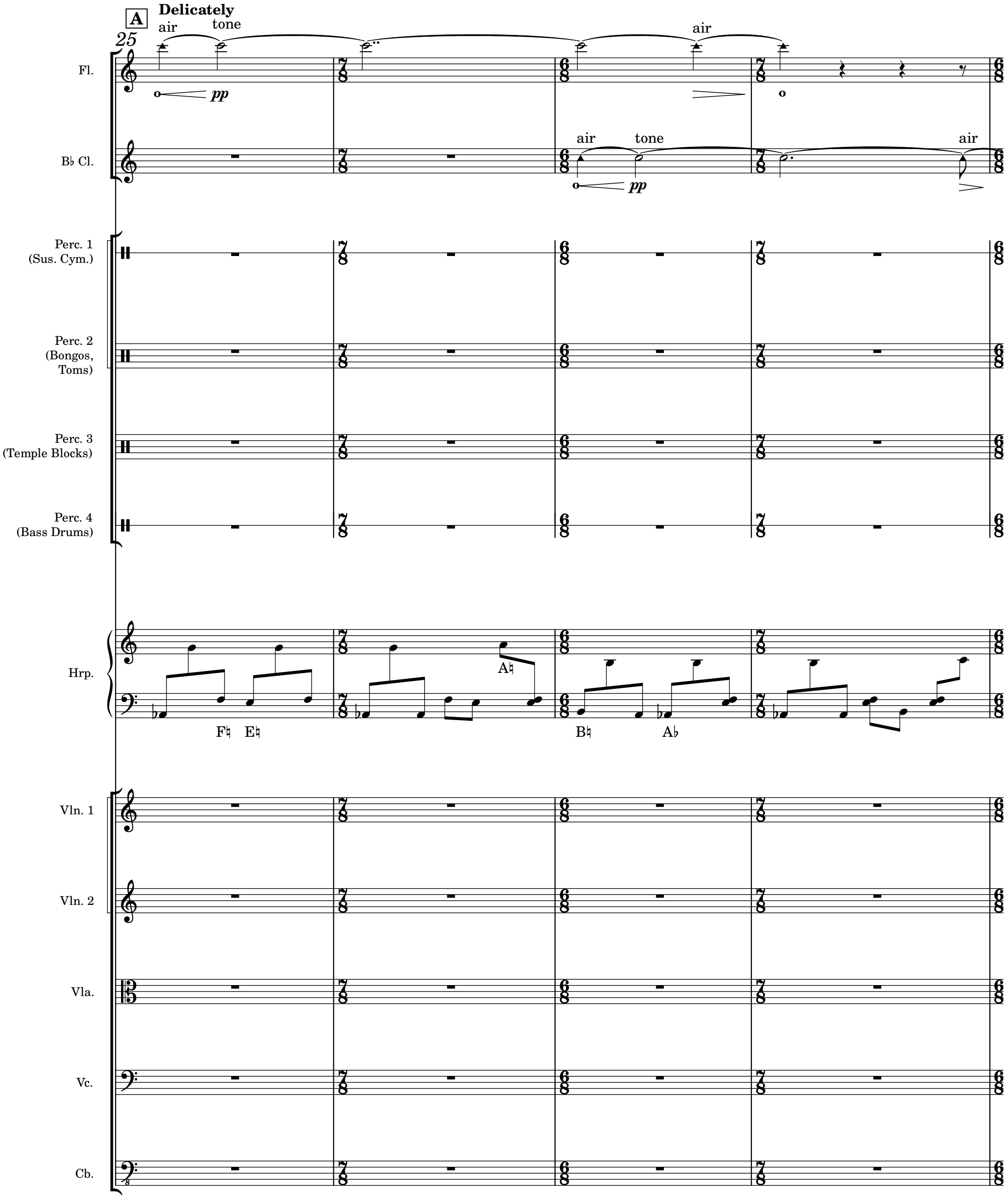

14
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp

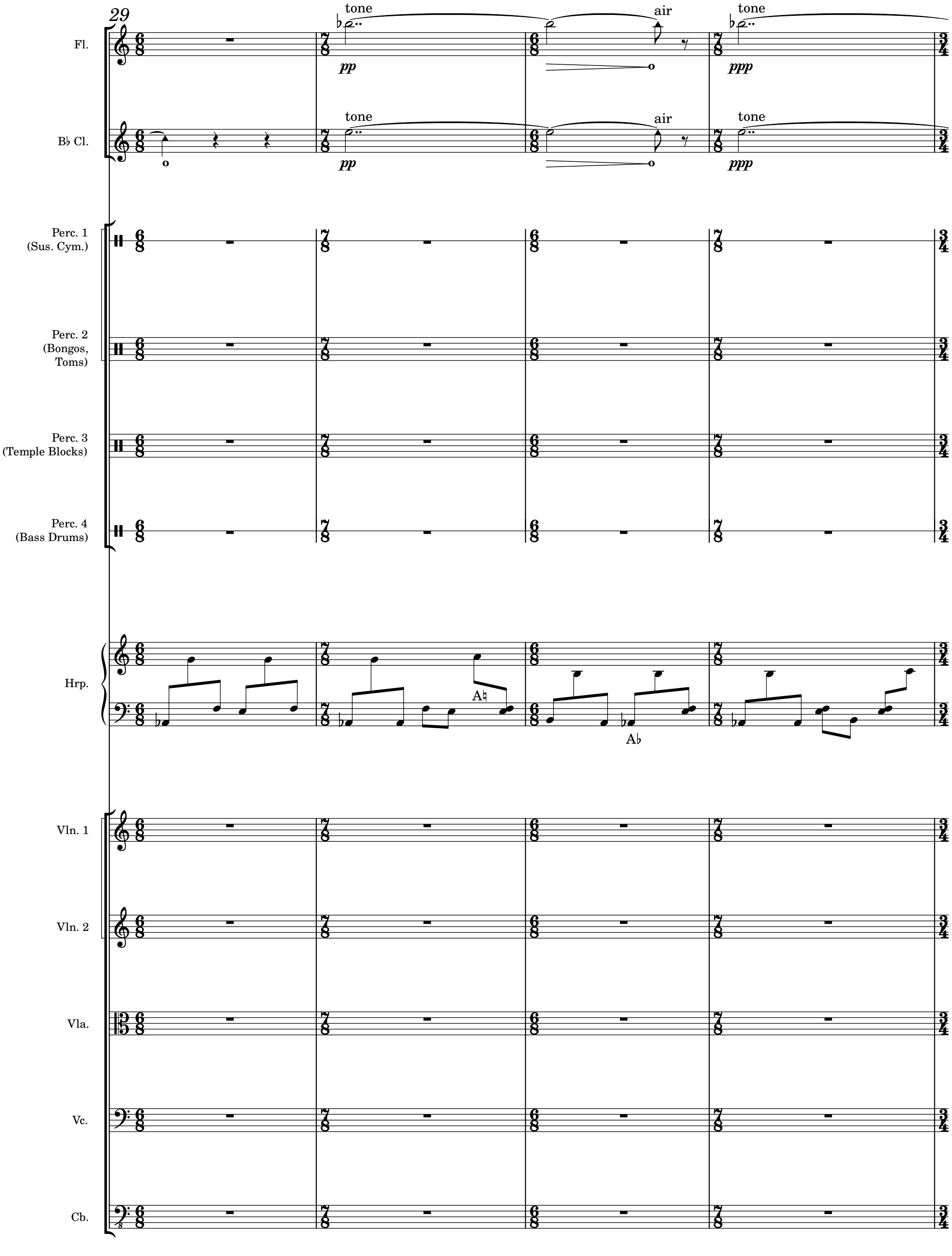

♩ = 45
15
Fl.
B♭ Cl.
with wood tip, bottom of bell
with stick shoulder on cymbal edge, 45 degree angle
Perc. 1
(Sus. Cym.)
S
B
E
Perc. 2
(Bongos,
Toms)
Perc. 3
(Temple Blocks)
mf
pp
Perc. 4
(Bass Drums)
Hrp.
mf
mp
F♮
f
p
mf
G♯
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

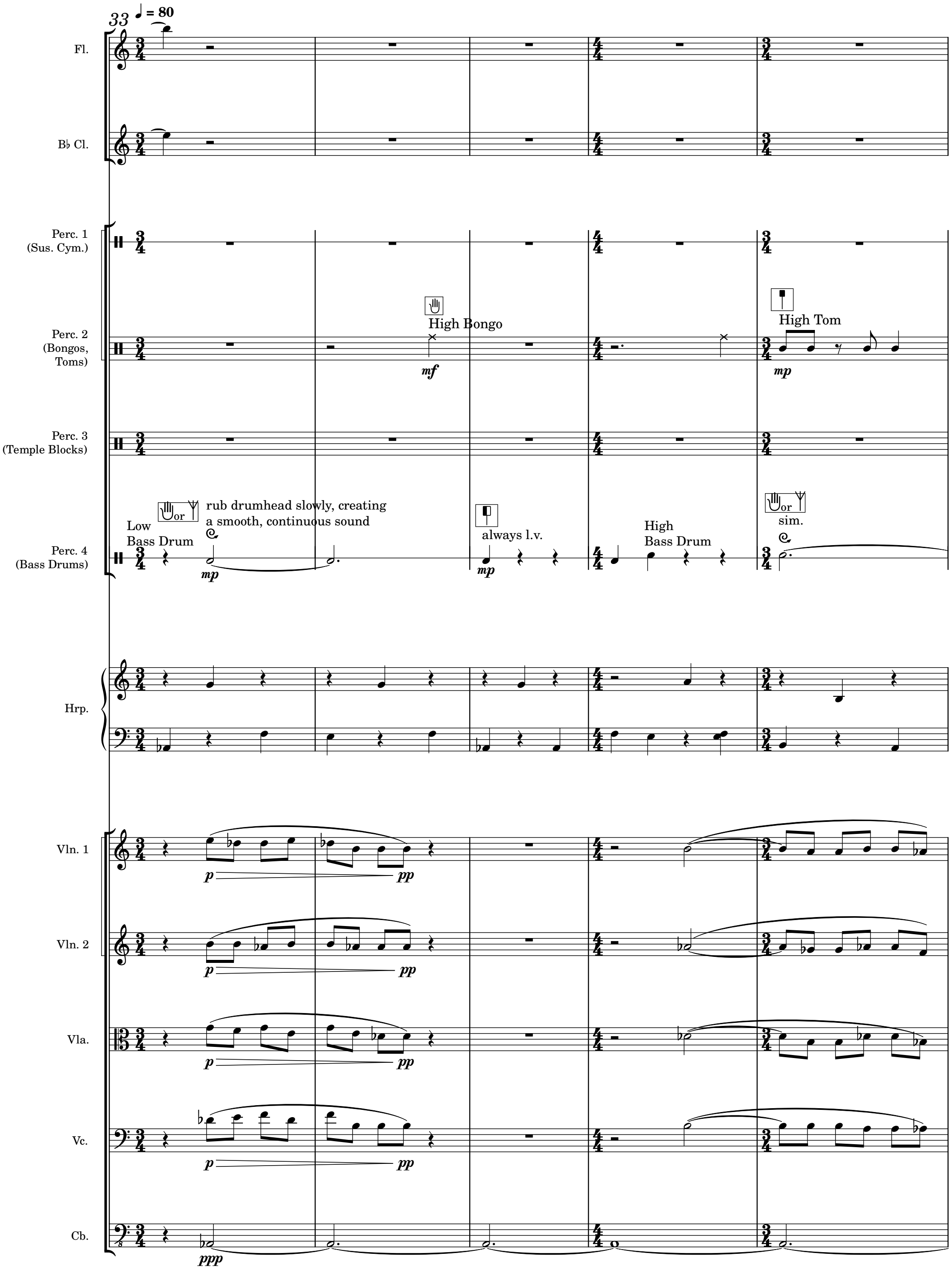

17
Fl.
B♭ Cl.
with stick shoulder on cymbal edge,
90 degree angle
Perc. 1
(Sus. Cym.)
ppp
mp
p
Perc. 2
(Bongos,
Toms)
Perc. 3
(Temple Blocks)
pp
mp
f
Perc. 4
(Bass Drums)
Hrp.
p
mf
f
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
9
8
5
4
3

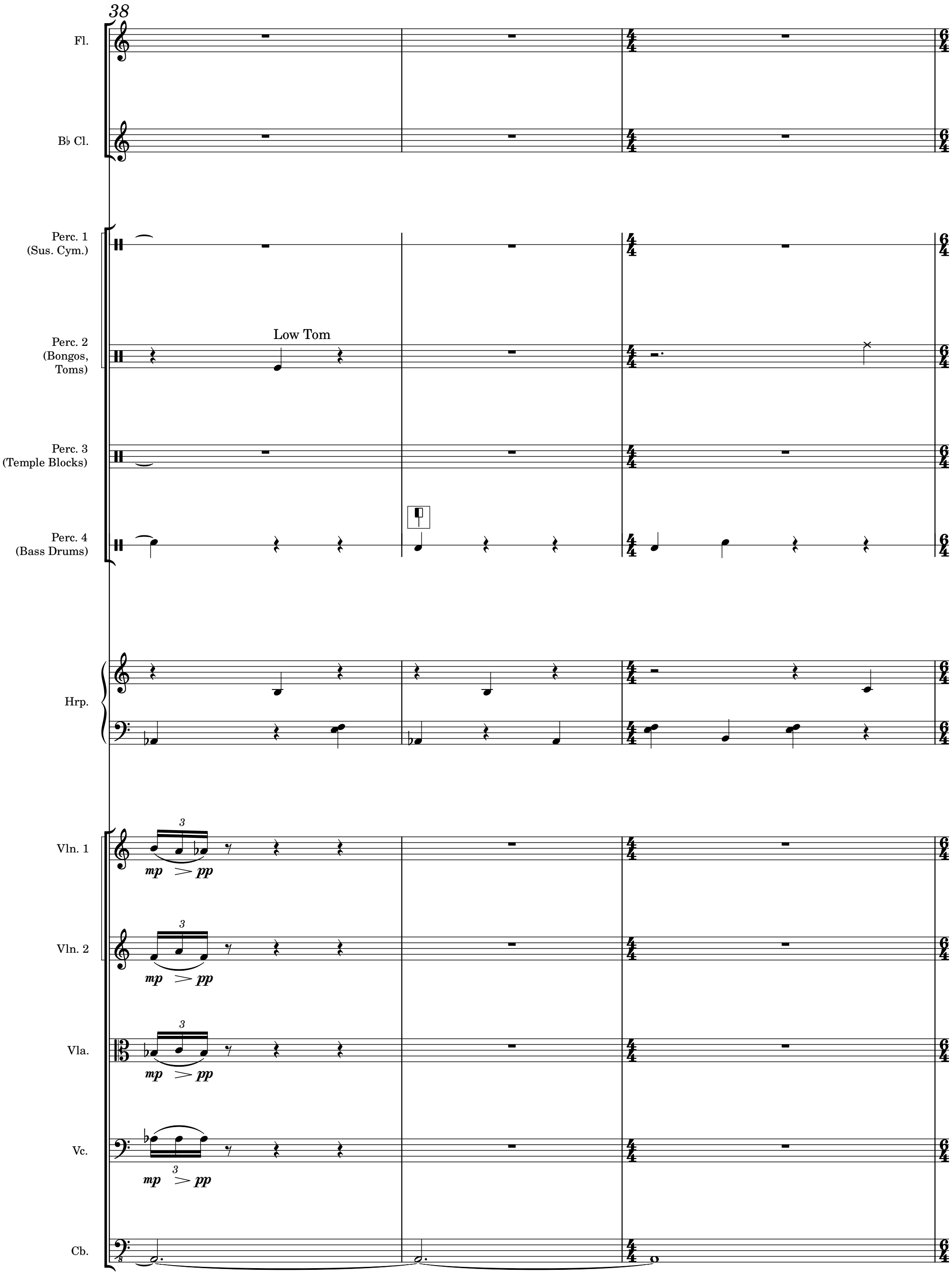

19
♩ = 40
progressively building strength
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
E
S
ppp
mute at rest
cymbal surface
mp
mf
p
f

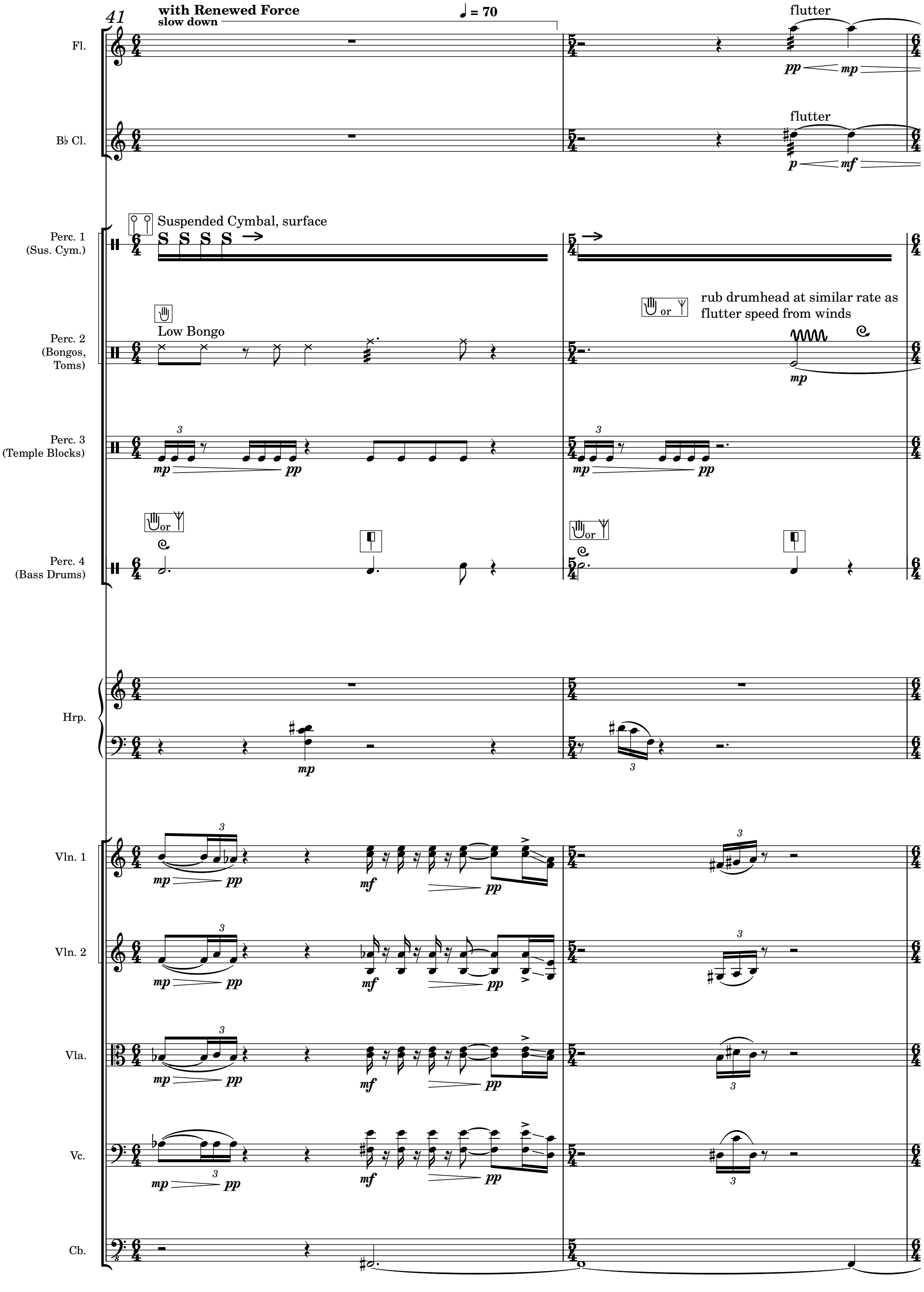

21
(♪ = 80)
♪ = 70
♪ = 60
♪ = 80
Fl.
B♭ Cl.
with nylon tip on top of bell
slow down
Perc. 1 (Sus. Cym.)
ppp
pp
p
ppp
3
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
pp
mf
pp
Perc. 4 (Bass Drums)
Hrp.
3
3
mf
p
f
pp
G♮
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

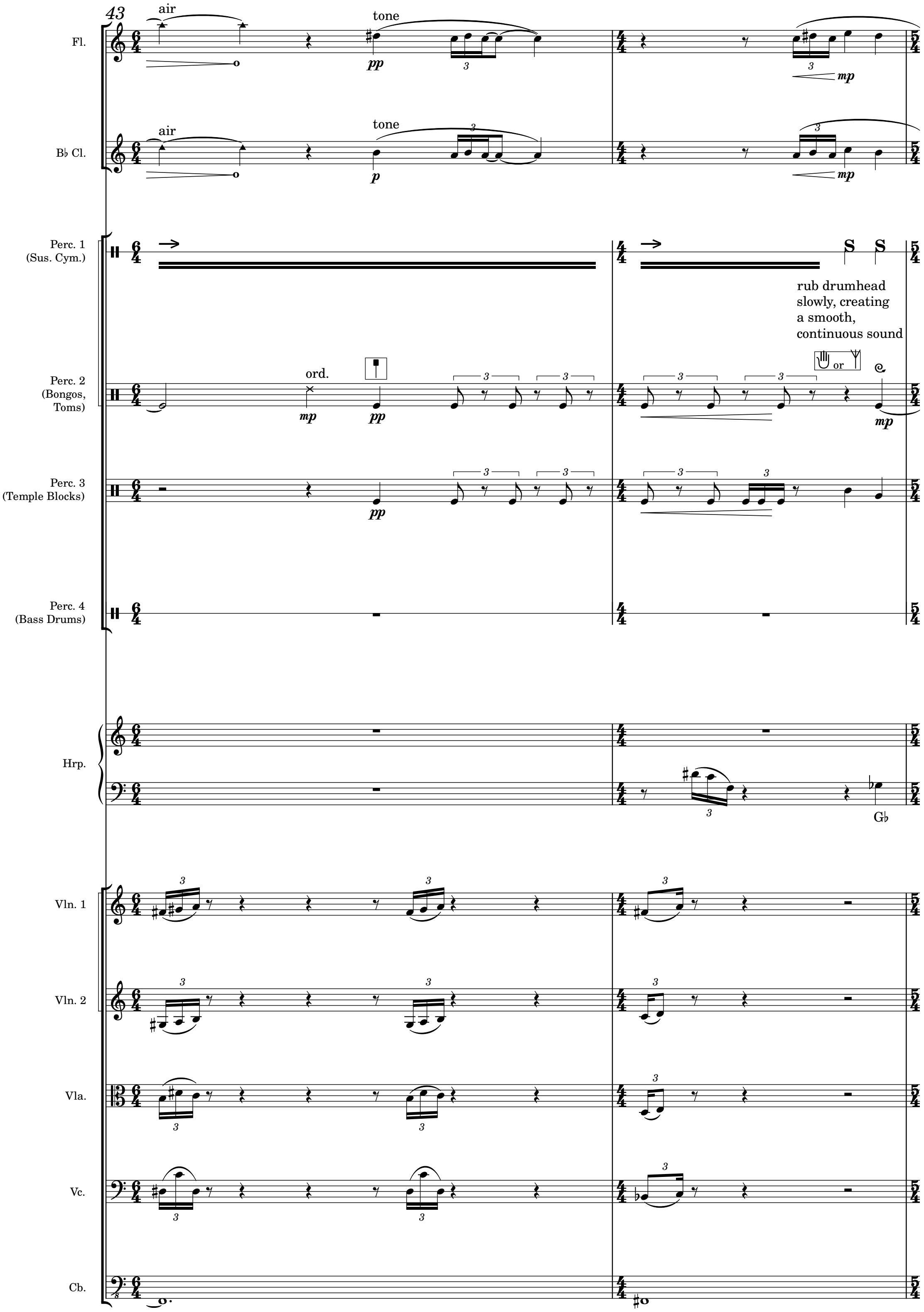

A
Delicately
25
air
tone
air
pp
air
tone
pp
air
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
F♮
E♮
A♮
B♮
A♭
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

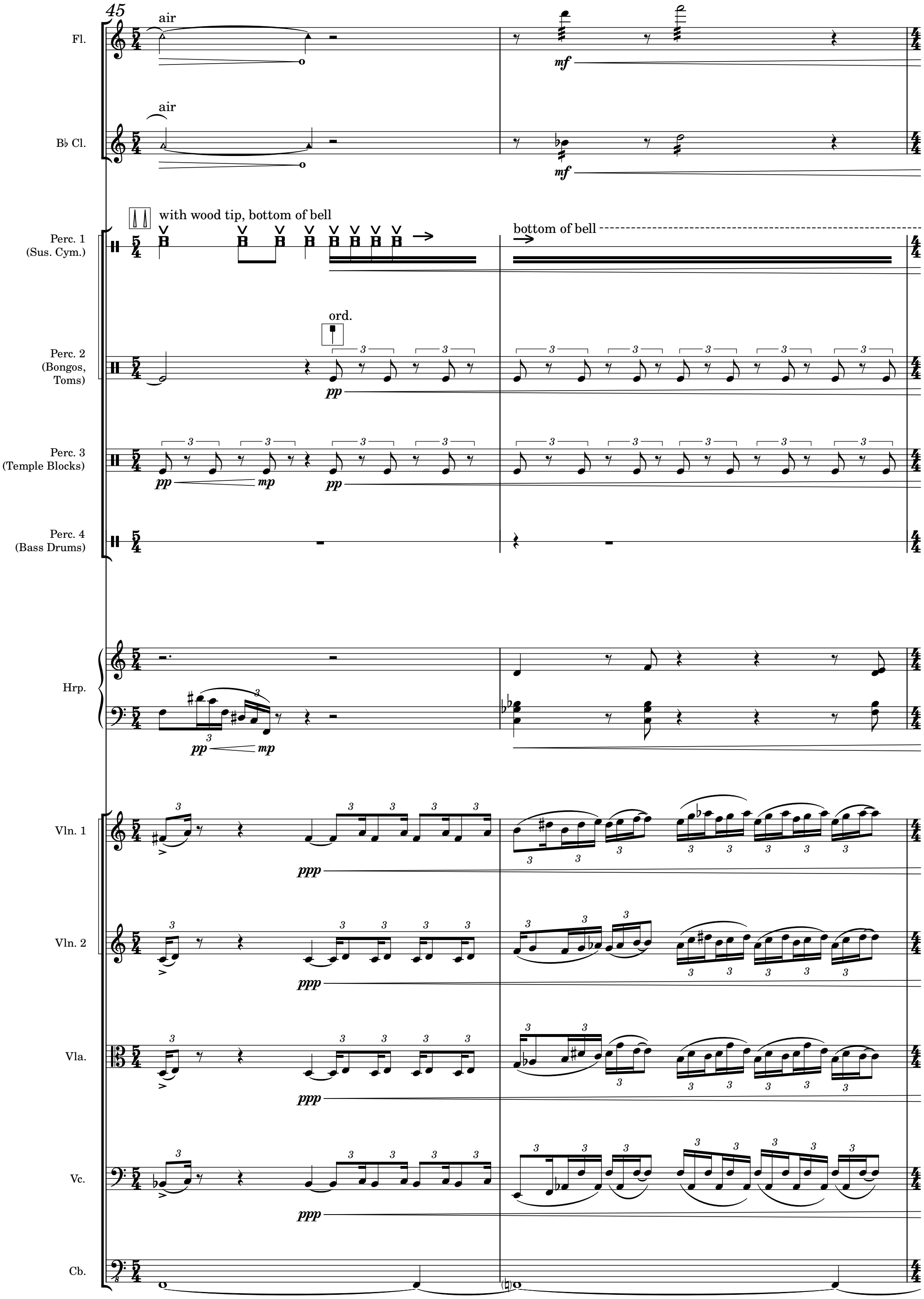

29
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
tone
air
tone
pp
ppp
A♮
A♭

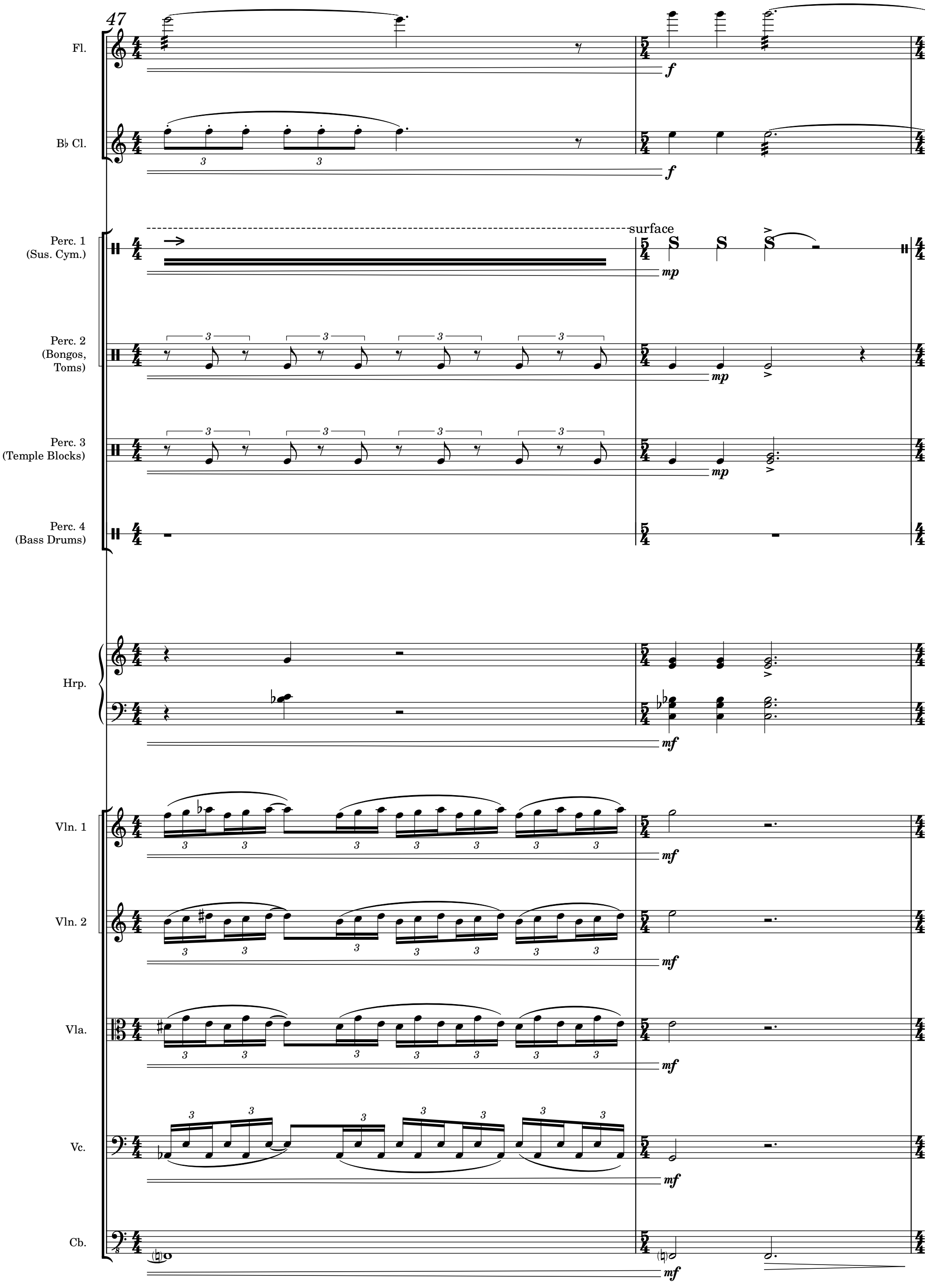

33
♩ = 80
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
High Bongo
mf
High Tom
mp
Low Bass Drum
or
rub drumhead slowly, creating a smooth, continuous sound
mp
always l.v.
mp
High Bass Drum
or
sim.
p
pp
ppp

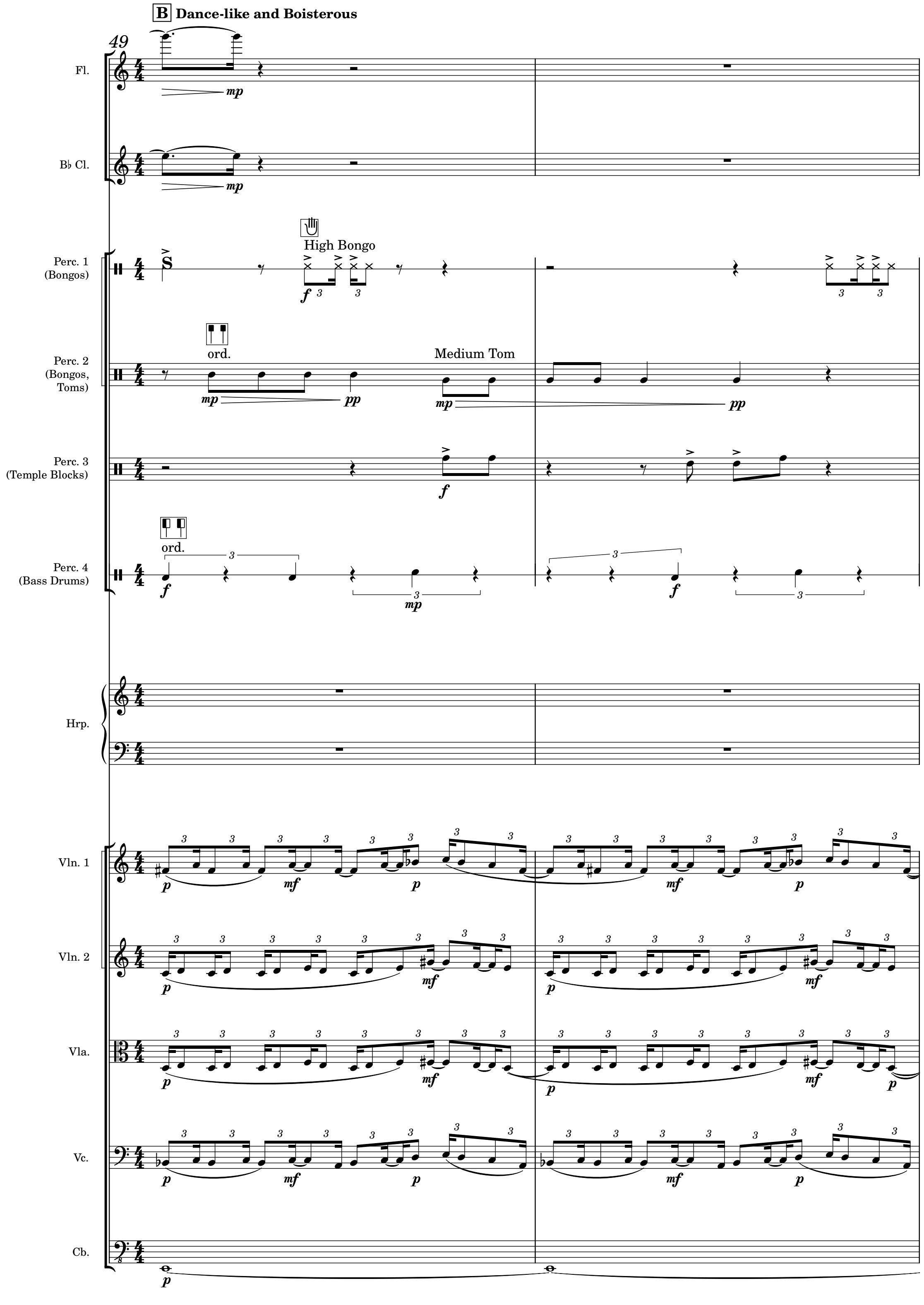

38
Fl.
B♭ Cl.
Perc. 1 (Sus. Cym.)
Perc. 2 (Bongos, Toms)
Low Tom
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
3
mp
pp

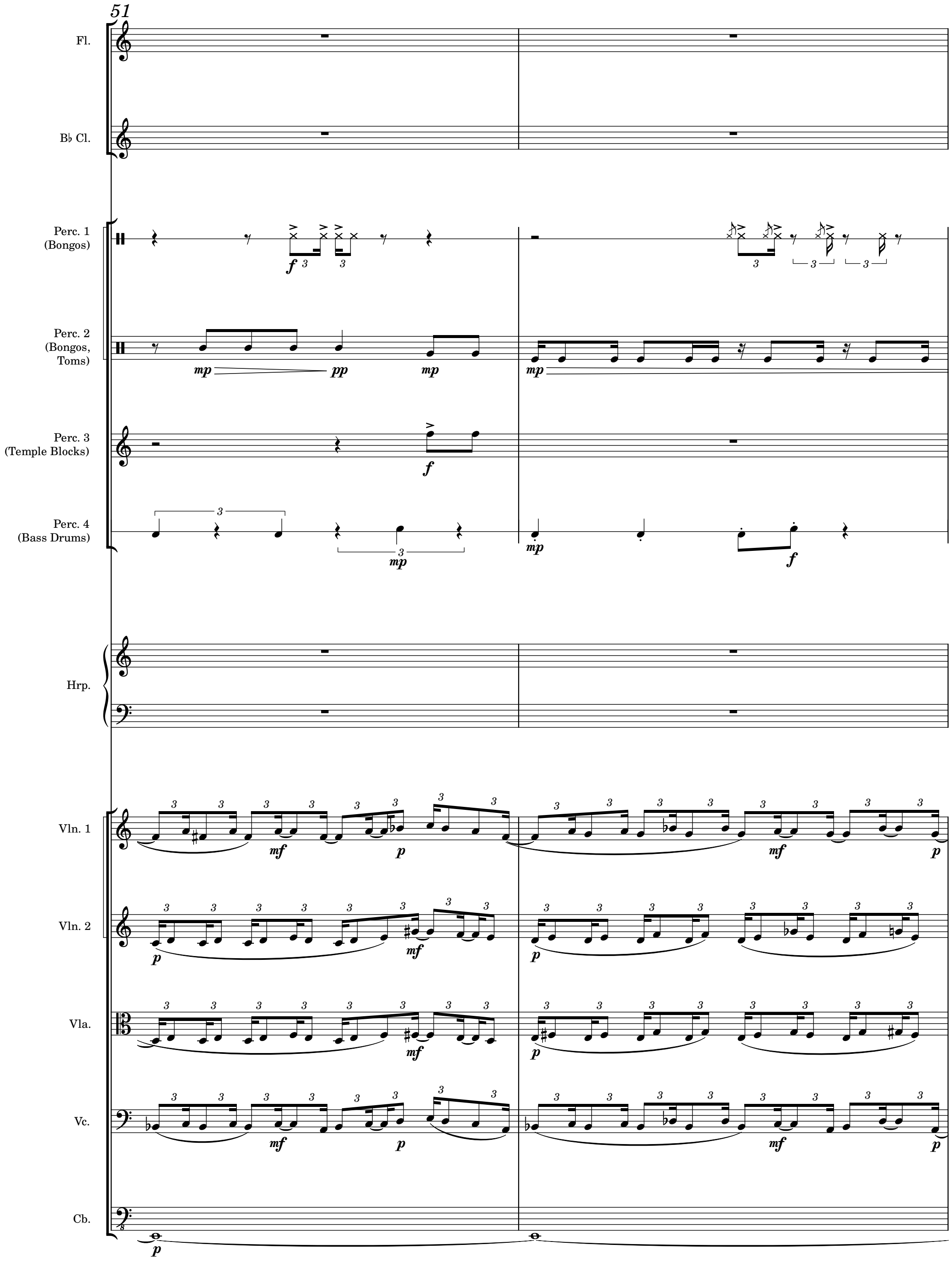

41
with Renewed Force
slow down
♩= 70
flutter
flutter
Fl.
B♭ Cl.
Suspended Cymbal, surface
Perc. 1 (Sus. Cym.)
Low Bongo
rub drumhead at similar rate as flutter speed from winds
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
mp
p
mf
mp
pp
mf
or

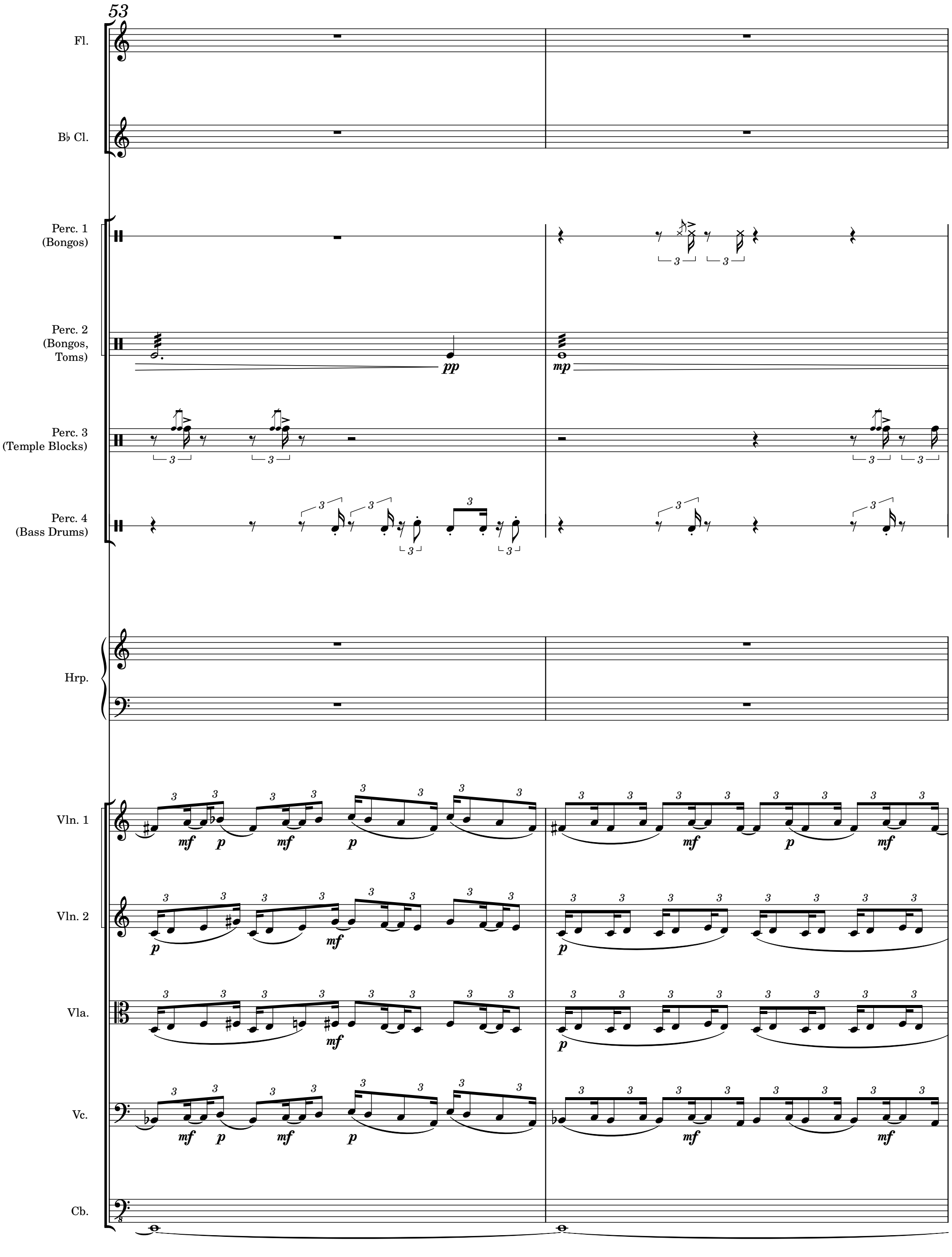

43
Fl.
air
tone
pp
mp
B♭ Cl.
air
tone
p
mp
Perc. 1
(Sus. Cym.)
S
S
rub drumhead
slowly, creating
a smooth,
continuous sound
or
Perc. 2
(Bongos,
Toms)
ord.
mp
pp
Perc. 3
(Temple Blocks)
pp
Perc. 4
(Bass Drums)
Hrp.
G♭
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

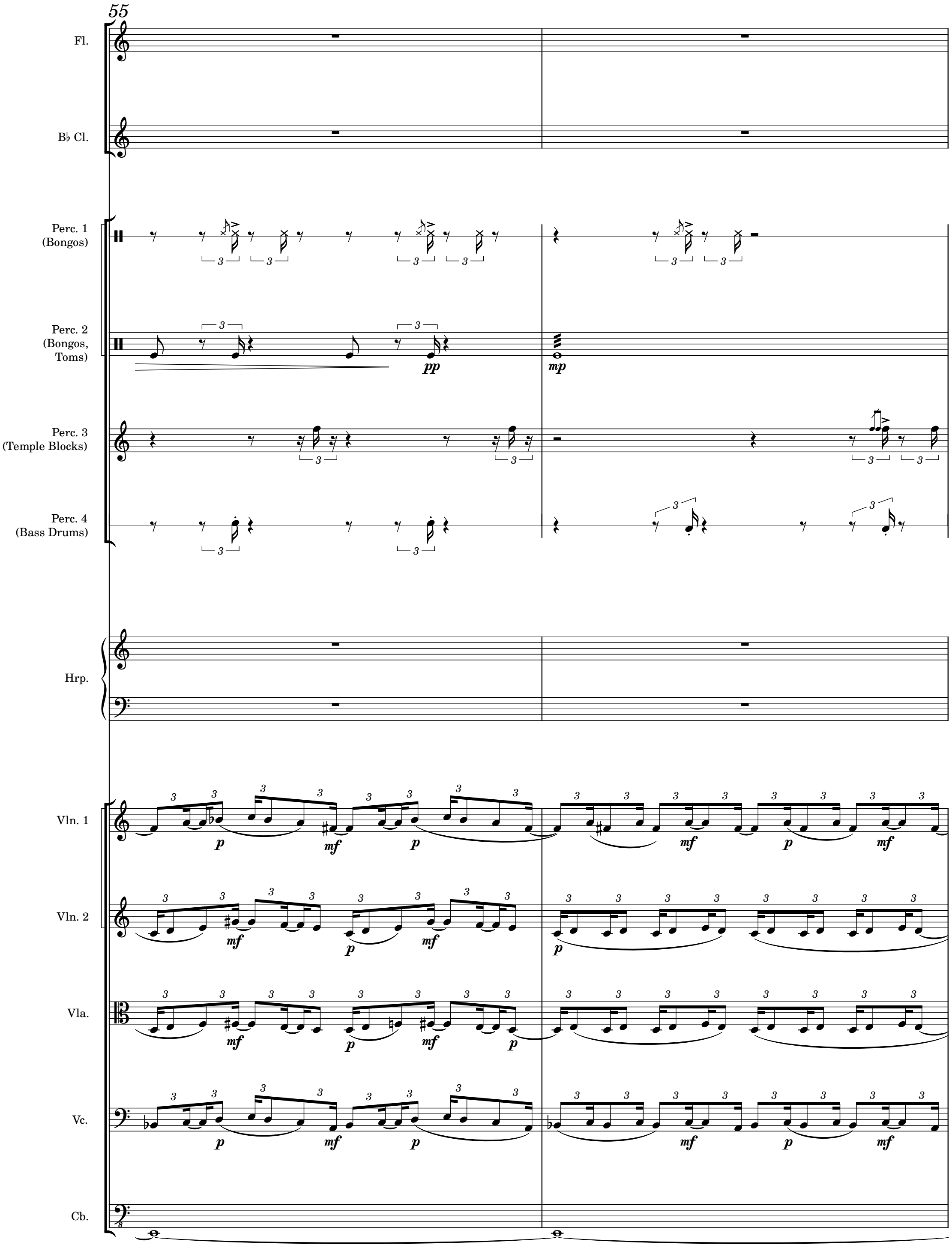

45
air
air
with wood tip, bottom of bell
bottom of bell
ord.
Fl.
B♭ Cl.
Perc. 1
(Sus. Cym.)
Perc. 2
(Bongos,
Toms)
Perc. 3
(Temple Blocks)
Perc. 4
(Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
pp
mp
ppp

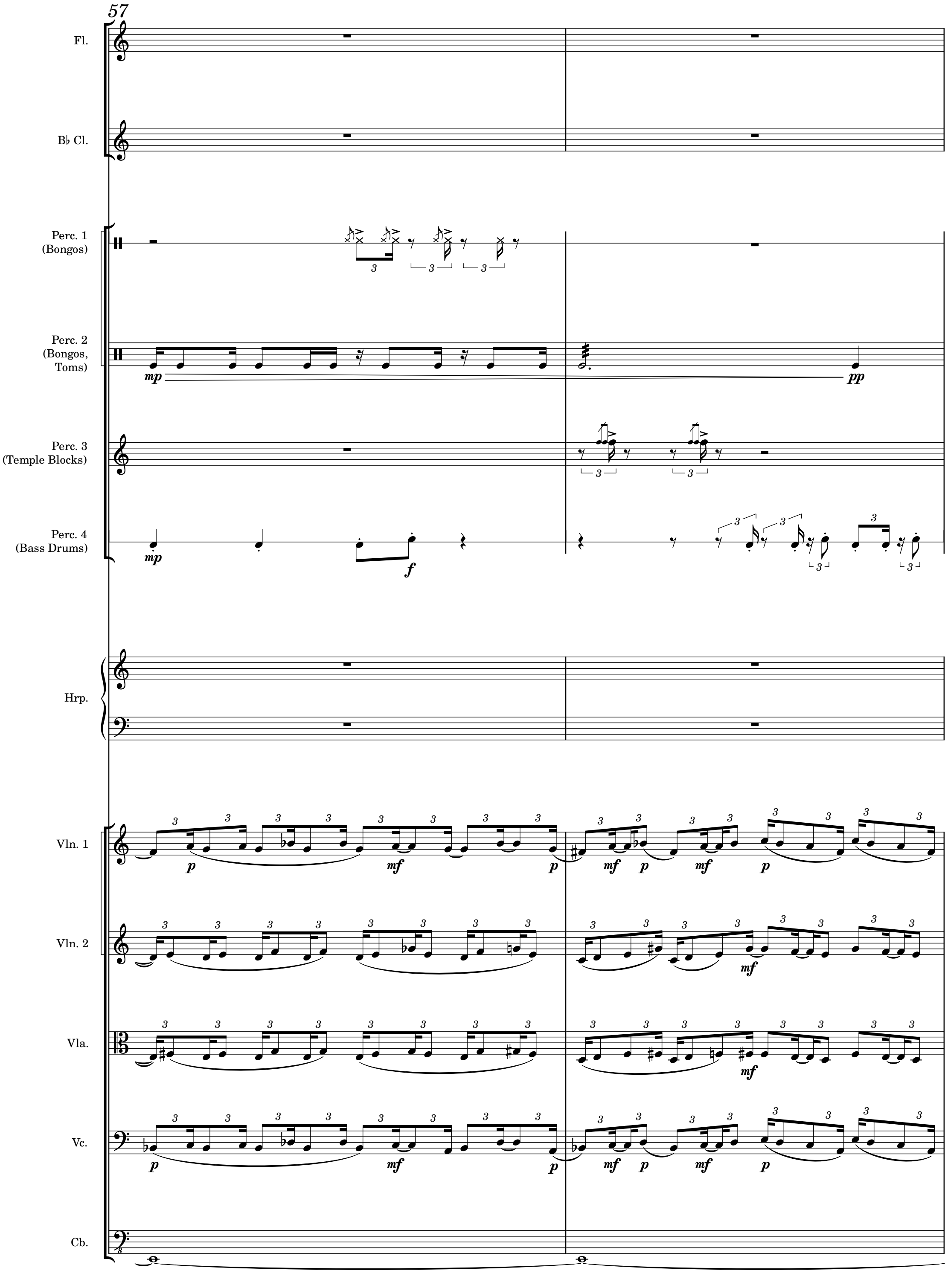

47
Fl.
Bb Cl.
Perc. 1
(Sus. Cym.)
Perc. 2
(Bongos,
Toms)
Perc. 3
(Temple Blocks)
Perc. 4
(Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
surface
f
mp
mf


B Dance-like and Boisterous
49
Fl.
B♭ Cl.
Perc. 1 (Bongos)
High Bongo
Perc. 2 (Bongos, Toms)
ord.
Medium Tom
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
ord.
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mp
f
pp
p
mf

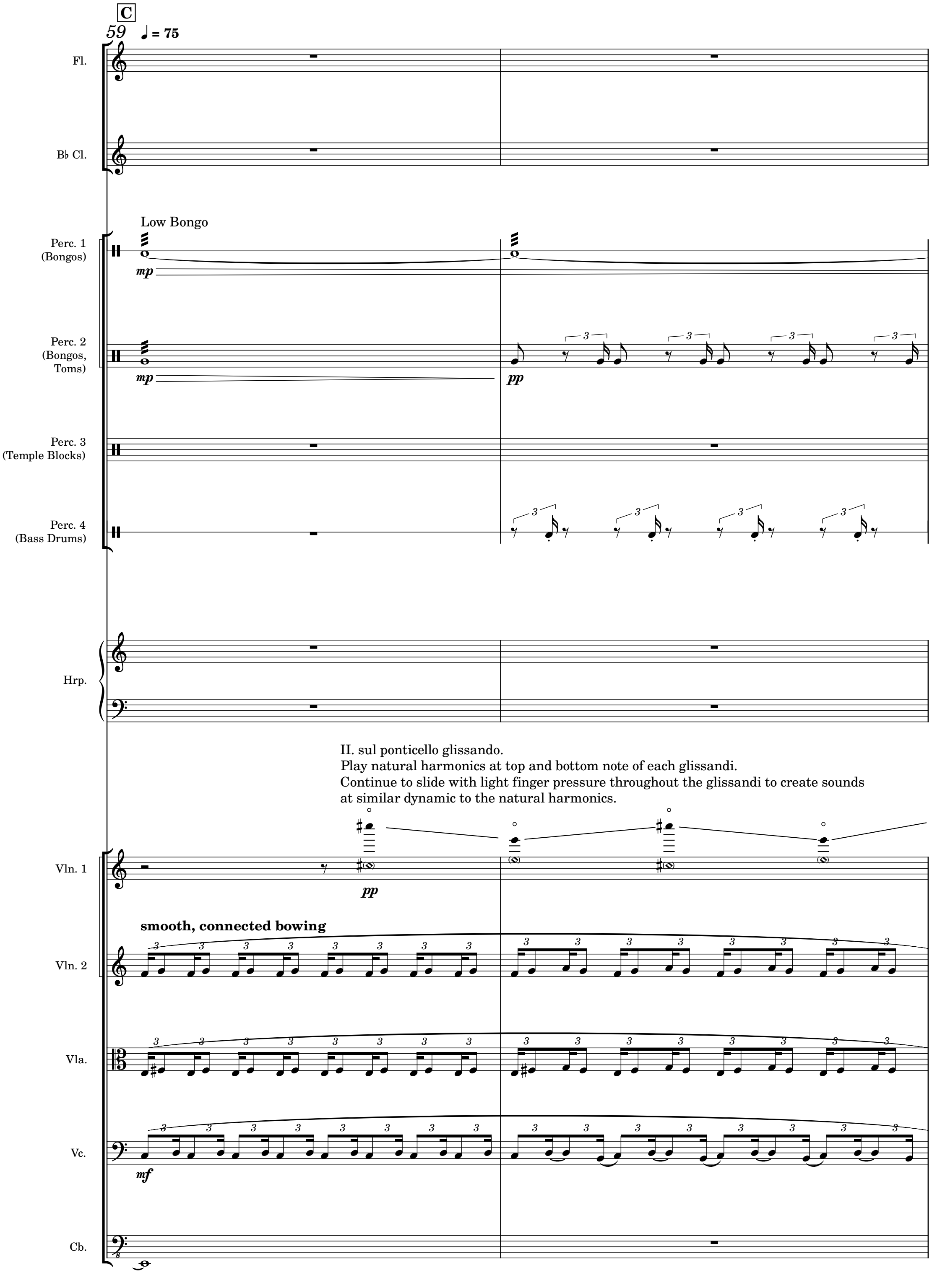

51
Fl.
B♭ Cl.
Perc. 1 (Bongos)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
f
mp
pp
mp
mp
f
mp
mp
f
mf
p
mf
p
p
mf
p
p
mf
p
mf
p
mf
p
p

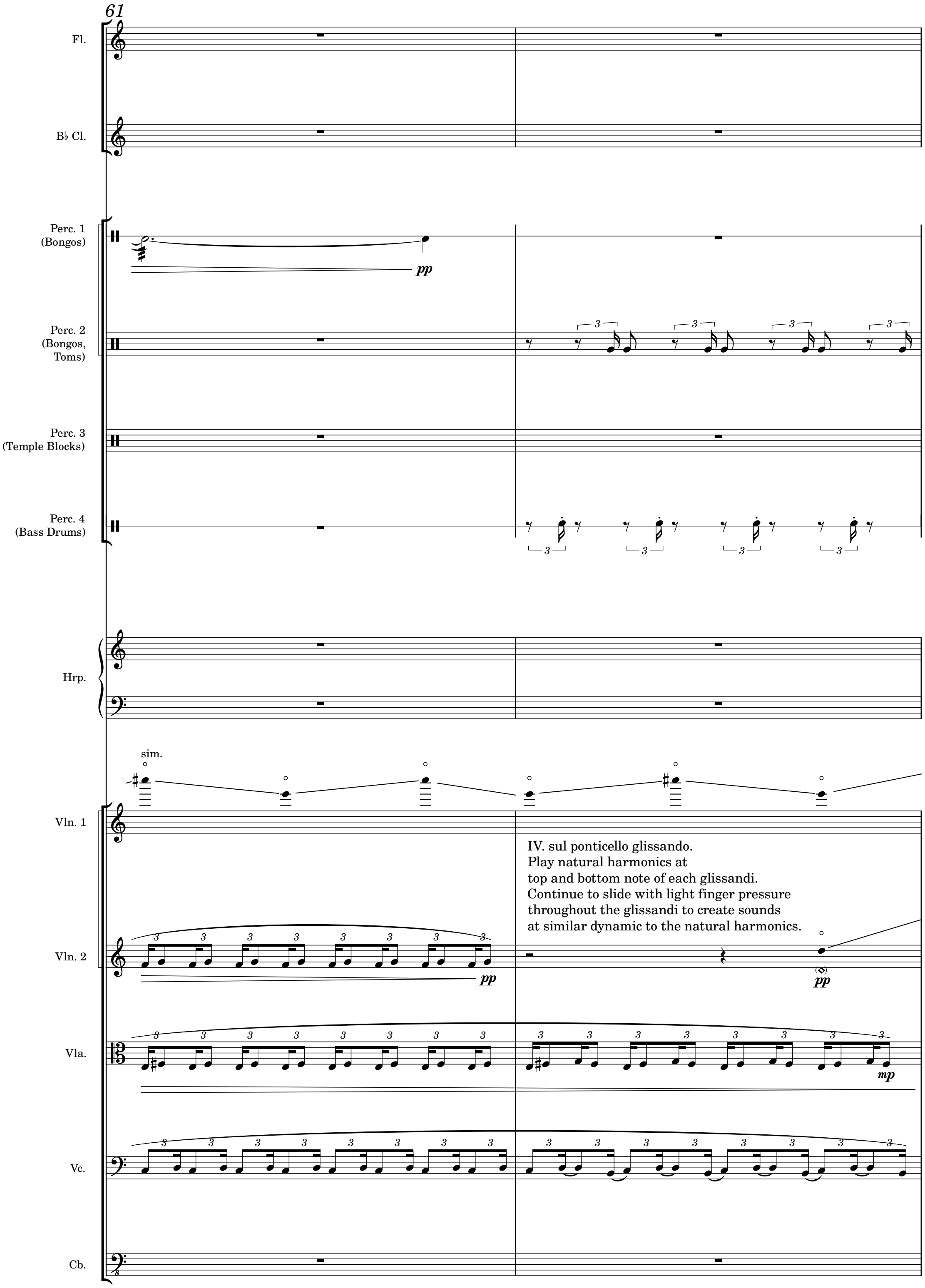

53
Fl.
B♭ Cl.
Perc. 1 (Bongos)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
mp
mf
p

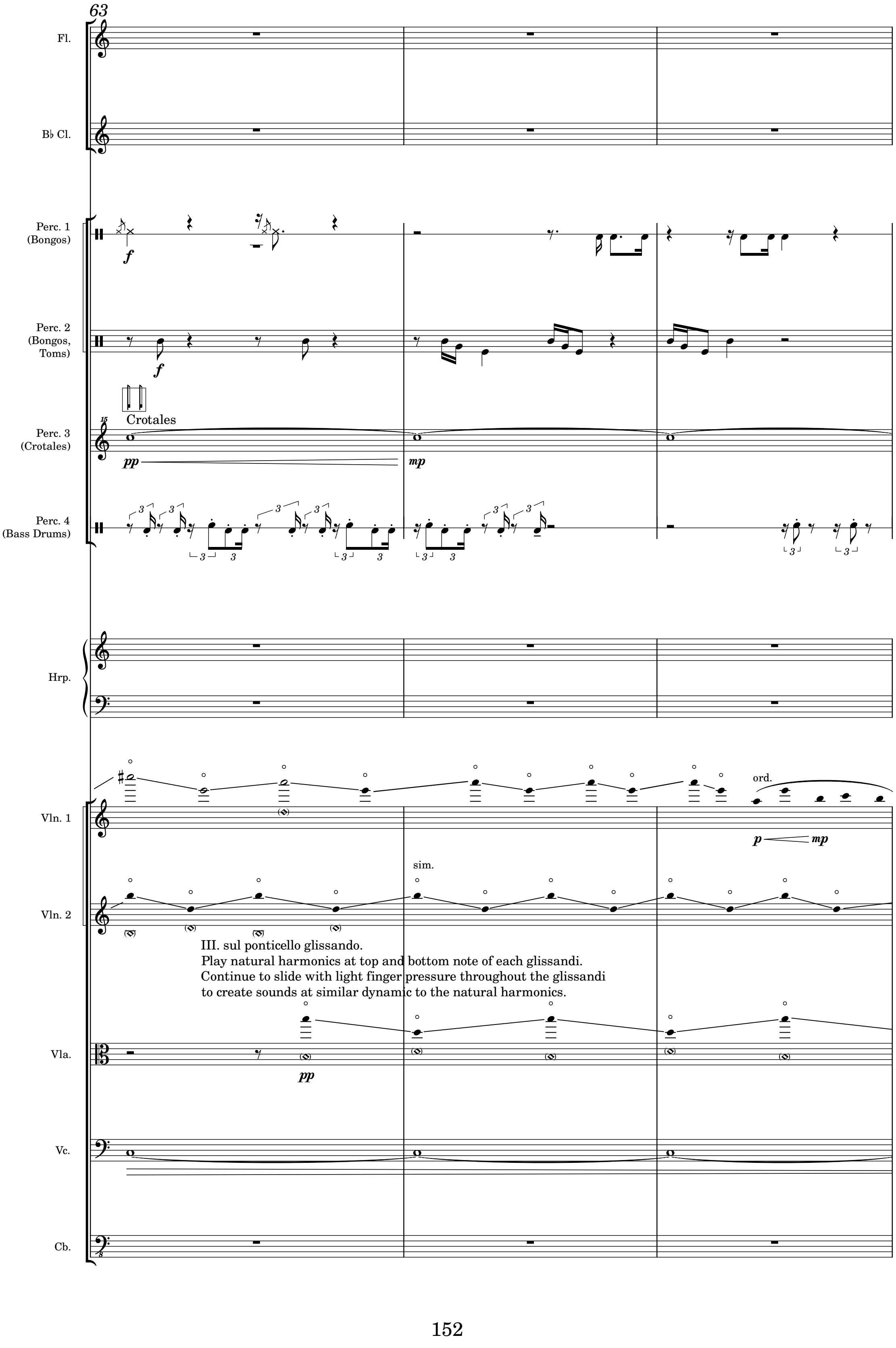

55
Fl.
B♭ Cl.
Perc. 1
(Bongos)
Perc. 2
(Bongos,
Toms)
Perc. 3
(Temple Blocks)
Perc. 4
(Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
3
pp
mp
p
mf



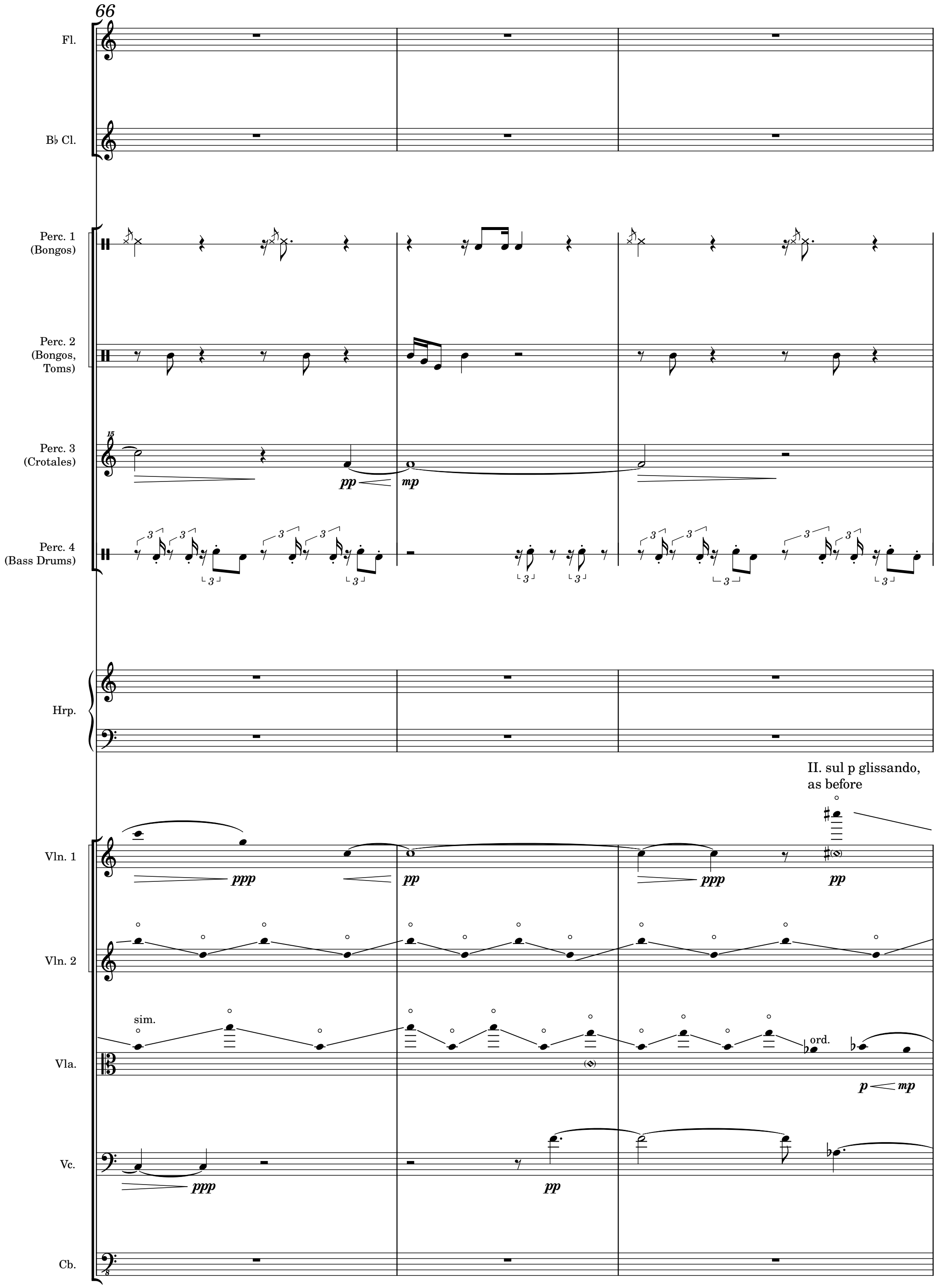
57
Fl.
B♭ Cl.
Perc. 1 (Bongos)
Perc. 2 (Bongos, Toms)
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mp
pp
f
p
mf
3

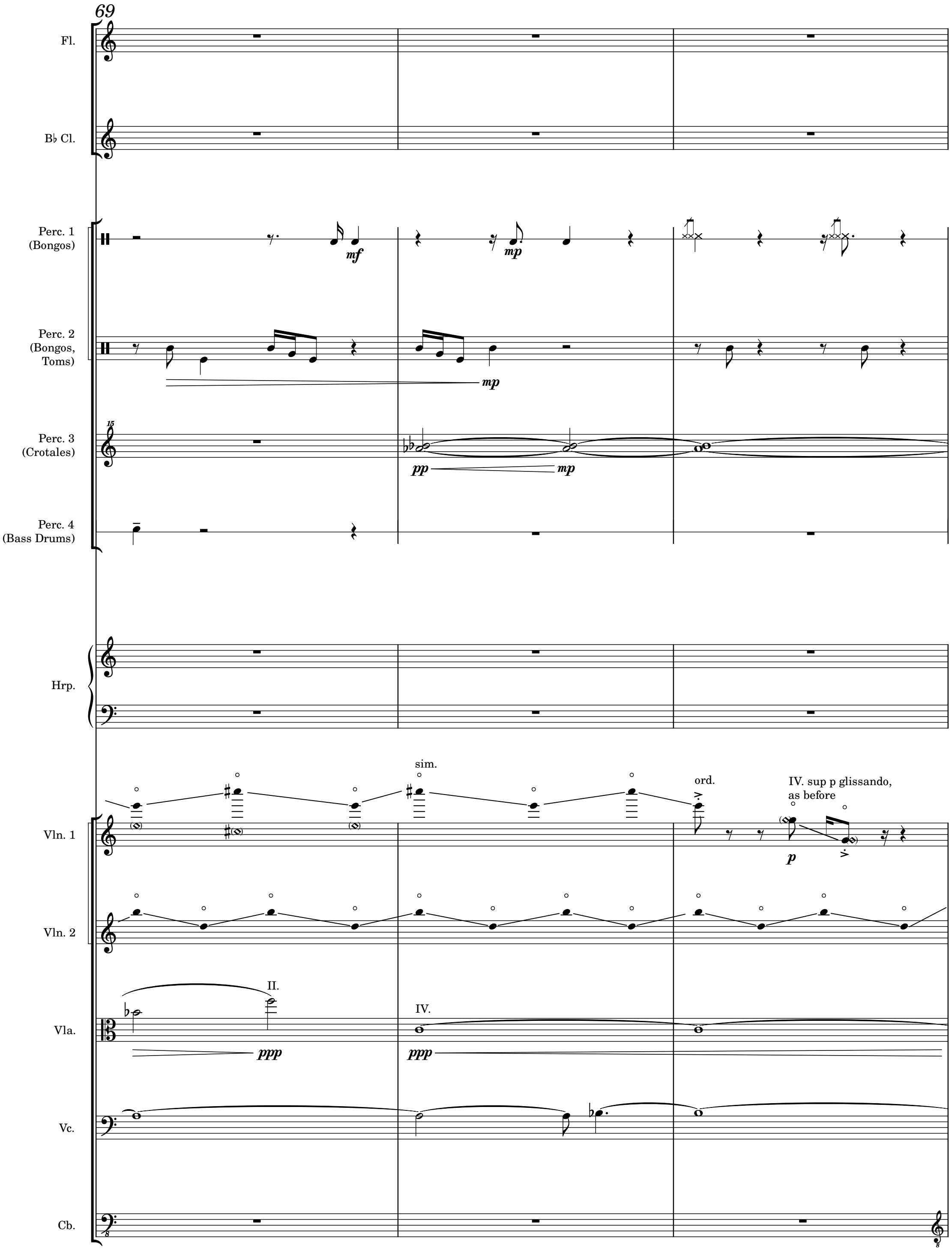

C
59
♩ = 75
Fl.
B♭ Cl.
Low Bongo
Perc. 1 (Bongos)
mp
Perc. 2 (Bongos, Toms)
mp
pp
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
3
Hrp.
II. sul ponticello glissando.
Play natural harmonics at top and bottom note of each glissandi.
Continue to slide with light finger pressure throughout the glissandi to create sounds at similar dynamic to the natural harmonics.
Vln. 1
pp
smooth, connected bowing
Vln. 2
Vla.
Vc.
mf
Cb.

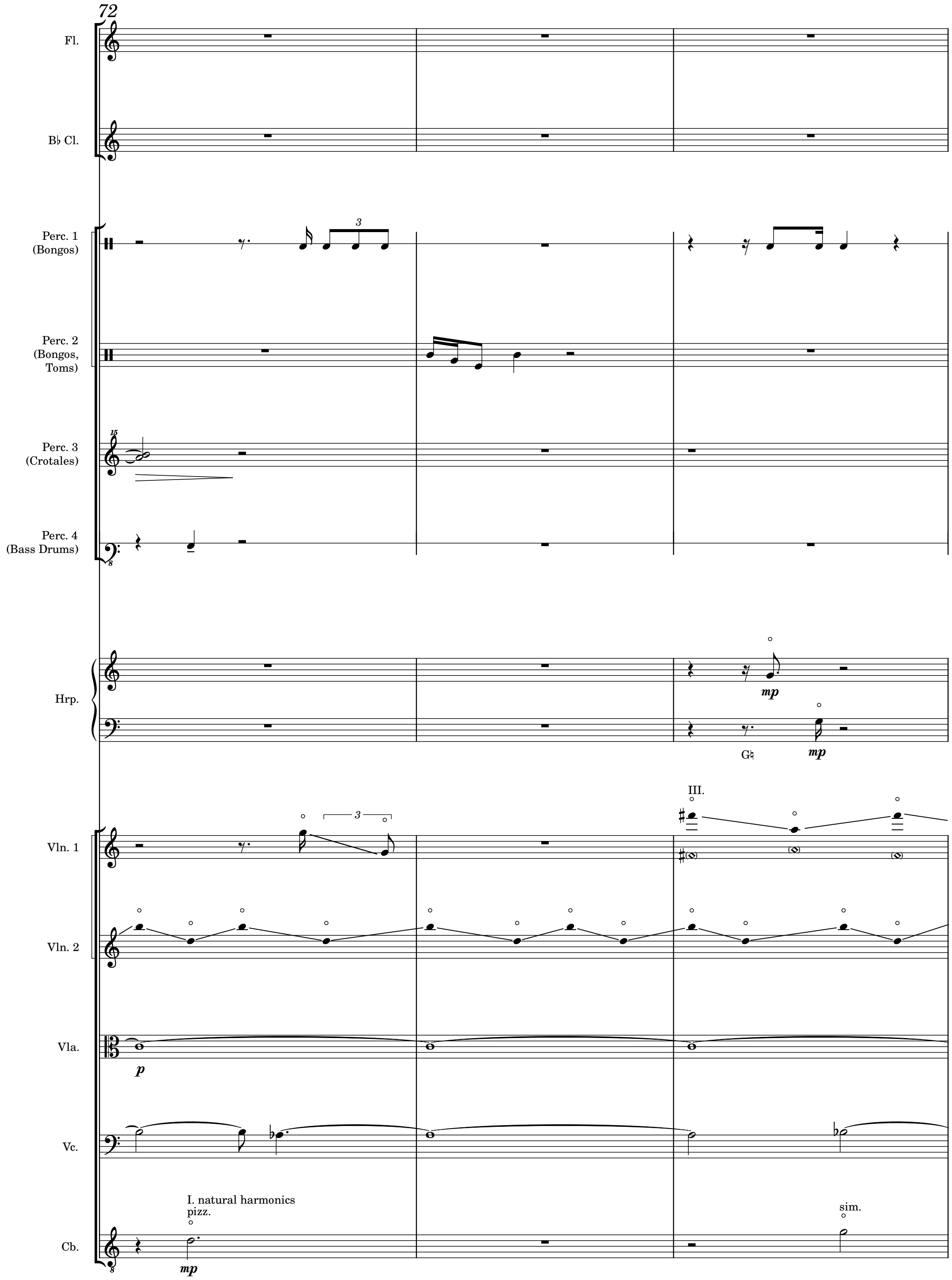

61
Fl.
B♭ Cl.
Perc. 1 (Bongos)
pp
Perc. 2 (Bongos, Toms)
3
Perc. 3 (Temple Blocks)
Perc. 4 (Bass Drums)
Hrp.
sim.
Vln. 1
IV. sul ponticello glissando.
Play natural harmonics at
top and bottom note of each glissandi.
Continue to slide with light finger pressure
throughout the glissandi to create sounds
at similar dynamic to the natural harmonics.
Vln. 2
pp
Vla.
mp
Vc.
Cb.

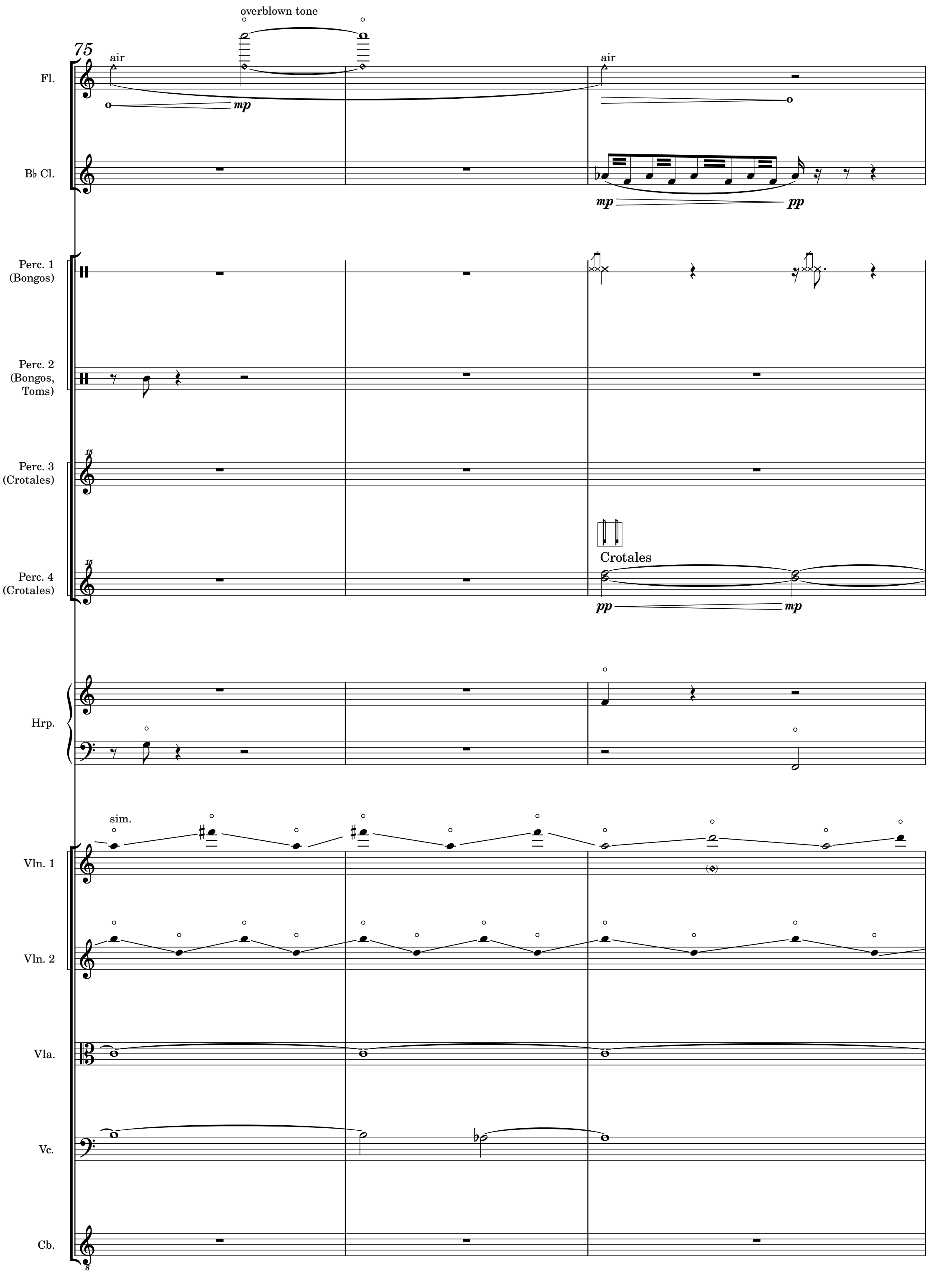

63
Fl.
B♭ Cl.
Perc. 1 (Bongos)
Perc. 2 (Bongos, Toms)
Crotales
Perc. 3 (Crotales)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
f
f
pp
mp
3
ord.
p
mp
sim.
pp

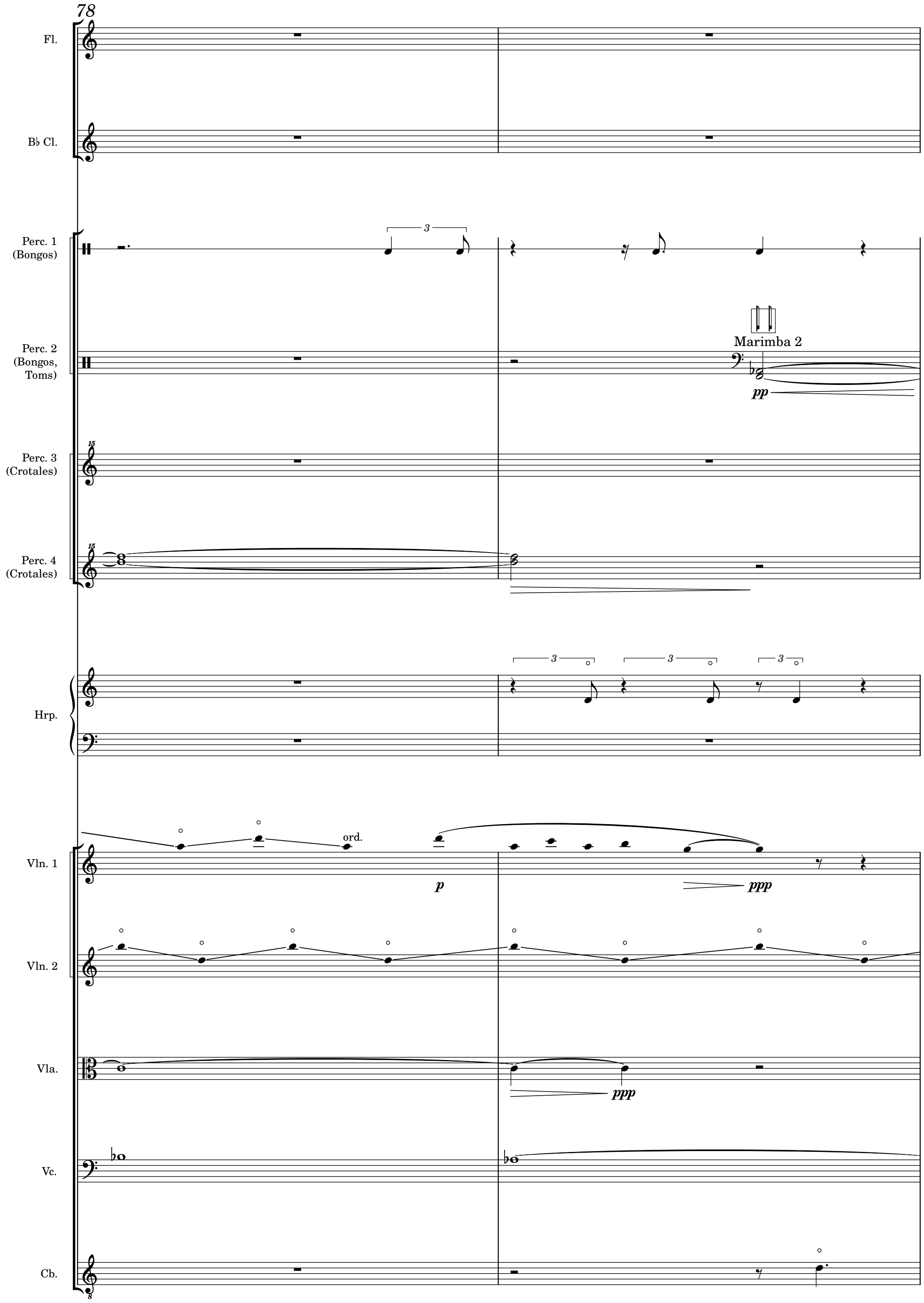
III. sul ponticello glissando.
Play natural harmonics at top and bottom note of each glissandi.
Continue to slide with light finger pressure throughout the glissandi
to create sounds at similar dynamic to the natural harmonics.

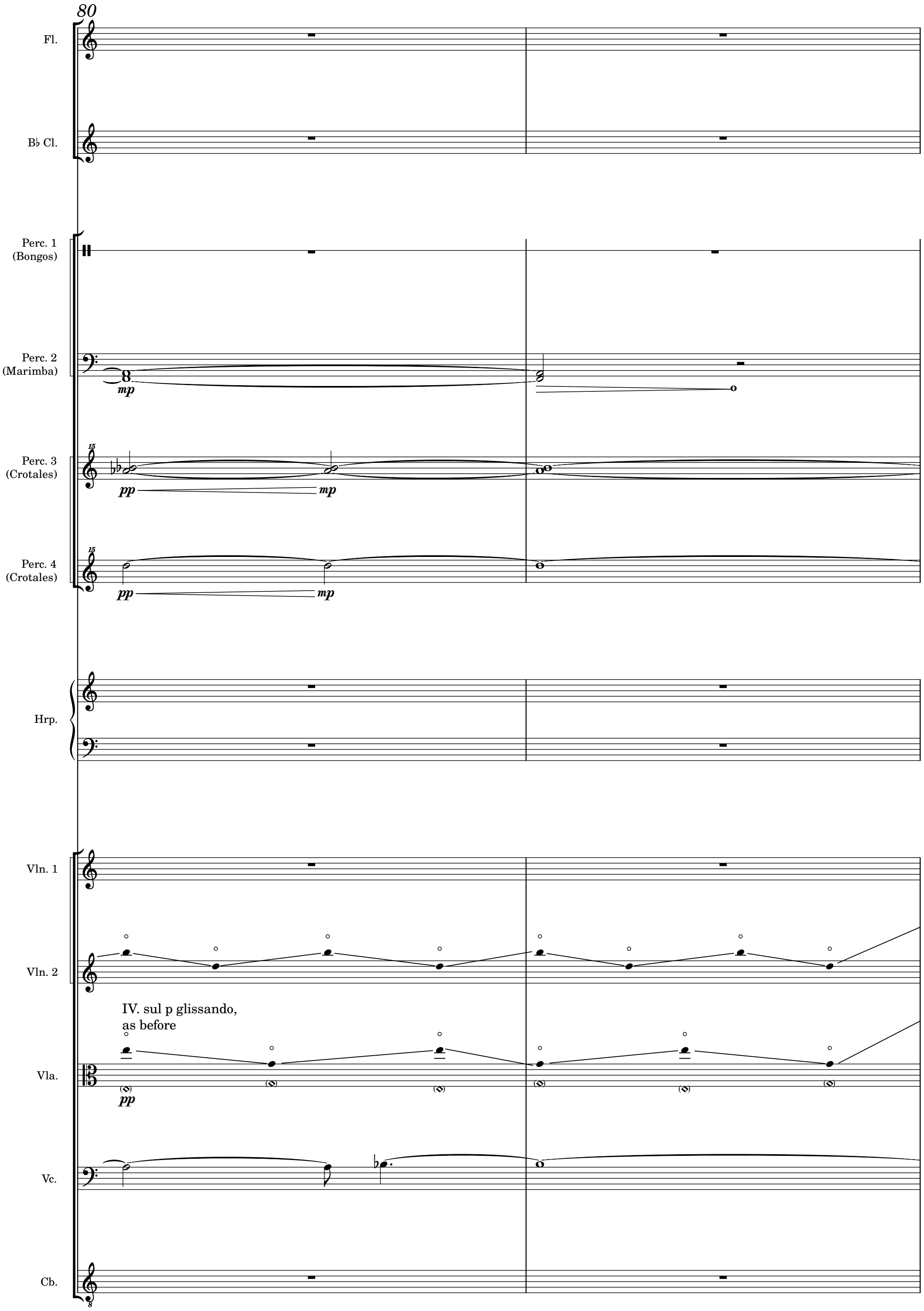

66
Fl.
B♭ Cl.
Perc. 1 (Bongos)
Perc. 2 (Bongos, Toms)
Perc. 3 (Crotales)
15
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
mp
ppp
pp
ppp
pp
II. sul p glissando, as before
sim.
ord.
p
mp
ppp
pp
3

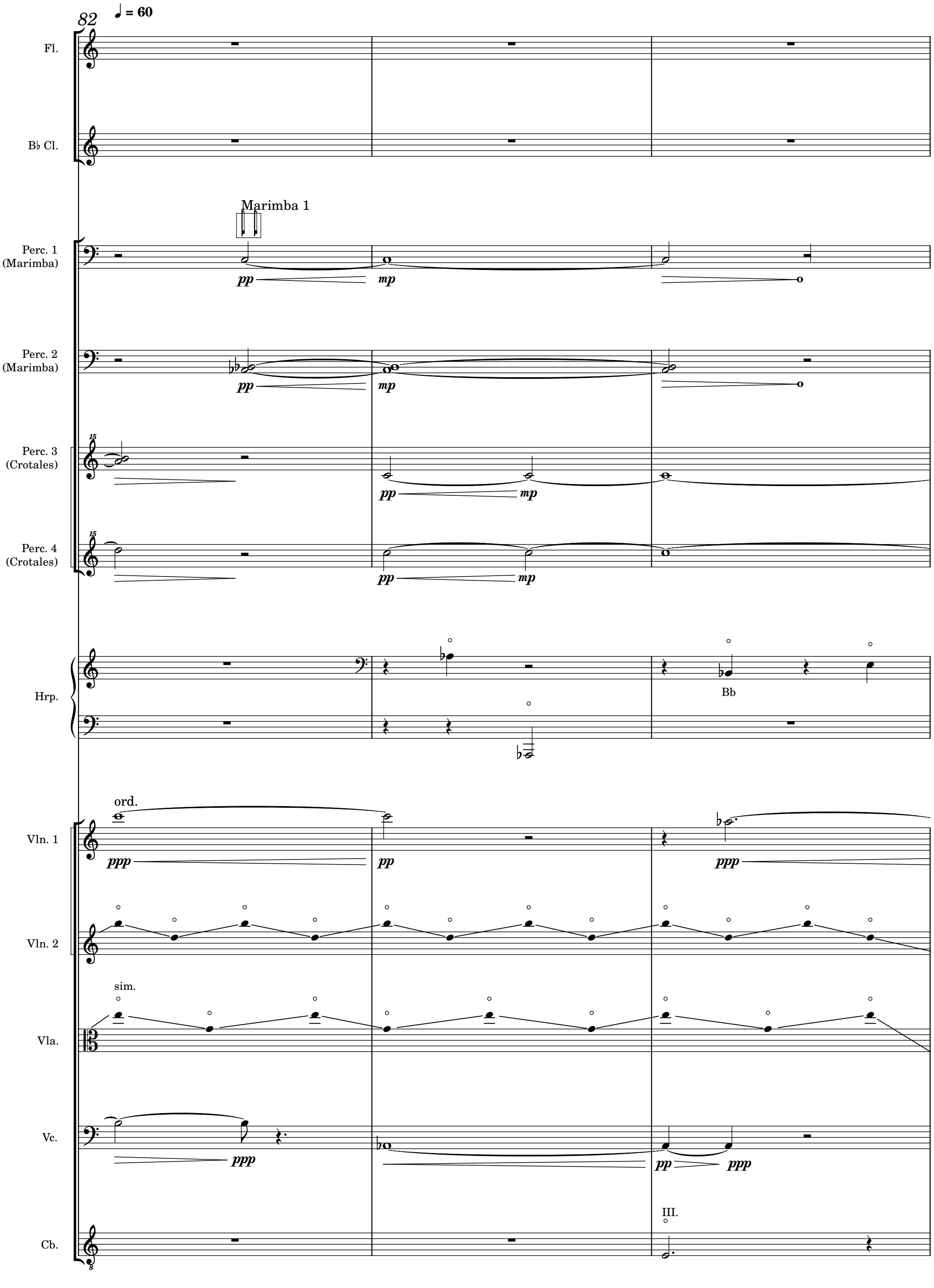

69
Fl.
B♭ Cl.
Perc. 1 (Bongos)
Perc. 2 (Bongos, Toms)
Perc. 3 (Crotales)
Perc. 4 (Bass Drums)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
mp
mp
pp
mp
sim.
ord.
IV. sup p glissando, as before
p
II.
IV.
ppp
ppp

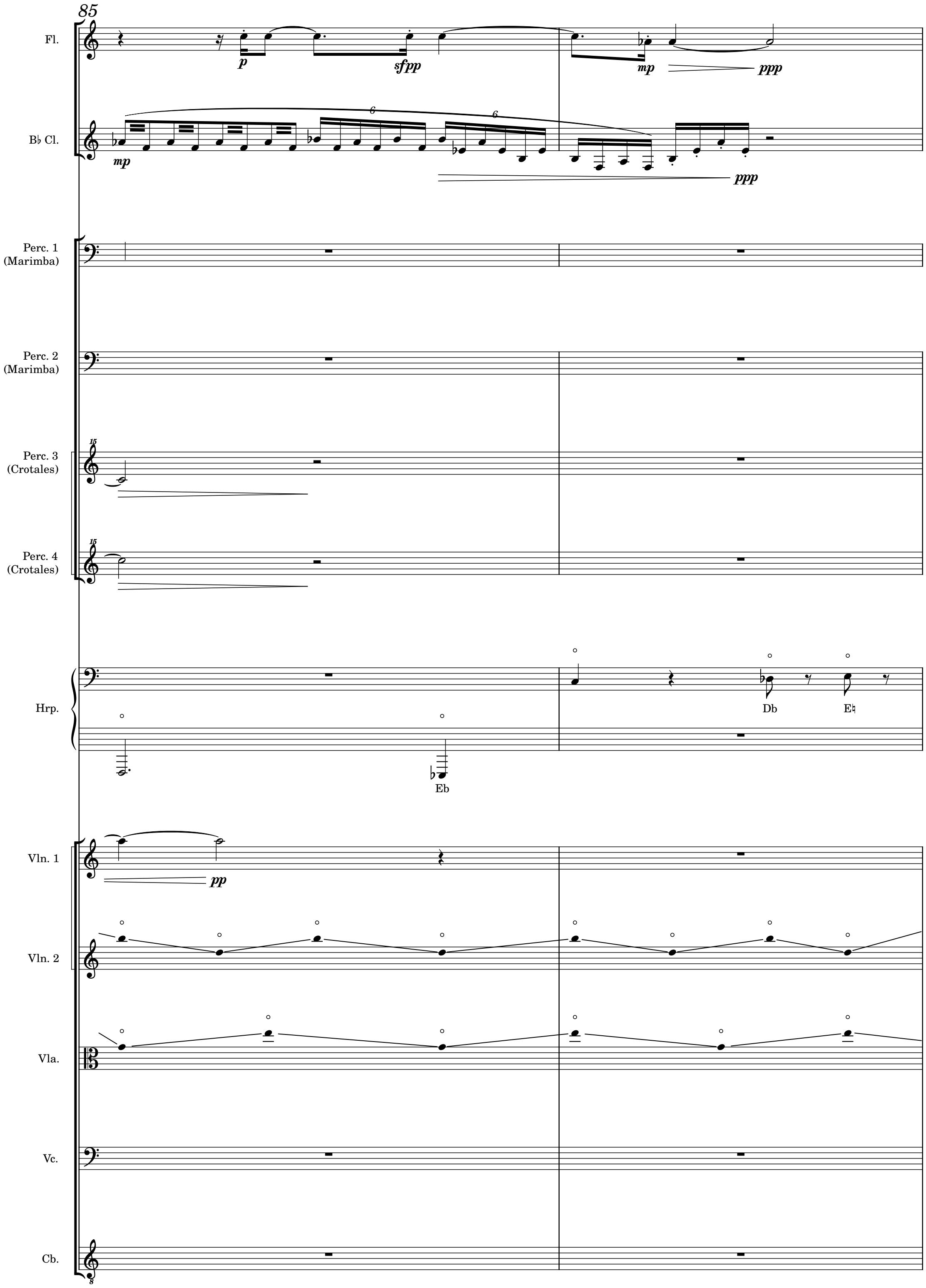

72
Fl.
B♭ Cl.
Perc. 1 (Bongos)
3
Perc. 2 (Bongos, Toms)
15
Perc. 3 (Crotales)
Perc. 4 (Bass Drums)
Hrp.
mp
G♮
mp
III.
Vln. 1
3
Vln. 2
Vla.
p
Vc.
I. natural harmonics
pizz.
sim.
Cb.
mp

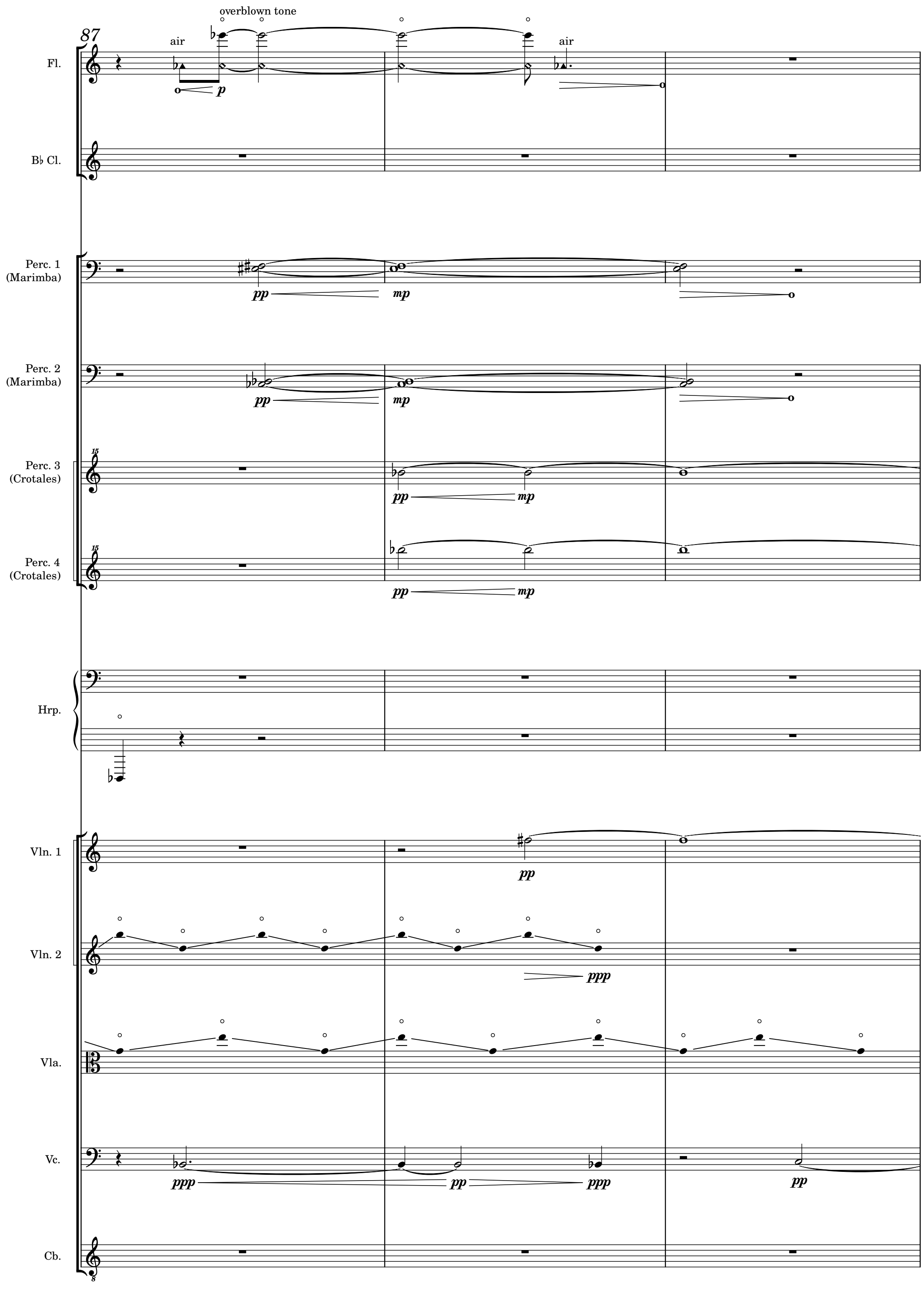

overblown tone
75
air
mp
air
Fl.
B♭ Cl.
mp
pp
Perc. 1
(Bongos)
Perc. 2
(Bongos,
Toms)
Perc. 3
(Crotales)
Perc. 4
(Crotales)
Crotales
pp
mp
Hrp.
sim.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

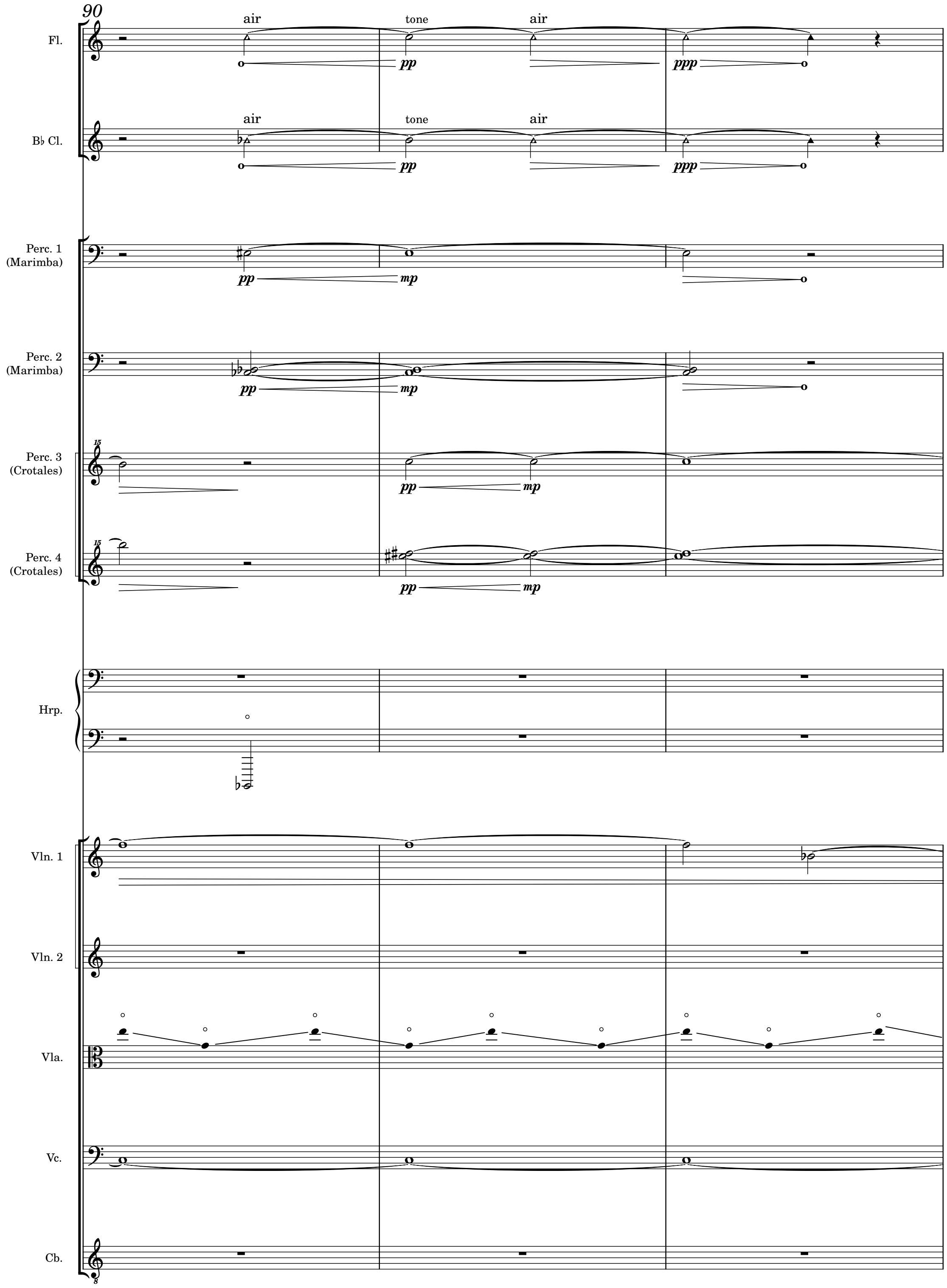

78
Fl.
B♭ Cl.
Perc. 1 (Bongos)
Perc. 2 (Bongos, Toms)
Perc. 3 (Crotales)
Perc. 4 (Crotales)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
Marimba 2
pp
ord.
p
ppp
ppp
3

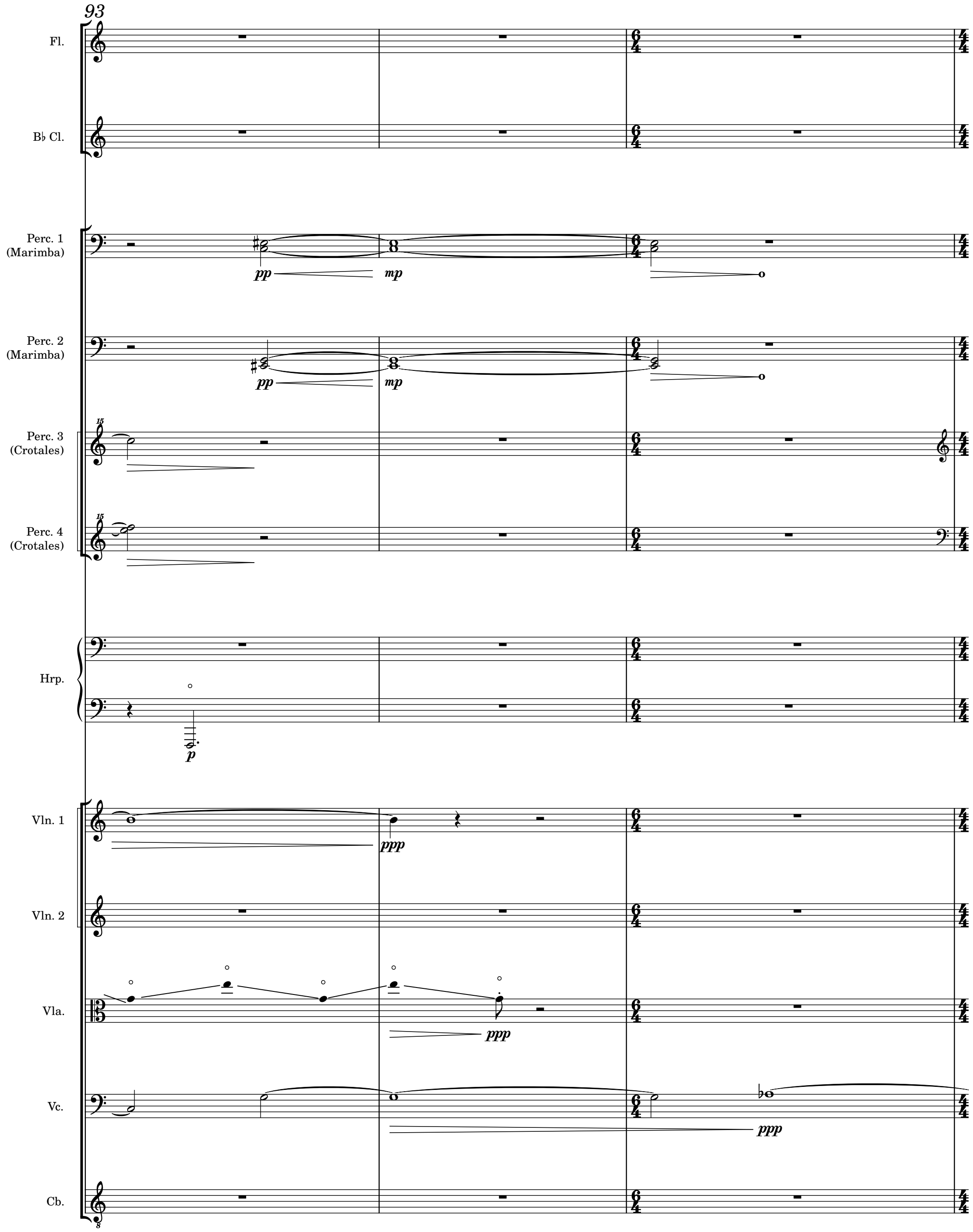

80
Fl.
B♭ Cl.
Perc. 1
(Bongos)
Perc. 2
(Marimba)
mp
Perc. 3
(Crotales)
15
pp
mp
Perc. 4
(Crotales)
15
pp
mp
Hrp.
Vln. 1
Vln. 2
IV. sul p glissando,
as before
Vla.
pp
Vc.
Cb.
8

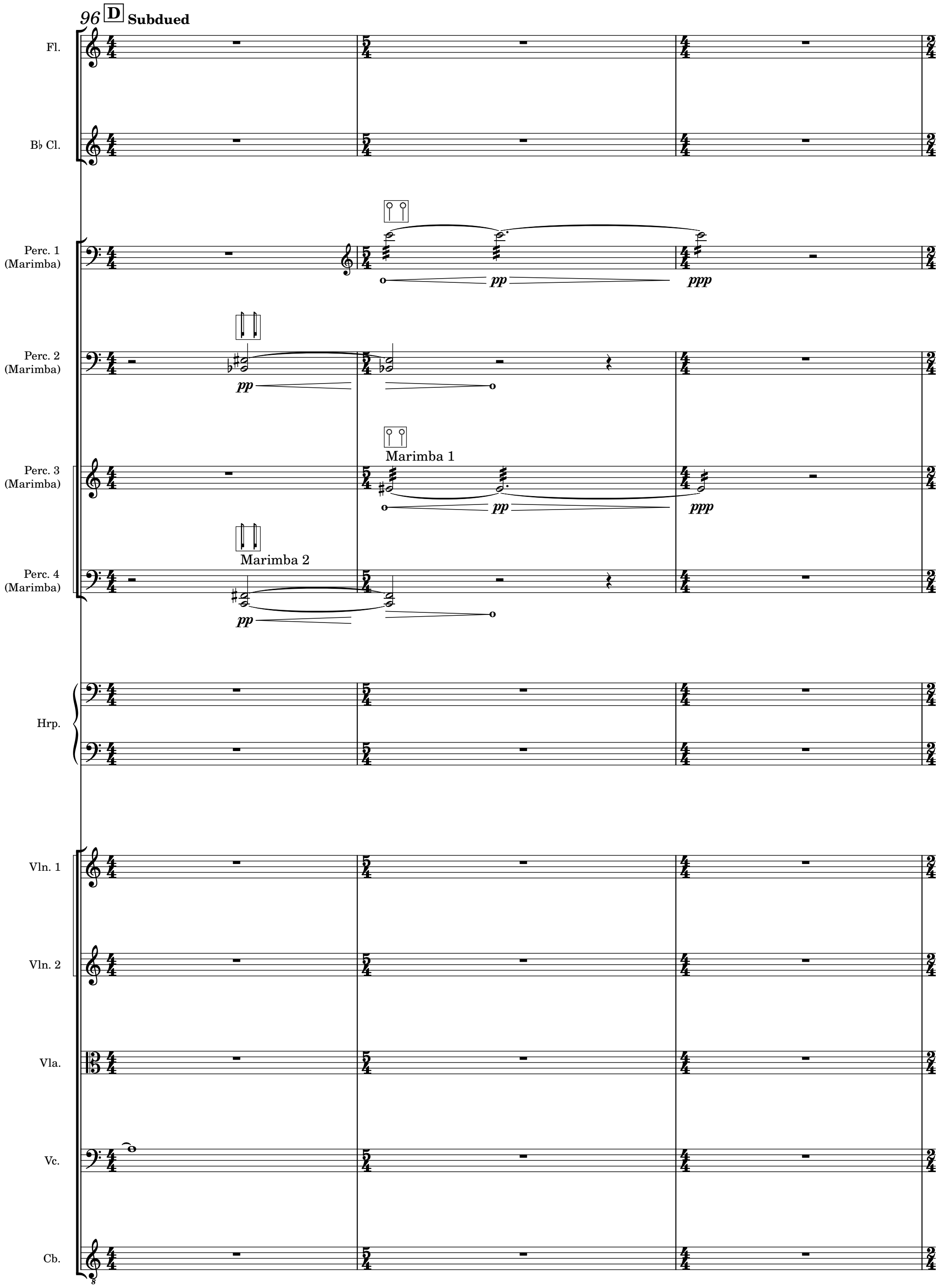

82
♩ = 60
Fl.
B♭ Cl.
Marimba 1
Perc. 1 (Marimba)
pp
mp
Perc. 2 (Marimba)
pp
mp
Perc. 3 (Crotales)
15
pp
mp
Perc. 4 (Crotales)
15
pp
mp
Hrp.
Bb
ord.
Vln. 1
ppp
pp
ppp
Vln. 2
sim.
Vla.
Vc.
ppp
pp
ppp
III.
Cb.

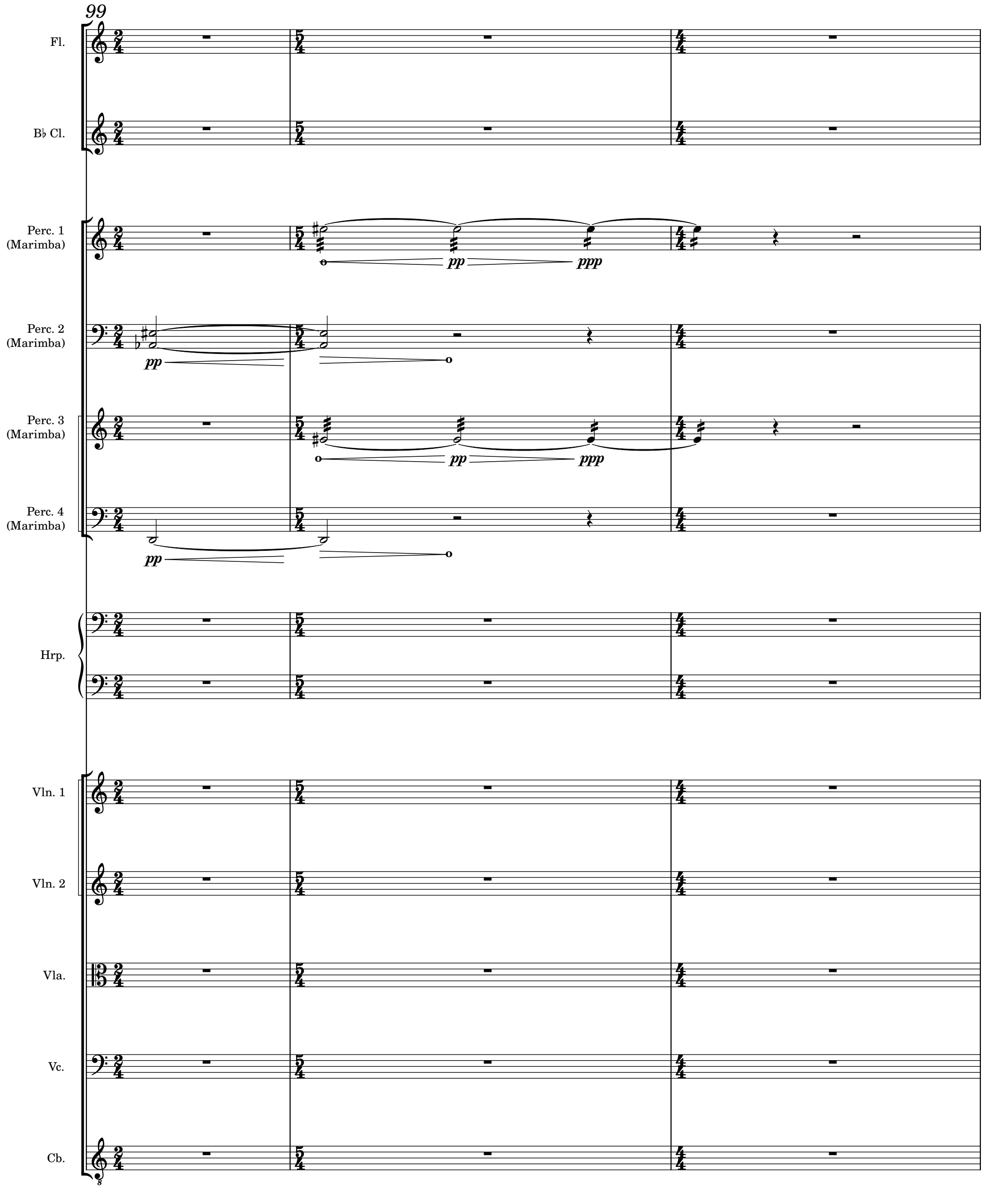

85
Fl.
p
sfpp
mp
ppp
B♭ Cl.
mp
6
6
ppp
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Crotales)
15
Perc. 4
(Crotales)
15
Hrp.
Eb
Db
E♮
Vln. 1
pp
Vln. 2
Vla.
Vc.
Cb.
8

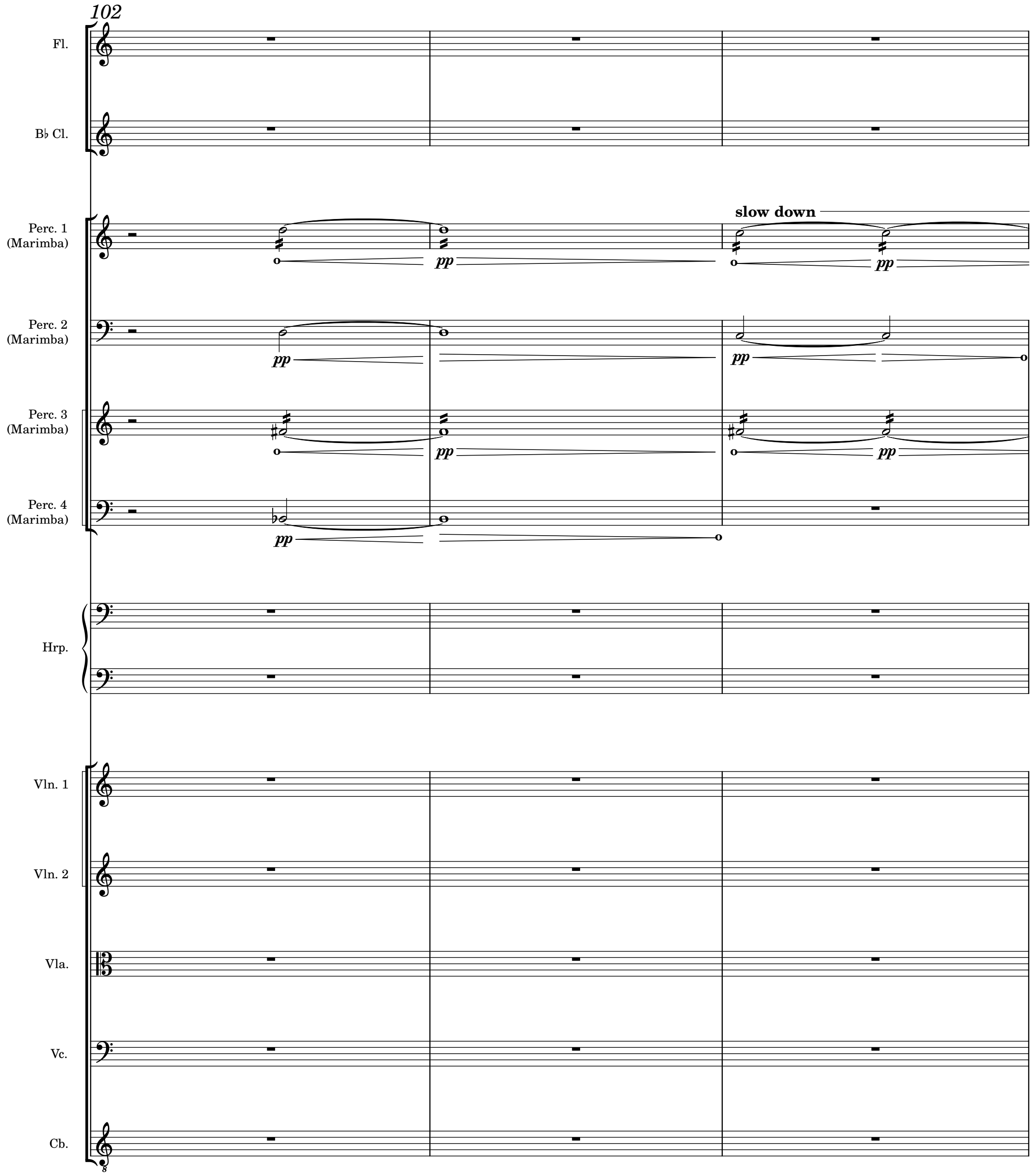

87
overblown tone
air
air
p
Fl.
B♭ Cl.
Perc. 1 (Marimba)
pp
mp
Perc. 2 (Marimba)
pp
mp
Perc. 3 (Crotales)
15
pp
mp
Perc. 4 (Crotales)
15
pp
mp
Hrp.
Vln. 1
pp
Vln. 2
ppp
Vla.
Vc.
ppp
pp
ppp
pp
Cb.
8

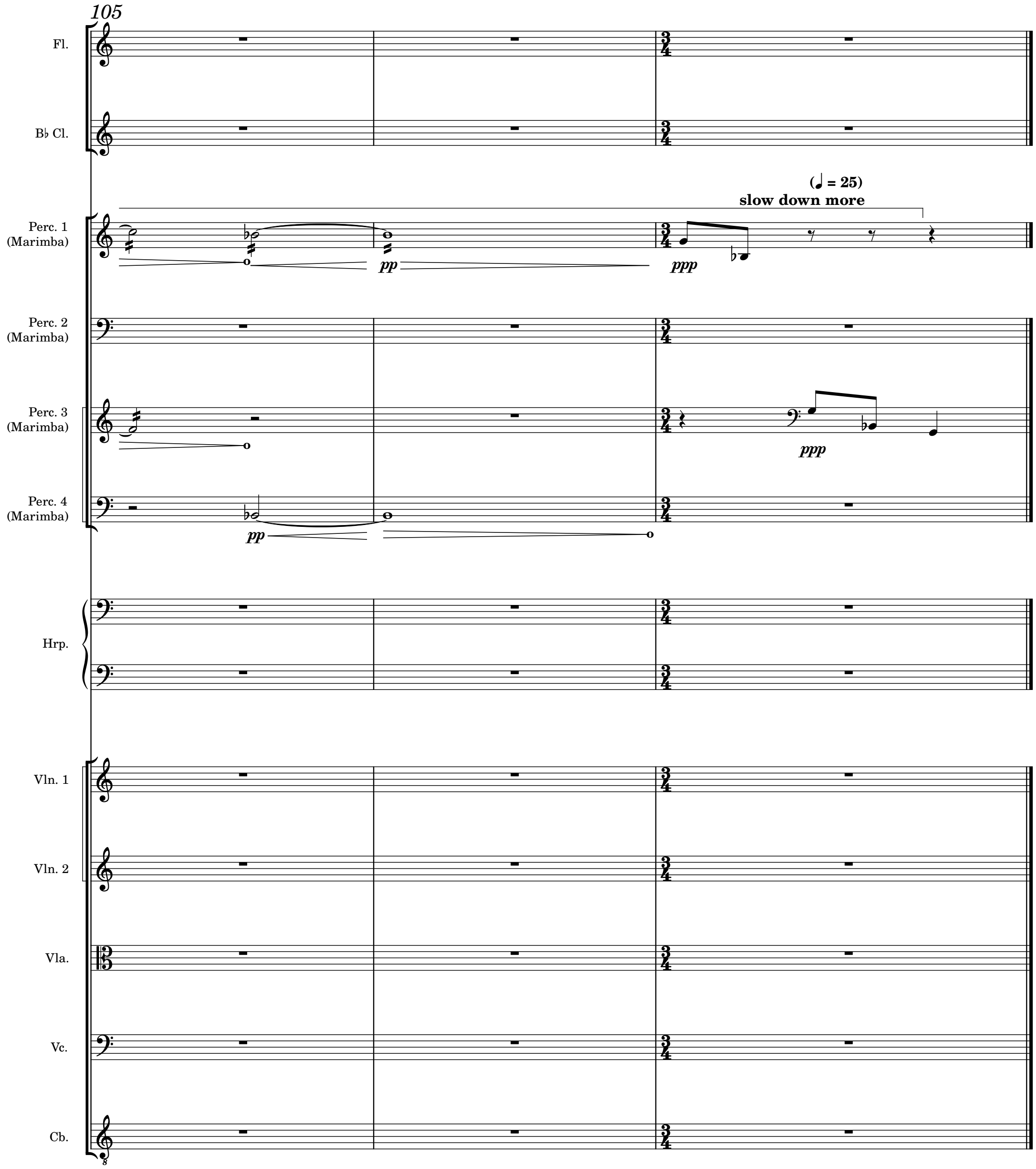

90
air
tone
air
air
tone
air
pp
ppp
pp
ppp
pp
mp
pp
mp
pp
mp
pp
mp
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Crotales)
Perc. 4
(Crotales)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.


93
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Crotales)
Perc. 4 (Crotales)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
mp
pp
mp
p
ppp
ppp
ppp


96
D
Subdued
Fl.
B♭ Cl.
Perc. 1
(Marimba)
pp
ppp
Perc. 2
(Marimba)
pp
Perc. 3
(Marimba)
Marimba 1
pp
ppp
Perc. 4
(Marimba)
Marimba 2
pp
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.


99
Fl.
B♭ Cl.
Perc. 1
(Marimba)
Perc. 2
(Marimba)
Perc. 3
(Marimba)
Perc. 4
(Marimba)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
ppp


102
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Marimba)
Perc. 4 (Marimba)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
slow down


105
Fl.
B♭ Cl.
Perc. 1 (Marimba)
Perc. 2 (Marimba)
Perc. 3 (Marimba)
Perc. 4 (Marimba)
Hrp.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
(♩ = 25)
slow down more
pp
ppp
ppp
pp

PART TWO: THESIS

Introduction

The natural movement of ocean waves and river currents is not uniform nor constant, as they crash and recede at different times and speeds. Internally, even our own breathing rate varies, which can affect our energy and emotions. "Ebb and flow" is a phrase that describes the recurring patterns of fluctuation within these systems, but it can also describe the dichotomy between death and birth, loss and love, struggle and resilience, and decay and growth. My composition *Ebb's Embrace, Fulfilling Flow* conveys these polarities through various rhythmic densities that rise and fall in tension and release. The three movements of the piece follow a theme-variation form, with introductory sections presenting thematic concepts that are developed and varied upon in subsequent sections.

Each movement's theme was inspired by three solo sketches that I wrote in 2020, one each for marimba, viola, and harp. Each sketch was developed further for strings (two violins, viola, cello, contrabass, and harp), winds (flute and Bb clarinet), and percussion. Four percussionists are responsible for pitched percussion instruments like marimbas and crotales, and unpitched metallic instruments (cymbals, brake drum, cowbell), drums (bongos, toms, bass drums), and temple blocks.

The theme of the first movement, "Rippling Riffles," is introduced in the opening section and varied throughout the movement. It explores the management of various rhythmic subdivisions and note density, highlighting the unique rhythmic personalities of each instrument's part. Some sections feature a sparse texture with a gradual increase in note density, while others start with a dense texture and gradually simplify. These changes in note density can occur with or without changes in tempo, impacting the overall feel and energy of the music. In Chapter 1, I discuss my use of rhythmic subdivision groupings and pizzicato phrasing in "Rippling Riffles," inspired by similar concepts found in György Ligeti's *String Quartet No. 2* (1968) and Witold Lutosławski's *Livre pour Orchestre* (1968). I analyze my work's rhythmically unified cadential phrases that contrast with the rhythmically diverse material found throughout the movement.

The second movement, "Pulling on Heartstrings," explores different levels of rhythmic and textural consonance and dissonance through the use of string techniques and bow placements. The viola and cello provide the base tempi and meter for the ensemble, while other instruments play at different speeds. Various motifs and performance techniques, such as pizzicato and tremolo, create unique sound textures and contribute to the contrast of consonance and dissonance. The use of different bow placements produces different sonorities, with sul tasto creating a delicate sound and sul ponticello creating a metallic sound. In Chapter 2, I discuss my usage of Python coding in order to compose the majority of "Pulling on Heartstrings," and my meterless score structures inspired by compositions from Michiyo Mamiya and Gérard Grisey. I dissect my pitch sets and instrument pairings within specific time intervals, harmony and rhythm within repeating cycles, time bracketed vs. time signatured measures, and stemmed vs. stemless notation. I reflect on advanced coding concepts to be used in future works, and broad motivic comparisons to Edgard Varèse's *Integrales* (1925).

The piece's final movement, "Bounds on the Crest," imitates the structure of ocean waves. It starts with small wave crashes represented by abrupt block chords and fades away via slow arpeggiations. The movement explores techniques such as arpeggiation, glissandi, and long note decay to create intricate melodies and harmonies. Multiple percussion instruments and percussive performance techniques are used to create a variety of musical textures that evolve and grow towards a climactic apex before receding back to a calm state. In Chapter 3, I reflect on the conceptual connections to traditional Sundanese presentational dance found in "Bounds on the Crest." I summarize my research of the history of Sundanese gamelan drumming notation and how I applied my findings to this movement's percussion notation style. I discuss my inspirations from the motifs and instrumentation of Xenakis' percussion solo *Rebonds* (1987), and from the open glissando harmonics from the end of Ligeti's *String Quartet No. 1* (1953-54). I analyze my usage of three chord types (tension, bridge, and release chords) as well as air and tone sounds from the winds, and how these concepts fit into the overarching theme of the movement.

CHAPTER 1: RIPPLING RIFFLES

The themes for “Rippling Riffles” are introduced in the movement’s Intro section and subsequently varied throughout the rest of the movement. One of the central themes of this movement is the management of various rhythmic subdivisions (i.e., how a musical beat is divided into smaller units). Each instrument in the ensemble carries its own subdivision, typically distinct from the other instruments’ subdivisions. At times, instruments frequently change subdivisions within a single measure, while other times they maintain a static subdivision throughout entire sections. The contrast between these approaches adds an interesting layer of complexity to the music, while also highlighting the unique rhythmic personalities of each instrument's part.

Another important theme of “Rippling Riffles” is the gradual increase or decrease in note density (i.e., the number of musical notes played within a given time frame). Some sections begin with a sparse texture, featuring only a few notes at a time, but gradually build in density as additional notes are added over time. Other sections start with a dense texture and have fewer notes over time. These changes in note density can occur with or without corresponding changes in tempo, which also have a significant impact on the overall feel and energy of the music .

The Intro section is dominated by chord progressions played by the two marimbas. The marimbas are played smoothly and connectedly, almost like they are a single instrument. Various unpitched metal percussion instruments are used throughout the Intro. The cowbell and brake drum are initially played before transitions are made to various cymbals. Along with the winds, strings, and harp, the unpitched percussion instruments play auxiliary roles that support the transitions in the marimba chord progressions. Each instrument has its own unique rhythmic subdivision throughout the section. The Intro begins with gradual, hairpin-like tempo changes. However, as the music matures, changes in note density span longer musical phrases and utilize steeper tempo changes and more instruments.

In Section A, the music transitions away from the thematic material led by the marimbas, and the strings begin to take the forefront. As the marimbas slowly fade away, a descending melody is played by the strings. However, instead of playing within a fixed rhythmic pattern, each string instrument has a unique subdivision for every quarter note. This results in a smoothly flowing and interweaving melody that resembles distinct water currents flowing together in the same stream.

Sections B, C, and D represent an extended version of the tempo changes from the main theme, with the focus shifting primarily to the strings. These sections continue to explore the contrasts between fluid and static subdivisions. In Section B, the strings alone are featured. Unlike the Intro, however, note density increases through changes to subdivisions rather than through tempo changes. The note density gradually increases from stacked subdivisions of 3, 4, and 5 to subdivisions of 8, 9, and 10. Section B ends in a cadential rhythmic unison, the first unison thus far in this movement.

Section C serves as the climax of “Rippling Riffles,” with the strings gradually increasing their note density while decreasing their dynamic level from very loud (*ff*) to very soft (*ppp*). In contrast to Section B, the rhythmic subdivisions change less frequently, and each string instrument plays within its own unique subdivision. Each string instrument gradually fades away, starting with the high strings until only the contrabass remains.

Section D is string-dominant and performed with pizzicato technique. The entire section gradually decreases in note density as the frequency of rests increases. The subdivisions per instrument change every measure. Previously in the movement, instruments typically played a note on every subdivision. However, in this section, the strings typically only play a note on half of the subdivisions. This creates a fractured sound and breaks with the steady current of notes that was previously experienced in the movement. The marimbas, winds, and harp play auxiliary roles as they did in the Intro. As “Rippling Riffles” comes to an end, the string pizzicato notes become sparser, resembling the tempo hairpins from the Intro. The piece ends with a cadential rhythmic unison similar to the one at the end of Section B.

Intro: Theme

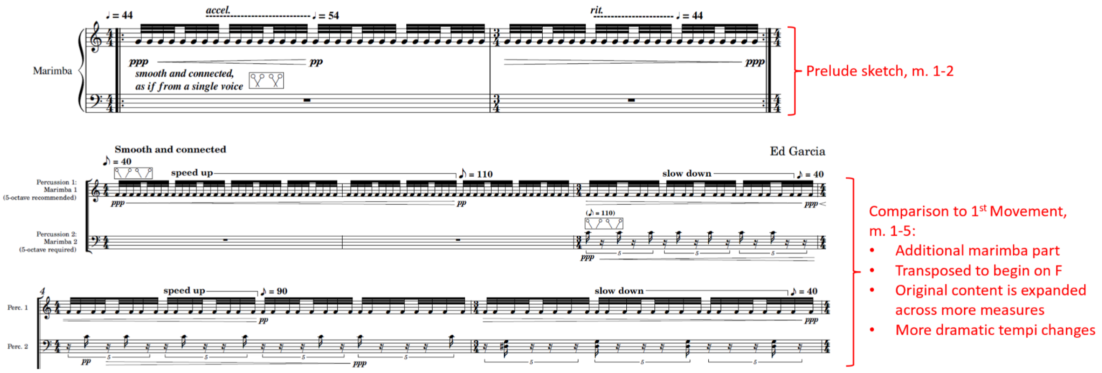
Construction of Marimba Parts

The first marimba part was inspired by an earlier sketch I wrote in a UCSC composition seminar. The seminar assignment was to compose a marimba solo for percussionist Chris Froh, who then read, recorded, and provided feedback on it (Garcia, audio 2020a). The sketch was titled *Prelude and Dance*, and the *Prelude* portion is the source material for the first marimba part in “Rippling Riffles.” It features the same chord progression and temporal shifts that are thematic across “Rippling Riffles.”

The *Prelude* sketch differs from the “Rippling Riffles” version in a few significant ways. First, the sketch began on the note G and ended on A, and “Rippling Riffles” is transposed to begin on F and end on G. This was a deliberate compositional choice, as I wanted the Intro section to end with G. Second, the “Rippling Riffles” chord progression transitions between chords at a slower rate than in the sketch. This change was made to accommodate a second marimba line. Lastly, the “Rippling Riffles” version contains slower tempi used for departures/arrivals in the temporal hairpins (see Figure 1).

Cadence from Winds, Strings, and Marimba

The winds contribute sustained notes, which contrasts with the other instruments’ highly percussive, rhythmically dense phrases that are present throughout the section. In measures 16-17, both wind instruments play long trills that gradually transition from one trill speed to another. Figure 2 serves as another example of the movement's motif of gradual changes in note density, but this time the flute (upper part) becomes sparser while the clarinet (lower part) becomes denser.


♩ = 44
accel.
♩ = 54
rit.
♩ = 44
Marimba
ppp
pp
smooth and connected,
as if from a single voice
ppp
Smooth and connected
♪ = 40
speed up
♪ = 110
slow down
♪ = 40
Ed Garcia
Percussion 1:
Marimba 1
(5-octave recommended)
Percussion 2:
Marimba 2
(5-octave required)
ppp
pp
ppp
(♪ = 110)
ppp
4
speed up
♪ = 90
slow down
♪ = 40
Perc. 1
Perc. 2
pp
ppp
pp
ppp

Prelude sketch, m. 1-2

Comparison to 1st Movement, m. 1-5:

- Additional marimba part
- Transposed to begin on F
- Original content is expanded across more measures
- More dramatic tempi changes

Figure 1, Evolution of marimba part in opening section

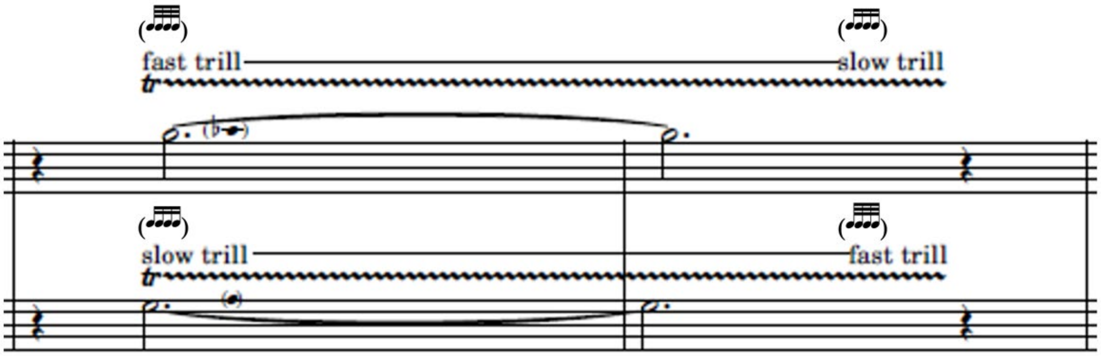

fast trill
slow trill
tr
slow trill
fast trill
tr

Figure 2, Crossfading of trill speed

In measure 18, the winds, first violin, and viola play G# and D. The winds create a slight dynamic swell to mask the strings' entrance, making the winds more audible as the other instrument dynamics begin to fade. The violin and viola create a low-volume drone with a breathing, pulsating effect. This is done by oscillating between G# - G and D - D#, respectively, but with each note having different lengths. The changes in oscillation frequency start slowly and become more frequent as the section comes to an end. By measure 23, the violin and viola align their oscillating phrases on G and D.

Section A: Transition into Main Body of Movement

In “Rippling Riffles,” Section A generally descends from Bb to C, realized through a series of smaller descending phrases. For example, in measures 25-26, the first violin descends from Bb5 to D5, and in measures 26-27 it descends from Bb5 to Bb4. By measure 33, the violin descends down to C4 (see Figure 3). The use of descending phrases and slow note decorations add a sense of continuity and cohesion to this section, while the differing rhythmic subdivisions generate musical momentum.

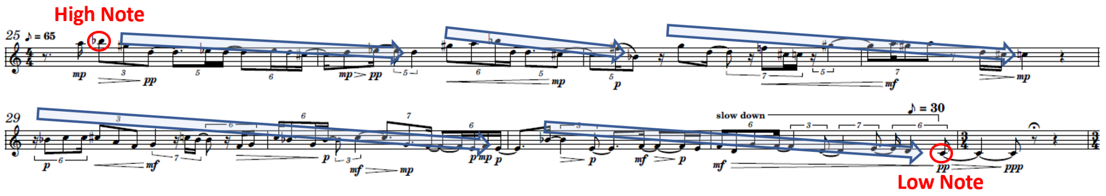


Figure 3, General descension of notes

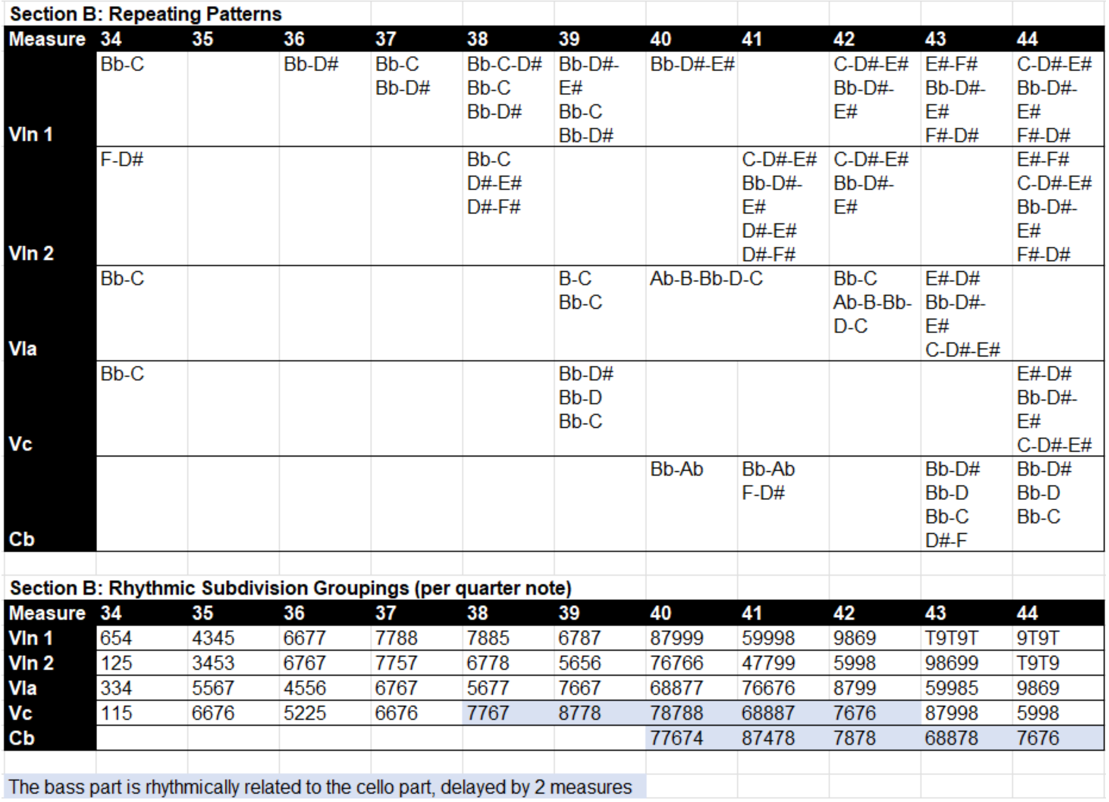
Section A begins with a duet between the first violin and viola. Simultaneously, the first and second marimbas start playing G5 and D5, respectively, serving as the background to the strings. This is the opposite of the Intro section where the marimba ostinato was in the foreground. Throughout the section, the marimbas decrease in dynamics and the number of notes they play until they disappear entirely. This gradual reduction of notes acts as a cadence to the gradual increase of marimba notes throughout the Intro. As the marimbas gradually play less notes, the cello and contrabass emerge, accompanying the violin and viola with their own set of rhythmic subdivision groupings.

Section B: Buildup

Section B Structure

In Section B, all the string instruments are used, with the first six measures featuring two violins, viola, and cello, later followed by the addition of the contrabass. The section utilizes numerous recurring patterns that extend across different rhythmic subdivisions. Patterns are shared between most instruments. Each string instrument starts with a two-note pattern (either Bb - C or F - D#), which persists across various rhythmic subdivisions (see Figure 4). This approach creates a sense of connectivity between the different instrumental parts, as they pull from the same bucket of patterns and subdivisions even if they are not aligned with one another at the same time.

To establish a foundation for the section, each instrument preserves their initial two-note pattern for the first two measures. As the section progresses, additional repeating patterns are introduced, coinciding with a rise in dynamic swells and denser rhythmic subdivisions. This helps build more momentum leading up to Section D.



Section B: Repeating Patterns

Measure	34	35	36	37	38	39	40	41	42	43	44
Vln 1	Bb-C		Bb-D#	Bb-C Bb-D#	Bb-C-D# Bb-C Bb-D#	Bb-D#-E# Bb-C Bb-D#	Bb-D#-E#		C-D#-E# Bb-D#-E#	E#-F# Bb-D#-E# F#-D#	C-D#-E# Bb-D#-E# F#-D#
Vln 2	F-D#				Bb-C D#-E# D#-F#			C-D#-E# Bb-D#-E# D#-E# D#-F#	C-D#-E# Bb-D#-E#		E#-F# C-D#-E# Bb-D#-E# F#-D#
Vla	Bb-C					B-C Bb-C	Ab-B-Bb-D-C		Bb-C Ab-B-Bb-D-C	E#-D# Bb-D#-E# C-D#-E#	
Vc	Bb-C					Bb-D# Bb-D Bb-C					E#-D# Bb-D#-E# C-D#-E#
Cb							Bb-Ab	Bb-Ab F-D#		Bb-D# Bb-D Bb-C D#-F	Bb-D# Bb-D Bb-C

Section B: Rhythmic Subdivision Groupings (per quarter note)

Measure	34	35	36	37	38	39	40	41	42	43	44
Vln 1	654	4345	6677	7788	7885	6787	87999	59998	9869	T9T9T	9T9T
Vln 2	125	3453	6767	7757	6778	5656	76766	47799	5998	98699	T9T9
Vla	334	5567	4556	6767	5677	7667	68877	76676	8799	59985	9869
Vc	115	6676	5225	6676	7767	8778	78788	68887	7676	87998	5998
Cb							77674	87478	7878	68878	7676

The bass part is rhythmically related to the cello part, delayed by 2 measures

Figure 4, Section B: repeating note patterns within rhythmic subdivision

Half Cadence with Rhythmic Unison

Section B concludes with a unison rhythm, in contrast to the ever-changing, ensemble-wide polyrhythms used in the movement thus far. The unison rhythm spans two measures, temporarily drawing attention away from the prior rhythmic subdivision groupings. Specifically, the rhythmic unison happens between all five string instruments except for the fourth partial in beat 1. In that instance, the two low strings have a rest, and only the high strings play in unison. Harmonically, the notes remain stagnant and give an unresolved feeling when the section ends (see Figure 5). A similar rhythmic unison phrase appears at the end of “Rippling Riffles,” and its harmony creates a sense of finality. For that reason, I refer to the Section B rhythmic phrase as the half cadence of the movement.

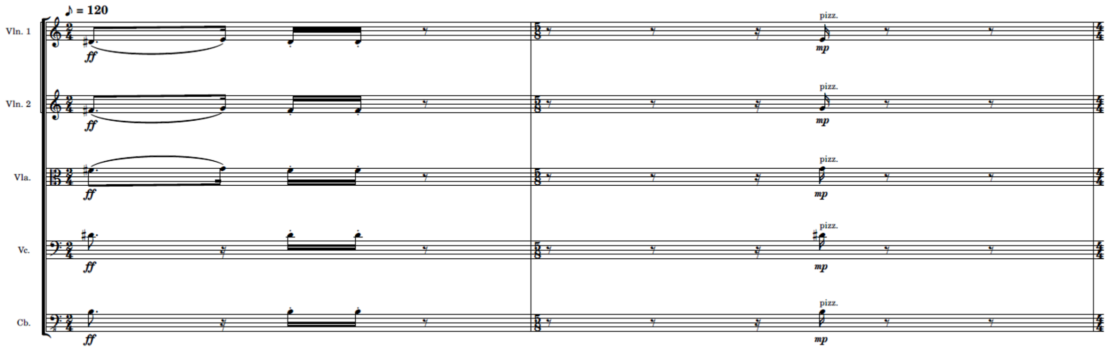


Figure 5, Half cadence with rhythmic unison

Inspirations from Ligeti’s *String Quartet No. 2*, 5th Movement

Section B was mainly inspired by the first 9 measures of the fifth movement from Ligeti *String Quartet No. 2*. In Ligeti’s work, different rhythmic subdivisions are used per quarter note beat per instrument and become gradually denser as the music progresses. For the first 4 measures, each instrument alternates between two notes that are a third apart, and then they begin alternating between 3-4 stepwise notes in the subsequent measures. The dynamics of the entire segment are very soft and without any accents. Expressively, the music is “colorless,” without any noticeable bow changes or “perceptible metrical divisions or pulsations” (Ligeti 1969, 24). This creates a static expression that gradually evolves through the use of denser subdivisions (see Figure 6).

Section B of “Rippling Riffles” follows Ligeti’s *String Quartet No. 2* by using gradually increasing rhythmic subdivisions, notes without accents, and small intervals between notes. However, the purpose of gradually increasing subdivisions within the larger context of Ligeti’s fifth movement is different from how it serves the context of “Rippling Riffles.” In Ligeti’s piece, the rhythmic subdivisions are present at the very start of his 5th movement, and the subdivisions gradually become sparser to set up accompaniment by long, sustained cello notes and wider-ranging arpeggiations from the higher strings. In my “Rippling Riffles,” gradually changing rhythmic subdivisions are already established in the Intro and Section A. Then, Section B dynamically gets louder as it builds up to the climactic Section C. Due to this, the subdivisions in Section B increasingly get denser throughout the section in order to set up the movement’s climax.

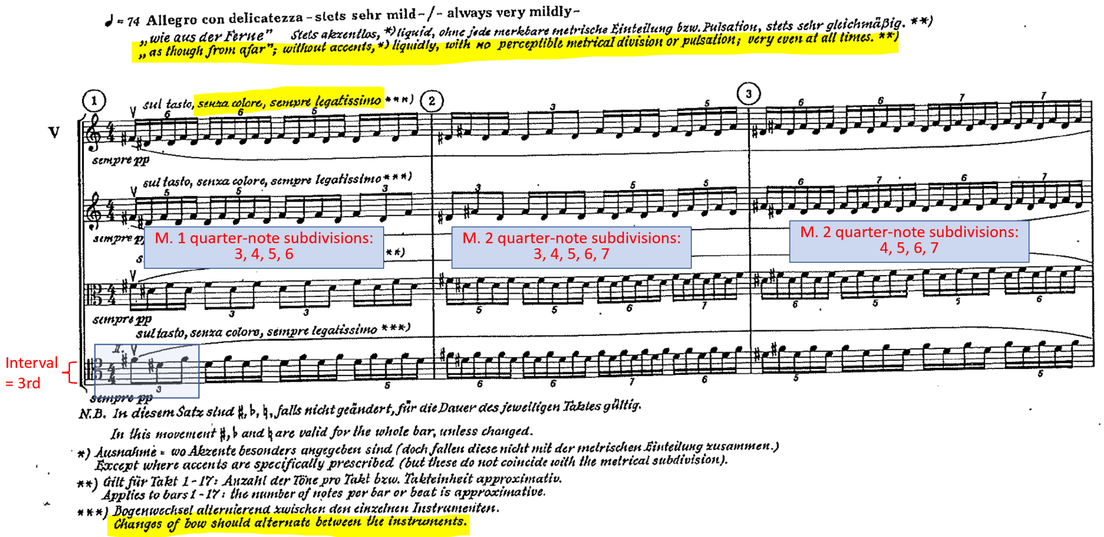
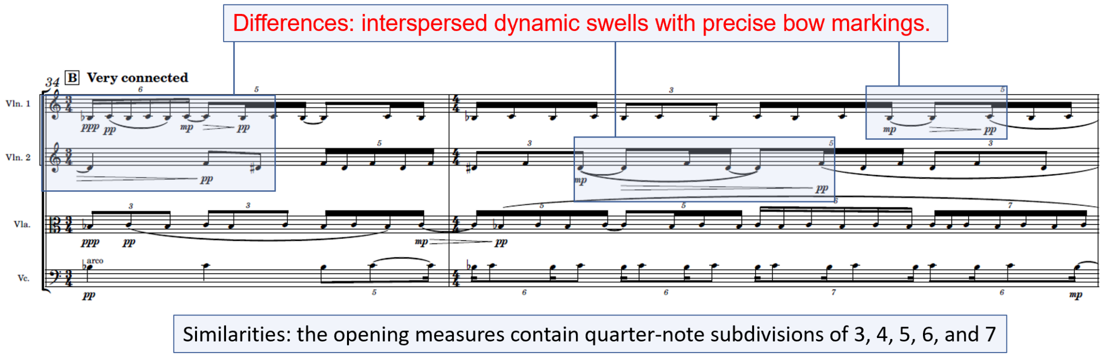

♩= 74 Allegro con delicatezza – stets sehr mild – / – always very mildly –
„wie aus der Ferne" Stets akzentlos, *) liquid, ohne jede merkbare metrische Einteilung bzw. Pulsation, stets sehr gleichmäßig. **)
„as though from afar"; without accents, *) liquidly, with no perceptible metrical division or pulsation; very even at all times. **)
sul tasto, senza colore, sempre legatissimo ***)
V
sempre pp
M. 1 quarter-note subdivisions: 3, 4, 5, 6
M. 2 quarter-note subdivisions: 3, 4, 5, 6, 7
M. 2 quarter-note subdivisions: 4, 5, 6, 7
Interval = 3rd
N.B. In diesem Satz sind ♯, ♭, ♮, falls nicht geändert, für die Dauer des jeweiligen Taktes gültig.
In this movement ♯, ♭ and ♮ are valid for the whole bar, unless changed.
*) Ausnahme = wo Akzente besonders angegeben sind (doch fallen diese nicht mit der metrischen Einteilung zusammen.)
Except where accents are specifically prescribed (but these do not coincide with the metrical subdivision).
**) Gilt für Takt 1 - 17: Anzahl der Töne pro Takt bzw. Takteinheit approximativ.
Applies to bars 1 - 17: the number of notes per bar or beat is approximative.
***) Bogenwechsel alternierend zwischen den einzelnen Instrumenten.
Changes of bow should alternate between the instruments.

Figure 6, Subdivisions from Ligeti's *String Quartet No. 2*, 5th Movement

Section B differs from the opening of Ligeti's 5th movement in terms of dynamics, bowing, and tempo. While Ligeti employed static dynamics and bowing, I used interspersed dynamic swells coordinated by precise bowing (see Figure 7). These bowed swells help generate momentum towards the very loud Section C that follows. From a tempo perspective, Ligeti's fifth movement starts at 74 BPM, and my Section B is at 30 BPM (notated as eighth note = 60). The vast difference in tempo speeds means that Ligeti's fifth movement takes approximately 40 seconds to reach its densest subdivisions, and my Section B takes approximately 90 seconds. The slower tempo in my work adds a sense of deliberation and control to the gradually increasing subdivisions.



Differences: interspersed dynamic swells with precise bow markings.

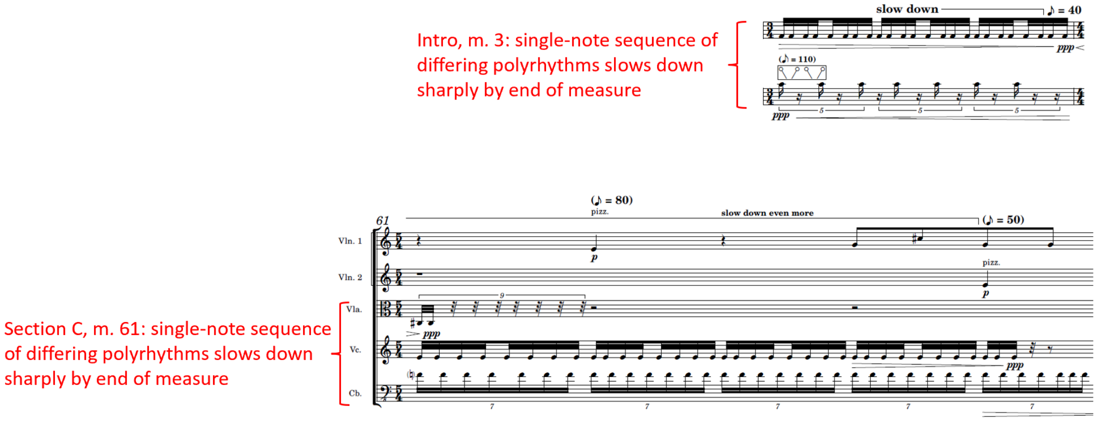
Similarities: the opening measures contain quarter-note subdivisions of 3, 4, 5, 6, and 7

Figure 7, Section B: differences and similarities to Ligeti's 5th movement

Section C: Apex

Section C Structure

Section C maintains the gradual increase in polyrhythmic complexity from the previous section. However, there is a notable difference in the written tempo as this section is written with a tempo of 60 BPM (scored as eighth = 120), twice the speed of the previous section's 30 BPM (scored as eighth = 60). Therefore, the perceived density of a decuplet in Section B is equivalent to a quintuplet in Section C. I found that this modulation of tempo helped to maintain score legibility, rather than increasing the polyrhythms to 12-20 notes per quarter note. Once the strings transition into single-note tremolos, the global tempo gradually slows down, a callback to the tempo decrease of the single-note marimba tremolo from measure 3 (see Figure 8). The tempo continues to slow down until the start of the movement's final section.



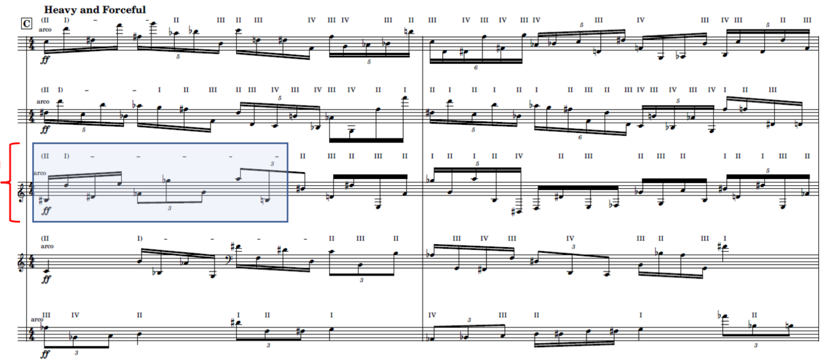
Intro, m. 3: single-note sequence of differing polyrhythms slows down sharply by end of measure

Section C, m. 61: single-note sequence of differing polyrhythms slows down sharply by end of measure

Figure 8, Section C slowdown is a direct reference to measure 3

Expressively, Section C is marked as “heavy and forceful,” conveying a sense of weight and power. This is displayed through the persistent use of single-note bowing of the strings. The section begins very loud (the loudest dynamics of the movement), and gradually gets softer until the section ends. Each instrument exits the section at different points, with the instruments playing the densest polyrhythms exiting first. The first violin (playing 11 beats per quarter note) is the first to leave, followed by the second violin (10 beats per quarter note), viola (9 beats per quarter note), and cello (8 beats per quarter note). The contrabass, playing 7 beats per quarter note, continues to play until the end of the section, providing a connection to Section D. The order of instrument exits by polyrhythmic density magnifies the effect of the overall tempo decrease.

String numbers are suggested in Roman numerals. Numerals in parentheses followed by dashes indicate a repeated pattern until a new numeral appears. For example, “(II - I)” followed by dashes indicate that the first note will be played on the second string, and the second note will be played on the first string. All subsequent notes will be played on the second and first strings in this manner until a new individual string or string pattern is specified (see Figure 9). Notes without Roman numerals should be played according to the previously suggested Roman numeral strings or string patterns. While these performance notes are not compulsory, they were useful to me while composing. Since this section may be physically demanding of the string players, I wanted to ensure that the note sequences were written in a playable order across each instrument’s fingerboard.



This phrase alternates between strings II and I (parenthesized) until the next string marking

Figure 9, Section C string markings

Inspirations from Ligeti’s *String Quartet No. 2*, 1st Movement

To create Section C of “Rippling Riffles,” I drew inspiration from a specific passage in the first movement of Ligeti's *String Quartet No. 2*, found in measures 72-79. Ligeti's passage begins with a strong and forceful bowing technique, and the polyrhythms quickly increase in intensity before abruptly becoming quieter. The passage moves around the fingerboard in intervals of 7ths and ends with a quiet tremolo phrase. I was drawn to this passage because it possesses a lot of energy, a fast tempo, constantly changing polyrhythms, and an overall feeling of instability. Additionally, the passage resolves into a quiet, stable tremolo chord, which is something that I wanted to incorporate as a transition into the final section of “Rippling Riffles.”

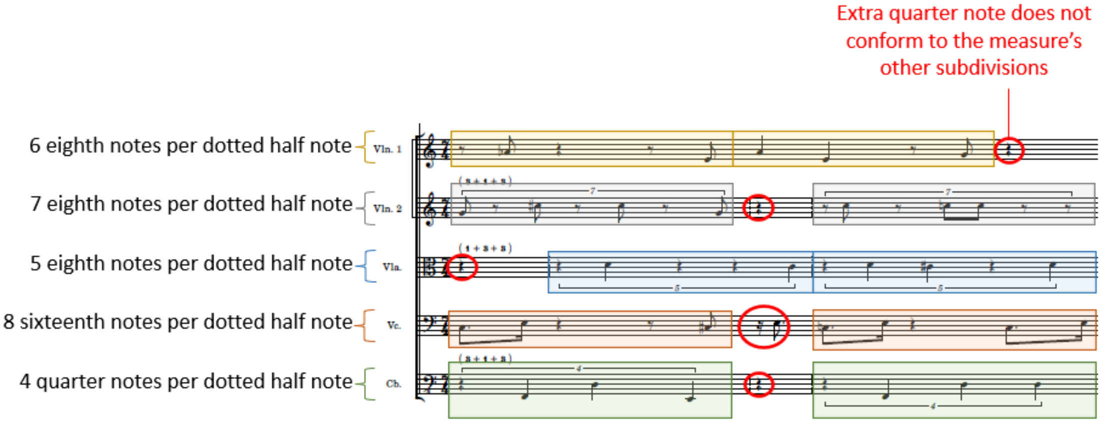
My Section C takes a departure from Ligeti’s passage in various ways. Ligeti's passage moves chromatically through alternating octave registers for the first two measures and then ascends and descends in arpeggios with gradually decreasing intervals, eventually arriving at single-note tremolos by measure 61. While Ligeti’s passage moves chromatically through alternating octave registers, I use a specific sequence of notes based on the prior notes used in Section B: Ab - Bb - B - C - D - D# - F - F# - G (see Figures 16 and 17). The first three measures alternate octave registers, similar to Ligeti, but then the sequence repeats without any register changes. The first violin begins a shorter sequence of five notes (G - Ab - Bb - B - C) at measure 57, followed by four notes (G - Ab - Bb - B), three notes (G - Ab - Bb), and two notes (G - Ab). Starting from measure 61, the first violin plays only Ab, which resolves downward to G at measure 63, creating a through-notated tremolo similar to Ligeti’s work. By measure 66, the first violin drops out. Each instrument follows a similar trajectory of playing the full 9-note sequence by each starting on different notes, moving in different directions, and playing in different polyrhythms. Each sequence is gradually shortened until they become single-note, through-notated tremolos, and then eventually fade.

Section D: Convergence/Full Cadence

Section D Structure

Section D provides a dense pizzicato texture with diverging rhythms. This is accompanied by overlapping fragments from the marimbas and winds which reprise musical ideas from the Intro. The marimbas play within a different rhythmic subdivision than the strings, referencing the distinct, constant subdivisions that each instrument group maintained in the Intro. Each marimba plays a single melodic line an octave apart from the other. Due to the octave difference, the combined marimba part feels similar to the grand-staff, multi-octave marimba parts from the Intro. The winds reprise their technique of crossfading trill speed from the Intro, with the flute playing fast to slow, and the clarinet playing slow to fast. The final phrase from the winds is a long-sustained hairpin from E to D played an octave apart, akin to the winds' opening phrase of the Intro (E-D#).

Subdivisions are per half note or per dotted half note. However, some measures have single beats that do not conform with the measure's subdivisions, such as measure 84 where some instruments have a quarter-note’s worth of material that is subdivided outside of the regular pattern. To avoid confusion, text descriptions of the quarter-note groupings are sometimes provided above the instrument parts and dashed beat lines are sometimes used to separate the beat groupings (see Figure 10). Section D uses a scale consisting of the pitches G - Ab - C - C# - D - E - F - F#. Each subdivision uses a subset of three notes from this scale, irrespective of which instrument is playing in that particular subdivision.


Extra quarter note does not conform to the measure’s other subdivisions
6 eighth notes per dotted half note
Vln. 1
7 eighth notes per dotted half note
Vln. 2
5 eighth notes per dotted half note
Vla.
8 sixteenth notes per dotted half note
Vc.
4 quarter notes per dotted half note
Cb.
(3+3+3)
7
(3+2+3)
5
(3+3+3)
4

Section D pitch sets per rhythmic grouping:
Subdivisions of 8: C - C# - E
Subdivisions of 7: G - C - C#
Subdivisions of 6: G - Ab - E
Subdivisions of 5: C - C# - D
Subdivisions of 4: D - E - F

Figure 10, Section D, m. 84: subdivision durations and related pitch sets

Full Cadence with Rhythmic Unison

The diverging pizzicato rhythms eventually converge within the final measures, reminiscent of the rhythmic half cadence that led into Section C.

As pizzicato notes are gradually eliminated, intentional gaps are created in the patterns. The result is a triangular shape of notes stacked on top of each other, bookended by rests. The triangular shape becomes narrower with each measure, causing the gaps of silence to widen between the phrases. By measures 93, the pizzicato notes converge into a vertical line, as if they were being drawn together by a magnet, or resembling a vibrating string that slowly becomes inert. Following the earlier performance expression of multiple currents in a single stream, this is the converging point where each independent current joins as one (see Figure 11). Together, these six measures refer back to the opening measures of the movement where the marimbas play within a series of tempo changes that result in a fluctuation of note density.

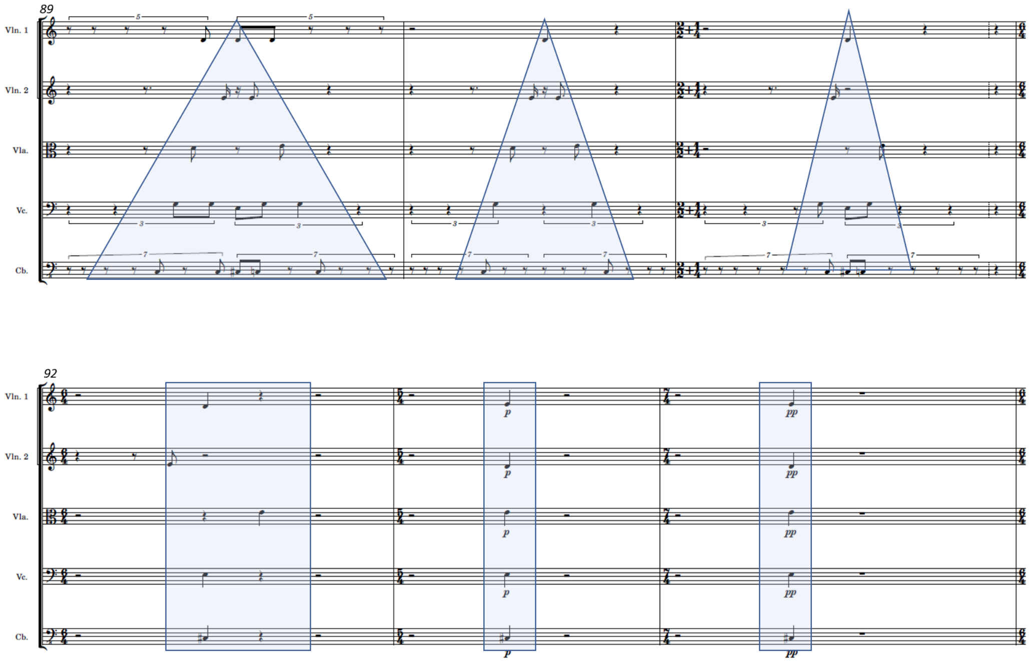


Figure 11, Convergence of pizzicato notes

The final measure is a full cadence with rhythmic unison, directly related to the half cadence at measures 49-50 (between Section B and Section C). There are rhythmic and harmonic reasons why I consider the phrase at measures 49-50 a half cadence and the phrase at measure 95 a full cadence. Rhythmically, both the half and full cadences have stacked rhythms that are similar to each other, providing a feeling of finality, arrival, and consonance that are absent from the continually diverging rhythms throughout the movement. Harmonically, the first two beats of the half cadence generally alternate between two notes, where the higher note acts as an upper neighbor tone a minor second above the primary note. The last note of the half cadence is the upper neighbor tone rather than the primary note, resulting in an unresolved feeling. On the other hand, the first two beats of the full cadence involve repeated notes or a leap between a minor third. The final note of the full cadence is either the primary note, the upper note of the minor third, or a note that complements the resulting chord. The final chord of the half cadence is B-D#-E-G, and the unresolved tension between the D# and E is used to create a bridge to the "heavy and forceful" expression in Section C. In contrast, the final chord of the full cadence is C-D-E-G, and the prominence of the C major chord gives the feeling of consonance and finality that the half cadence was lacking (see Figure 12).

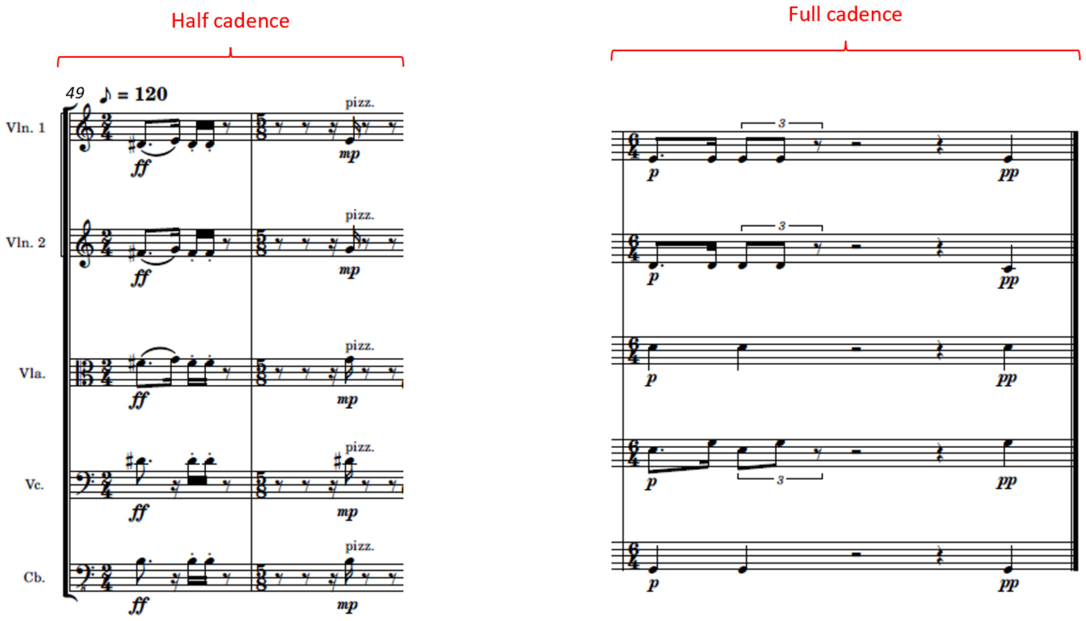


Figure 12, Half cadence (m. 49-50) vs. full cadence (m. 95)

Inspiration from Lutosławski’s *Livre*, 2nd Movement

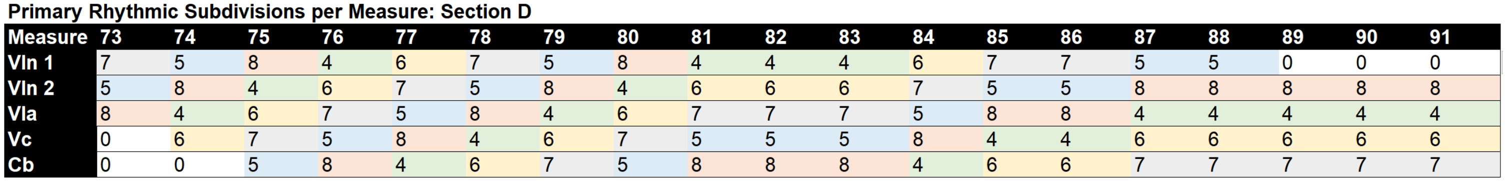
This section draws inspiration from the opening nine measures of the second movement (up to section 202) of Lutosławski's *Livre pour orchestre*. In *Livre*, the second movement starts with a landscape of pizzicato notes from the string instruments, while the harp, piano, celesta, and vibraphone play overlapping fragments that add color and expression.

The beginning of *Livre*’s second movement is constructed with stacked rhythmic sequences that repeat each measure. There are five main rhythmic sequences used in the opening nine measures: 4-3-3, 3-5-8, 3-3-5, 8-4-3, and 5-8-4 (see Figure 13). Each number within a sequence represents the number of beats played per half note (three half notes per measure). For the first five measures, each rhythmic sequence appears once in each instrument part. I consider the sequences 0-5-8 and 3-5-8 as the same sequence, since the only difference between them is that the first beat either has a rest or a triplet. Similarly, I consider the sequences 3-3-5, 3-0-5, 3-3-0 as the same. For measures 5-9, each sequence jumps to a new instrument part in discernible ways. The 4-3-3 and 3-5-8 sequences alternate between the first violin and contrabass, and the 8-4-3 and 3-3-5 sequences alternate between the second violin and cello. The 5-8-4 sequence remains with the viola but alternates with a variation of the 3-3-5 sequence (3-3-0). Therefore, the complete 3-3-5 sequence is present through a combination of the second violin (3-0-5) and the viola (3-3-0).

Measure	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Vln 1	433	584	335	843	358	433	058	433	058
Vln 2	058	433	584	335	843	305	843	305	843
Vla	335	843	358	433	584	330	584	330	584
Vc	843	358	433	584	335	843	305	843	305
Cb	584	335	843	358	433	058	433	058	433

Figure 13, *Livre*, 2nd movement: rhythm sequences per half note

Unlike *Livre*, subdivisions in Section D of “Rippling Riffles” ascend to the next highest instrument part in the score, where the ascending order is contrabass, cello, viola, second violin, and first violin. In the first eight measures, the shift in subdivisions occurs every measure. However, from measure 81, the subdivisions can persist for several measures before changing (see Figure 14).



Primary Rhythmic Subdivisions per Measure: Section D

Measure	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
Vln 1	7	5	8	4	6	7	5	8	4	4	4	6	7	7	5	5	0	0	0
Vln 2	5	8	4	6	7	5	8	4	6	6	6	7	5	5	8	8	8	8	8
Vla	8	4	6	7	5	8	4	6	7	7	7	5	8	8	4	4	4	4	4
Vc	0	6	7	5	8	4	6	7	5	5	5	8	4	4	6	6	6	6	6
Cb	0	0	5	8	4	6	7	5	8	8	8	4	6	6	7	7	7	7	7

Figure 14, Section D: primary rhythmic subdivisions per measure

CHAPTER 2: PULLING ON HEARTSTRINGS

The second movement of *Ebb's Embrace, Fulfilling Flow* is titled "Pulling on Heartstrings," and it is focused on exploring different degrees of temporal and metric independence. Together with the use of string performance techniques and bow placements, these elements push and pull the music towards and away from rhythmic and textural consonance.

The viola and cello are the primary instruments that provide the ensemble with base tempi and meter in which other instruments relate their respective playing speeds. Throughout "Pulling on Heartstrings," there are various motifs that push the music towards a sense of rhythmic consonance, such as short-long motifs and heartbeat-like pulsations. In contrast, there are meterless measures and stemless notes that pull the music into a sense of rhythmic dissonance.

Different string performance techniques and bow placements are utilized throughout "Pulling on Heartstrings," which create unique sound textures. The soft, plucked notes of pizzicato technique and rapid, fluctuating tremolo sounds all pull away from the consonant texture of long, sustained bowing. For bow placement, the strings use sul tasto (played close to the fingerboard) to produce a delicate and airy sound, and conversely use sul ponticello (played close to the bridge) to create a glassy and metallic sound.

"Pulling on Heartstrings" opens with a chord played freely by the high strings (pizzicato) and low strings (fast tremolo). The string sounds shift from sul ponticello to sul tasto and are meant to be expressed mysteriously. The pizzicato notes are arpeggiated without a clear rhythm until they are synchronized with a steady, unison marimba phrase. This leads to the strings introducing a series of short-long motifs, where low string notes of short duration precede high string notes of long duration. This is resolved through a bright, descending counterpoint from the strings and marimba.

In Section A, a plaintive melody from the low strings and low marimba is accompanied by staccato punctuations from the harp, high strings, and high marimba. The melody becomes more animated as the clarinet joins in. The staccato punctuations become more prominent as the melody gets louder and dramatically slows down. A grand pause precedes a soft, descending melody from the low strings.

In Section B, a cello-led tremolo ostinato from the low strings evokes the mysterious expression from the Intro, punctuated by a low marimba ostinato. Each instrument repeats their patterns at different speeds until the high strings enter with a steady, heartbeat-like pulse. This large pattern repeats itself with another series of rhythmically ambiguous ostinatos followed by serene, heartbeat-like pulsations from the high strings and winds. The pulsations gradually get louder with each repetition.

As the pulsations from the high strings and winds reach their peak, the viola-led low strings and low marimba introduce a fresh set of ostinato patterns in Section C, accompanied by long sustained chords from the violins. The winds, harp, and high marimba scatter quick multi-note fragments over the low-pitched ostinato landscape, causing an agitated effect as the fragments become more frequent and rapid.

The harp and marimbas become more dominant and intricate in their fragments in Section D, taking a more prominent position than before. Bass drums are played in a way that matches the tremolo speed from the low strings, creating a more forceful rhythmic backdrop. As the piece progresses, the tempo, tremolo speed, and playing speed of the bass drums slow down gradually. The winds make a final melodic statement while the harp plays an extended, intricate sequence. Eventually, all the ostinato patterns drop out, leaving only the winds, harps, and bass drums. When the low strings disappear, the bass drums generate a slow, continuous sound that blends with the sustained notes played by the winds.

Code Inspiration from SCAMP Tutorials

The majority of the musical material in “Pulling on Heartstrings” was generated using a computer-assisted composition framework called SCAMP (Suite for Computer-Assisted Music in Python), which was developed by Marc Evanstein and is based on the programming language Python. With SCAMP, users can create musical structures using logical and conditional formulas, set parameters such as tempo, dynamics, and note duration, and use virtual instruments to play back the resulting music. The final product can then be exported in a music notation format (such as XML) for further editing in MuseScore (my preferred music notation software) or a similar software program.

I was drawn to the idea of using a program like SCAMP after working on previous compositions stemming from datasets and polytempo attributes. For example, my composition *Piano Rug* (2018) for solo piano was inspired by an image of a small, weaved design on an Islamic prayer rug. To create the composition, I divided the image into tiny pixels, each representing sixteenth note durations within the piece. I manually determined the pitch, duration, and dynamics of each note based on the RGB color values of each pixel (RGB are a set of three numbers representing the intensity of the red, green, and blue components of a given color). Looking back on this process, I found it difficult to perceive the overall form of the piece as I was deciding how the RGB values would influence the larger musical structure, and it was time-consuming to input each treated note into MuseScore.

Another example is my composition *The Well Distanced Trio* (2020) for percussion trio. In this piece each percussion part has their own unique temporal path. Each part was created in an individual MuseScore file, independent of the other parts. This was done so that the parts could be notated according to their own temporal trajectory rather than converting all the parts to one master tempo (which would have resulted in complex tuplet groupings and dotted notes). I was not able to hear the full music together until I merged the three audio files together. I found that there was a lot of rework to be done to shift some notes and dynamics around, as well as some slight tempo shifting. The reworks were time-consuming and cumbersome within the constraints of the notation program. Only a few reworks could be completed before the piece needed to be submitted to the performers, and while the end result was satisfactory, I felt that too much time was spent moving objects around in the notation program rather than finding a way to test a fully notated draft earlier on in the development process.

Upon downloading and exploring SCAMP, and studying Evanstein's guidance and tutorials, I came to the realization that both of my previous compositions could have been significantly improved if I had utilized SCAMP at the outset. In fact, the reason Evanstein created SCAMP was to address similar scenarios to my own. One example Evanstein outlined was a composer mapping climate data into a musical form who wanted to hear the initial audio output before reshaping the result further in music notation software. Another example is of a composer creating a polytempo piece who requires a means to hear all parts before transferring them into notation software within their respective tempi (Evanstein 2019, 2).

In composing the second movement, I aimed to create polytemporal music with particular pitch sets, dynamics, and instrument techniques that occur within certain time frames. Although I had a rough idea of the duration for each section, I was uncertain about the exact tempi, note durations, and note placement. I was therefore interested in exploring a new method of composition that would enable me to have greater flexibility in composing and testing these aspects before committing them to notation.

SCAMP proved to be an excellent tool for me to create this musical idea as it allowed for the creation and testing of musical sequences in relation to time or beats. Notably, I could define whether an instrument's musical events happened in relation to time or beats, and each instrument could be defined differently and have its own tempo. This is different from composing in notation software where all beats must align with time signatures and the global tempo, and tempo curves can only be achieved by attaching individual tempo markings to a sequence of individual notes.

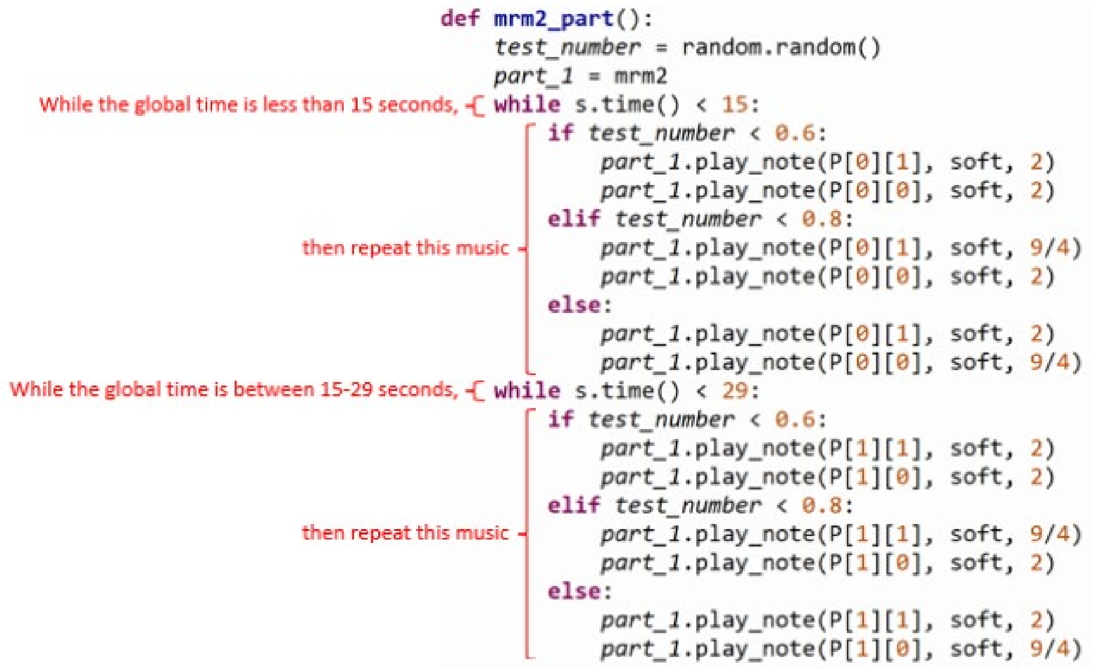
Composing outside of the restrictions of measures and time signatures meant that I could define event probabilities (e.g., a note may or may not happen at a specific beat or timestamp, with different likelihoods of note durations). After defining all of my tempi, instruments, events, and other parameters, I could run the code to immediately hear the audio output. This made it easy for me to tweak certain aspects of the music and hear the result without having to redefine tempo markings for individual notes or rewrite an entire notated phrase. Instead, I could rewrite a few lines of code and immediately hear what the new idea would sound like. I found that this process of rewriting and hearing the result took less time in SCAMP than it would have in MuseScore. Once I was happy with the result, then I could ask SCAMP to generate the music into XML format, placing the entire realization into a music score format that I could continue refining in MuseScore. This resulted in a well-tested audio product before even starting the engraving process. Additionally, the composition's creation logic was already documented within the Python script, which made it easy to compare with the finished product.

Specific inspirations for using SCAMP came from the tutorial videos on the SCAMP website (Evanstein 2023a). In his video “Generating Music Notation,” he demonstrated how to place musical sequences within specific timeframes. For example, if I only wanted a musical sequence to be heard for the first ten seconds, then I could wrap the sequence in a condition like “while time is less than 10” to ensure that it is not heard after ten seconds. I applied this logic while coding for “Pulling on Heartstrings,” ensuring that certain sequences were only heard during specific timeframes, such as the first 5 seconds of a section, or between 5 and 20 seconds, and so forth (see Figure 15).

In his video “Functions and Forking,” Evanstein discussed the concept of using counters to repeat sequences a specific number of times. I applied this technique in my scripts to tag individual notes with dynamic markings and other staff text properties, which reduced the amount of engraving work needed once the result was exported into MuseScore. For example, one of my violin sequences was going to be played at a mezzo-piano dynamic, which only requires the *mp* dynamic marking on the first note in the sequence (not every note). Therefore, I assigned the *mp* marking to a variable in my script that is only visible when there are no counters. At the end of the musical sequence, I incremented the counter by one before the sequence repeats itself. That way the next time the sequence is played, the *mp* marking would no longer be visible in the script.

In his video “Tempo Changes and Polytempo Music,” Evanstein explained the concepts of setting and changing the session clock (i.e., the initial global tempo marking, and how to adjust it within the music) and setting and changing each instrument’s individual clock (i.e., creating individual tempi and tempo curves for each instrument). I applied this to my second movement so that each instrument was scripted in their own tempo.

The SCAMP website contains robust documentation of the various note properties that can be attributed to a note, such as articulations, dynamics, staff text, and note spelling. It is possible to assign multiple properties to a single note by grouping them together in a list (Evanstein 2023b).



```
def mrm2_part():
    test_number = random.random()
    part_1 = mrm2
    while s.time() < 15:
        if test_number < 0.6:
            part_1.play_note(P[0][1], soft, 2)
            part_1.play_note(P[0][0], soft, 2)
        elif test_number < 0.8:
            part_1.play_note(P[0][1], soft, 9/4)
            part_1.play_note(P[0][0], soft, 2)
        else:
            part_1.play_note(P[0][1], soft, 2)
            part_1.play_note(P[0][0], soft, 9/4)
    while s.time() < 29:
        if test_number < 0.6:
            part_1.play_note(P[1][1], soft, 2)
            part_1.play_note(P[1][0], soft, 2)
        elif test_number < 0.8:
            part_1.play_note(P[1][1], soft, 9/4)
            part_1.play_note(P[1][0], soft, 2)
        else:
            part_1.play_note(P[1][1], soft, 2)
            part_1.play_note(P[1][0], soft, 9/4)
```

While the global time is less than 15 seconds,

then repeat this music

While the global time is between 15-29 seconds,

then repeat this music

Figure 15, Composing within specified time frames in SCAMP

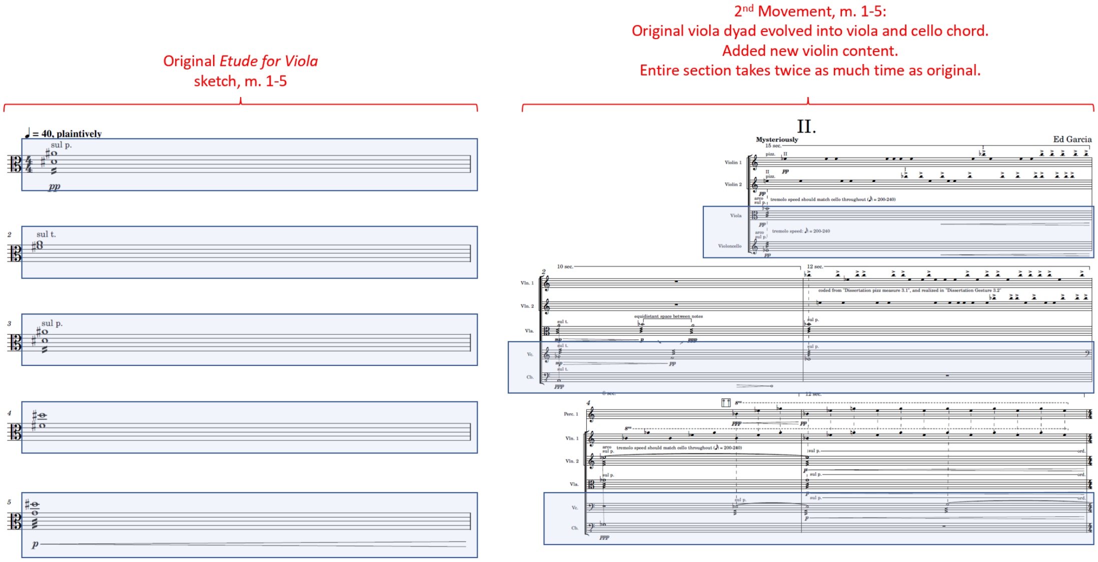
Inspirations from *Etude for Viola* Sketch

The Intro and Section A were inspired by an earlier sketch I wrote in a UCSC composition seminar. The seminar assignment was to compose a viola solo for violist Ellen Ruth Rose, who then read, recorded, and provided feedback on it (Garcia 2020b). The sketch features the chord progression, melodic movement, and performance techniques as the Intro and Section A.

I approached the viola sketch as an opportunity to experiment with creating chords that could evoke different emotional reactions by either pushing or pulling the music in certain directions. Specifically, I found that the constant bowing of tremolo notes created a sense of momentum and push, while long sustained bowing pulled the music back into stasis. To complement this effect, I used pizzicato notes to push the music forward through punctuation while using long sustained notes to create a sense of pull. Furthermore, I found that the different bow placements, such as sul tasto and sul ponticello, added another layer of push and pull, as these sounds created a departure from standard bow placement and added more texture and contrast to the music.

After reviewing the viola sketch, I realized that adding more instruments could enhance the overall sound and bring out the musical ideas more effectively. I thought it would be interesting to have other string instruments moving in contrapuntal motion around the viola melodies, with a low-pitched string instrument (such as a cello) accompanying the viola. To avoid overburdening the violist with simultaneous plucking and bowing, I considered incorporating plucked sounds from higher-pitched strings (such as violins) and using a combination of high-pitched xylophone-like sounds from a marimba and plucked sounds from a harp.

Another difference between the viola sketch and the “Pulling on Heartstrings” version is the note durations. The viola sketch's opening five measures have a duration of roughly 30 seconds, while the opening for “Pulling on Heartstrings” contains additional pizzicato sequences from the violins, and each measure lasts 8-15 seconds (with no time signature). This makes the opening for “Pulling on Heartstrings” twice as long as in the viola sketch. Also, while the viola sketch ends with a reprisal of the opening, “Pulling on Heartstrings” replaces this with Sections B-D, which are an elongated and altered variation of the opening five measures (see Figure 16).


Original *Etude for Viola* sketch, m. 1-5

2nd Movement, m. 1-5:
Original viola dyad evolved into viola and cello chord.
Added new violin content.
Entire section takes twice as much time as original.

♩ = 40, plaintively
sul p.
pp
sul t.
sul p.
p
II.
Mysteriously
Ed Garcia
Violin 1
Violin 2
Viola
Violoncello
10 sec.
12 sec.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
Perc. 1

Figure 16, Evolution of opening 5 measures

Inspiration from Mamiya’s *Serenade III* “Germ”

The organization of “Pulling on Heartstrings” into time-bracketed and time-signatured sections was inspired by the first movement of Michiyo Mamiya’s *Serenade III* “Germ.” Mamiya’s opening section starts with stemless passages from the strings written underneath time brackets. The accompanying percussion is written with stems in order to convey specific rhythms, while vertically dashed lines are used to signify a unison attack between specific string and percussion notes. Solid lines are used to specify specific note order across multiple instruments. This notation style lasts for 23 seconds before being replaced with time-signatured measures with stemmed notation. In “Pulling on Heartstrings,” I intersperse time-bracketed and time-signatured measures throughout the piece and use vertically dashed lines to convey unison attacks between multiple instruments. Specifically in measure 2, I use Mamiya’s method of connecting sequential notes, but instead of using solid lines I use arrows (see Figure 17).

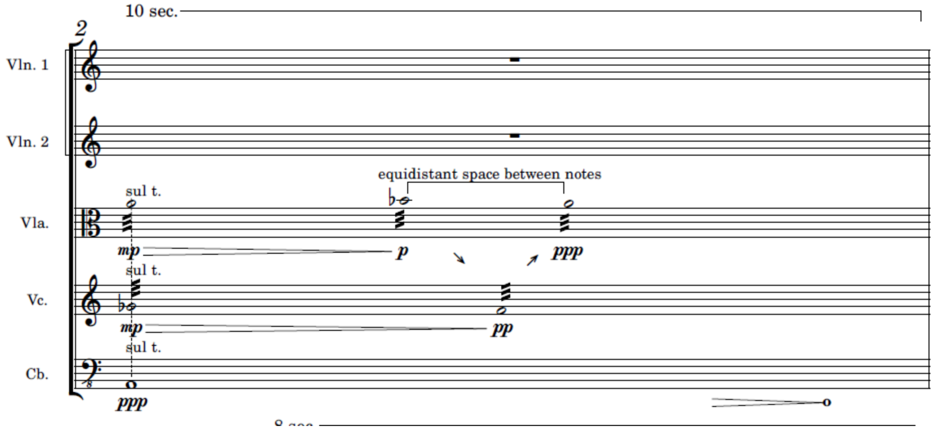


Figure 17, Time brackets, vertical lines for unisons, arrows for note order

Intro: Slow Breathing

Similar to the push-pull description that I discussed about my viola sketch, I feel that the opening five measures of “Pulling on Heartstrings” represent a breath-like pulse that permeates the entire movement. The first, third, and fifth measures are like inhales, while the second and fourth measures are like exhales. Chord changes usually mark the transition between inhales and exhales, but other elements such as dynamic shifts, the presence of certain instruments, bow placement, changes in note density, and melodic direction can also play a role. For example, measures 1, 3, and 5 (inhale) do not have a bass instrument, while measures 2 and 4 (exhale) do. Measures 1 and 3 have increasing note density, while measure 2 has decreasing note density. Additionally, growing dynamics in measures 1 and 5 signal inhaling, while receding dynamics and descending melodic movement in measure 2 indicate exhaling (see Figure 18).

The first few measures of “Pulling on Heartstrings” are reminiscent of the opening measures of “Rippling Riffles,” where the marimba notes gradually increased and decreased in density using tempo curves. Measure 1 of “Pulling on Heartstrings” features a gradual increase of pizzicato notes as it progresses. By the end of measure 2 this density is replaced by sustained, decaying notes without any new notes being introduced, thus evoking a gradual decrease in density.

The Intro section of “Pulling on Heartstrings” is divided into two phrases. The first phrase, which primarily embellishes an Eb chord, spans measures 1-8. The second phrase, eventually arriving on G#, spans measures 9-18.

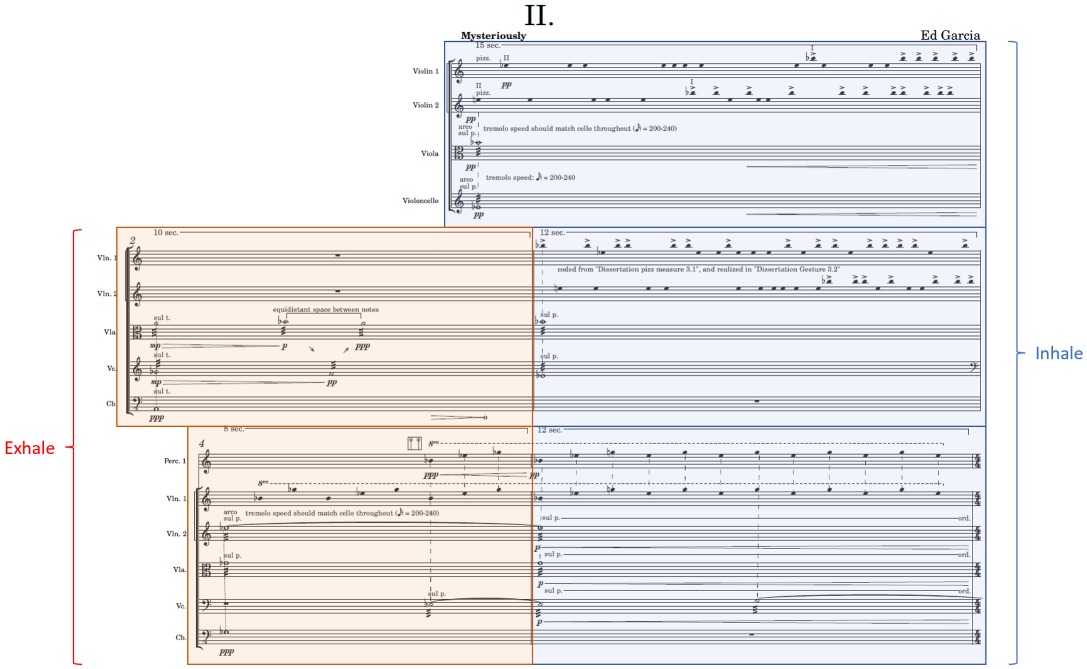

II.
Mysteriously
Ed Garcia
15 sec.
pizz.
Violin 1
Violin 2
Viola
Violoncello
arco
sul p.
tremolo speed should match cello throughout (♪ = 200-240)
tremolo speed: ♪ = 200-240
10 sec.
12 sec.
coded from "Dissertation pizz measure 3.1", and realized in "Dissertation Gesture 3.2"
equidistant space between notes
sul t.
8 sec.
Perc. 1
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
ord.
Exhale
Inhale

Figure 18, Examples of inhale vs. exhale, m. 1-5

The first phrase is mostly notated in stemless notation in time-bracketed measures (measures 1-5) until it abruptly switches to stemmed notation in time-signatured measures (measures 6-8). In the stemless notation, note placements and durations are approximate and should be realized according to their spatial and proportional relationship to the measure’s bar lines and other notes present. Notes connected by a vertical dashed line should be played in unison. In measures 4-5, more notes are played in unison, leading to a smooth transition into the stemmed notation of measures 6-8, which is read according to normal rhythmic conventions. Measures 6-8 represent a short cadence of the preceding music, starting with a descending rhythmic unison (exhale) in ordinary bowing position with synchronized, alternating bowing. This creates a break from the dense pizzicato and tremolo from the beginning of the movement, but it is interrupted in measures 7-8 when the tremolo is reintroduced by the violins. The lower strings' long bowing drops to a lower dynamic than the violins, allowing the violin tremolo to stand out. As a result, the arc of the first phrase briefly emerges into long bowing in measures 6-7 before ultimately returning to tremolo by the end of measure 8.

In the second phrase of the Intro, the main motif involves short, punctuated sul tasto notes from the low strings (exhale) followed by sustained sul ponticello hairpins with a mix of tremolo and long bowing (inhale). As the sequence of short and long notes continues, it becomes more intense when trilled sul tasto notes from the viola are added above the other short notes from the low strings. This builds in intensity until the appearance of sudden glissandi from the violins and marimba in measure 14. The marimba then continues to roll long notes in line with the descending melody growing from the viola. The viola, accompanied by the low strings, plays brightly in normal bowing position until it is interrupted by pizzicato notes in rhythmic unison from the other four string instruments.

Section A: Introduction of Instrument Pairings

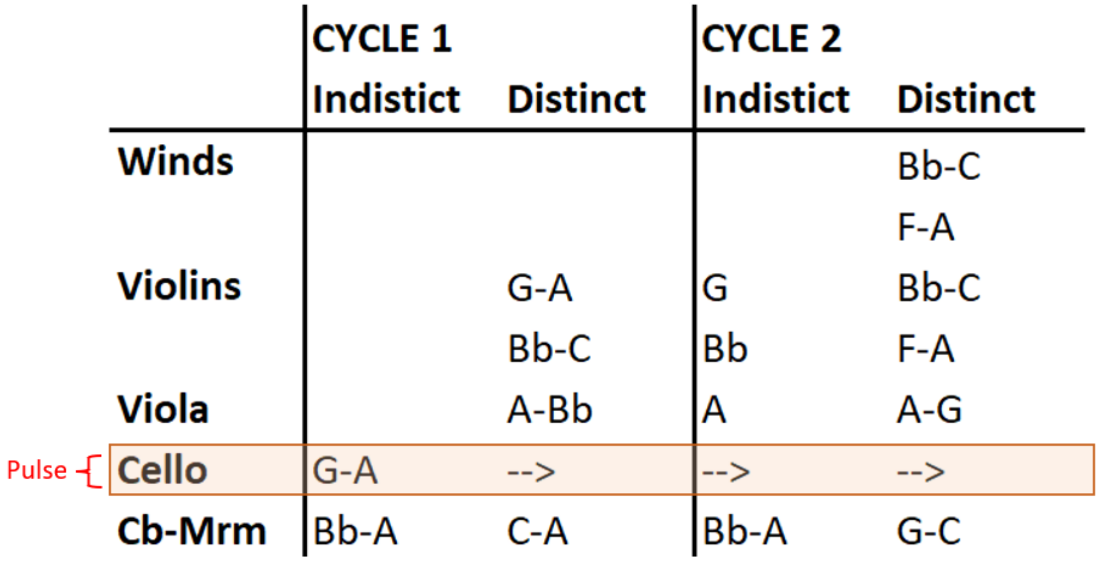
At this point in “Pulling on Heartstrings,” the clarinet, harp, and second marimba are introduced, each with a specific role to play. The clarinet joins the viola and cello as the melodic leaders, while the harp provides high-pitched punctuations to complement the pizzicato violins and first marimba. The second marimba works with the contrabass to provide low-pitch harmonic support, using percussive rolls to create a sustained sound while the contrabass provides long, sustained notes.

It is important that the two marimba parts sound distinct from each other due to the difference in octave register. The high marimba part is played with staccato-like rubber mallets, creating a sound similar to that of a xylophone. This sound is meant to accompany the pizzicato notes of the violins, which generally do not have as much volume as a marimba played with conventional yarn mallets. Rubber mallets were chosen for their ability to emphasize attack rather than resonance. On the other hand, the low marimba part is played with soft yarn mallets, which are ideal for bringing out resonance rather than attack. This mallet type was chosen to complement the natural resonance of the contrabass.

Section B: Cycles of Indistinct and Distinct Pulsations

Section B is composed of two cycles that each start with low-pitched instruments playing with distinct and imprecise pulses. Each cycle ends with high-pitched instruments that play with discernible and regular pulses, resembling the contraction and relaxation of a heartbeat. This creates a sense of stability in the midst of the many low-pitched pulses. The heartbeat-like pulsations proportionally resemble the contraction and relaxation of the human heart's cardiac cycle. The cycles follow a push-pull metaphor, where they begin by pulling away from the rhythmic stability of Section A and then pushing back towards it once the high-pitched instruments introduce discernible pulsations. This alternation is similar to how previous sections alternate between tremolo and sustained notes, short and long notes, and sul ponticello and sul tasto notes.

In Section B, there is a recurring theme of pairing instruments. These pairings include the contrabass and low marimba, two violins, and two winds. The viola and cello play independently but share common notes in the second cycle. Instrument pairs play repeated patterns of two notes at a similar tempo. While the cello plays a consistent G-A pattern throughout, other instruments change their patterns roughly every half cycle. Only the contrabass-marimba pair play continuously, alternating patterns in an ABAC format. The violins and viola do not begin playing until the second half of the first cycle, and the winds do not begin until the second half of the second cycle. These entrances help create a shift from an indistinct to a distinct rhythmic feel in each cycle (see Figure 19).



	CYCLE 1		CYCLE 2	
	Indistict	**Distinct**	**Indistict**	**Distinct**
Winds				Bb-C F-A
Violins		G-A Bb-C	G Bb	Bb-C F-A
Viola		A-Bb	A	A-G
Cello	G-A	-->	-->	-->
Cb-Mrm	Bb-A	C-A	Bb-A	G-C

Figure 19, Harmonic pairings by instruments and cycle

Notation Style

Section B uses different styles of notation to represent the various tempi played. This section is conducted at a tempo of 40 BPM, and the cello plays quarter notes at this tempo throughout, acting as the central pulse of the section. Any phrase in this section that aligns with the conducted pulse is notated with stems. All other phrases use stemless notation to indicate the approximate placement of each note in relation to the conducted pulse. Beat lines at quarter-note intervals further subdivide the measure. For example, in measure 34, the marimba and contrabass parts are written in stemless measures with dotted beat lines, and each beat line corresponds to the stemmed quarter notes from the cello. Thus, the Bb in the first beat of the contrabass part is meant to be played just before the halfway point of the first beat, and the A in the second beat of the marimba part is meant to be played near the beginning of the beat. Unless notes are connected with vertical lines, notes do not have to be played in unison with other notes that share the same vertical space. Incidental unisons are acceptable (see Figure 20).

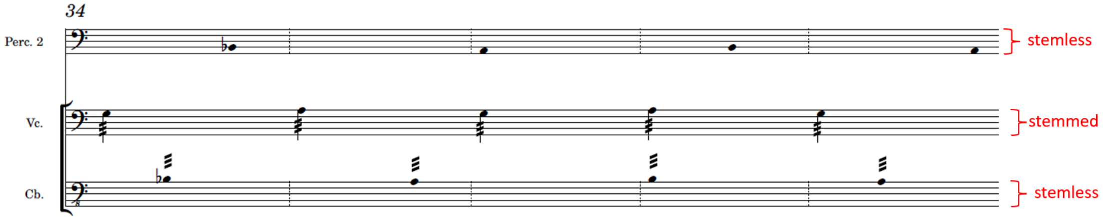
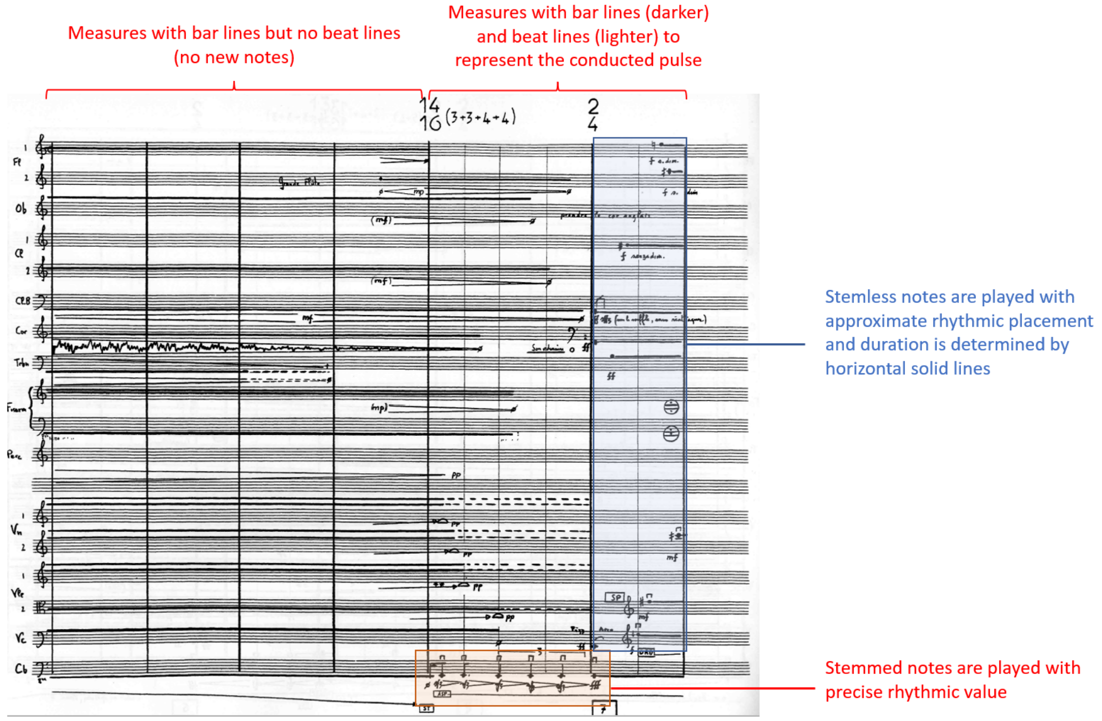


Figure 20, Stemless vs. stemmed notation, m. 34

The use of beat lines at quarter-note intervals were inspired by Grisey's *Partiels* (1975). In his piece, Grisey used thick, dark lines to represent bar lines, and he used lighter (yet solid) lines to represent beats within measures. The use of beat lines in *Partiels* is conducive to the writing style – the piece predominantly consists of long sustained notes with approximately-written entrances and exits. Grisey used minimal rests and showed sustained durations via horizontal lines that spanned multiple measures. Whenever a measure contained multiple notes, Grisey divided the measure with beat lines according to the conducted subgroupings. For measures in which there are long sustained notes throughout the ensemble, then measures do not have beat lines – there are no notes that require a display of subdivision. Some notes are stemmed with rhythmic flags to denote an exact rhythm and entrance, and some notes are stemless to denote an approximate placement according to its proximity to the beat lines and measure lines. For example, just before rehearsal section 7, the contrabass plays a series of motivic hairpins across a measure with a 14/16 time signature, and each note is notated with precise rhythmic placement. Concurrently, the strings, brass, and winds have hairpins that decay into nothing at approximately-notated locations. At the next 2/4 measure, the brass and winds have approximately-placed note entrances (see Figure 21).

I use similar notation practices in my music, both in “Rippling Riffles” and “Pulling on Heartstrings.” In “Rippling Riffles,” Section D, I use beat lines to represent the conducted pulse. In “Pulling on Heartstrings,” sections B through the end, I use beat lines for the conducted pulse and to provide reference points for stemless notes. In contrast to Grisey's technique of using solid horizontal lines to indicate sustained notes, I prefer to use ties. Also, I use rests in measures that contain stemmed notation, and I use rests in stemless measures to signify that a previously sustaining note should stop playing.



Measures with bar lines but no beat lines (no new notes)

Measures with bar lines (darker) and beat lines (lighter) to represent the conducted pulse

Stemless notes are played with approximate rhythmic placement and duration is determined by horizontal solid lines

Stemmed notes are played with precise rhythmic value

Figure 21, Grisey's *Partiels*, section 7: beat lines and stemless notation

Polyrhythmic Relationships in Distinct Cycles

In Section B, the polyrhythmic relationship of the violins and winds and the oscillating partnership of the contrabass and marimba are important, consonant motifs that transition the movement into Section C via a multi-measure increase in dynamics.

The lower-pitched instruments have a slower rhythm compared to the higher-pitched instruments. The contrabass and marimba play at a slower tempo than the cello. In the second half of the second cycle, all rhythmic patterns are precisely notated and have a polyrhythmic relationship with the cello's quarter-note pulse. Specifically, the contrabass and marimba play two notes for every three cello notes, the viola plays three notes for every two cello notes, the violins play in groupings of five notes for every two cello notes, and the winds play in groupings of five notes for every three cello notes.

In measures 41-44, both the violins and winds play a 2-note heartbeat-like pattern within quintuplet groupings, but the difference lies in the duration of the quintuplet. The violins' quintuplet grouping lasts for a half note, while the winds' lasts for a dotted half note. The resulting effect is that the winds seem to be playing the same figure as the violins, but at a slightly slower tempo, supporting the multi-tempo theme of this section. Since the passages by the winds and strings are so similar it helps generate stability and a feeling of serenity. Each note of the 2-note pattern lasts two partials and three partials, respectively, of the quintuplet grouping. The note lengths are a recurrence of the short-long motif that is constant throughout “Pulling on Heartstrings.” For example, the short-long phrases in measures 9-14 (short staccato notes followed by multi-note phrases) are a foreshadowing to the short-long phrases in this section. In the distinct half of the first cycle, the violins play a similar heartbeat-like figure as in measures 41-44, but with a different notation style. Measures 41-44 are notated in stemmed, rhythmically precise notation, while measure 37 is played in stemless notation connected by unison lines where the short notes have darkened noteheads and the long notes have transparent noteheads.

As previously stated, the contrabass and marimba follow an ABAC pattern in this section, with their 2-note patterns as Bb2-A2 and C3-A2 for the “A” and “B” portions, respectively. During the "C" portion of this pattern, which coincides with the distinct half of the second cycle (measures 41-44), the contrabass plays the notes C3 and G2, while the marimba plays G2 and C3, resulting in them playing opposite notes in opposite directions. The sudden change in melodic direction contributes to a sense of musical stability and serenity in the phrase by establishing a steady, yet fluctuating, foundation that becomes more familiar as the phrase progresses.

Section C: Scattered Sequences

Section C is a continuation of the indistinct cycle halves from the previous section. The contrabass and marimba continue their partnership, and the violins continue to play long sustained notes. The viola plays the conducted pulse (60 BPM), modulated from the quarter-note triplet pulse from the previous section. New motifs in this section are a series of scattered sequences played by the winds, harp, and high marimba.

The violins sustain the notes G4 and A4 throughout Section C, with subtle changes in bowing to maintain the sustained sound. These notes are meant to create a drone-like effect in the background of the section. To keep this sound subdued, I specified that both violin parts should be played on the D-string. I believe that this unifies their sound and maintains a deep, rich tone.

I think that if the A4 note was played on the A-string, it may sound brighter than the G4 on the G-string, which would detract from the desired effect of a unified, background drone.

Section D: Apex

Section D is the loudest part of “Pulling on Heartstrings,” where all instruments play at a moderate to loud volume. This section is a continuation of instrument pairings (contrabass-marimba, violins, winds), indistinct rhythms of oscillating 2-note patterns via stemless notation, distinct rhythms for the conducted pulse (viola) via stemmed notation, multi-note sequences (winds, harp, high marimba), and time-bracketed measures. However, there are a few unique elements in this section. Firstly, the overall tempo slows down gradually until the end, making all of the polytempo parts slow down at the same rate. This creates a feeling of expectation and stability within the music, despite the sea of polytempo parts. Due to this, Section D feels similar to the long distinct cycle from Section B. Together, Sections C and D form a very long indistinct-distinct phrase of music.

Secondly, the individual notes within multi-note sequences have longer durations than those in Section C, and their perceived durations increase as the overall tempo decreases. Thirdly, two bass drums from the third and fourth percussion parts are added to accompany the tremolo speed from the cello and contrabass, becoming impactful as the overall tempo (and the overall tremolo speeds) decrease. The bass drums create soft, frictionless sounds when rubbed with hands or wire brushes. The large, low-sounding bass drum is rubbed at a very slow rate, independent of the low-string tremolo speed, producing smooth and continuous sounds. The small, high-sounding bass drum is rubbed at the same rate as the tremolo speed from the cello and contrabass, creating a shaking, oscillating sound. As the overall tempo decreases, the speed of the high bass drum, cello, and contrabass decelerate at the same rate. When the cello and contrabass exit at the movement's penultimate measure, the high bass drum is rubbed at the same rate and with the same effect as the low bass drum. At the last measure, only the winds and bass drums remain, making the bass drums an integral effect that builds in importance as the section reaches its end.

Post-Composition Reflections

Reflection for Future Coding Projects

For future SCAMP pieces that rely on probability and randomized musical elements, there are some things I would do differently to expedite the transition from SCAMP to MuseScore. When I composed “Pulling on Heartstrings,” I would listen to the output directly in SCAMP before exporting it to MuseScore. This would allow me to make immediate adjustments to the code if the result was unsatisfactory. However, since the music relied on a range of probable events (i.e., a 60% chance of a particular rhythm or note being present), the output was not identical every time. This was because I used SCAMP's 'random.random' function to generate random values for each musical event. If the random number was within a specified range, then the musical event will either take place or not.

For example, if the marimba pitch A3 will only take place if the randomly generated number is less than or equal to 0.6, and the randomly generated number is 0.7, then the event will not take place. Let's say that I enjoyed the music the best when the marimba pitch A3 did not take place. Therefore, even when I achieved this ideal result in SCAMP, I often needed to generate several outputs to MuseScore and then select the output in which the A3 pitch did not take place. The issue became exponential if there were multiple musical events in which I enjoyed their absence (or presence), and then needed to comb through multiple MuseScore exports in order to find an output in which all of my desired outcomes were true.

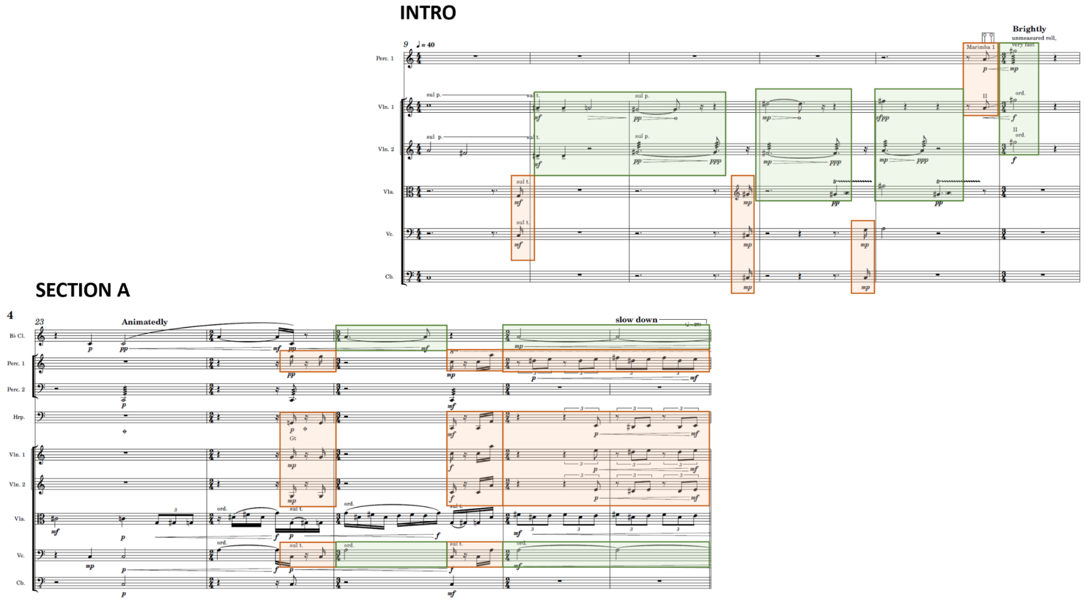
After completing my composition, I discovered a SCAMP function called 'random.seed()' that would have allowed me to save specific SCAMP outputs that could then be exported to MuseScore. This method would have been more time efficient and more resource efficient rather than exporting to MuseScore multiple times and then deciding which exported version was most similar to my preferred SCAMP output. The 'random.seed()' function is very similar to the 'random.random' function in that they both generate random values. However, the ‘random.seed()’ function has the ability to return the same randomized number every time it runs. Taking the example above where the marimba A3 pitch only takes place 60% of the time, if I had set the seed value for its randomly generated number (e.g., random.seed(10)) and the result was that the A3 pitch did not occur, then every time I executed that seed code then the A3 pitch would not occur. That means that if I had used seeding on all randomized numbers in my code, then once I generated an ideal output in SCAMP it would produce the exact same output to MuseScore.

Comparisons to Varèse’s Writing: Short-Long Phrases

Upon reflecting on “Pulling on Heartstrings,” I decided to study Edgard Varèse's *Integrales* more closely, specifically the motifs he used in it. I have had the opportunity to perform *Integrales* several times, playing various percussion parts, so I feel that I have a personal connection to the piece. It was satisfying to look at the piece from a composer's perspective and identify similarities between my short-long motifs and the ones used in *Integrales*.

To give an example, I used short phrases from one group of instruments followed by longer phrases from another group, similar to Varèse’s *Integrales*. In the first part of “Pulling on Heartstrings,” I used short, staccato notes played on the strings (plucked with pizzicato technique), harp (plucked), and marimba (played with rubber mallets), followed by longer, sustained notes played on the strings and winds. In measures 26-27, I merged the short-note instrument groups with the long-note instrument groups so that they play their parts together (see Figure 22). This is similar to *Integrales*, particularly in Section 14 where Varèse used unison eighth notes from winds, trombones, and percussion as a short pickup note to long sustained notes from the French horn and trumpets in the following measures. To set up this expectation for the short-long passage, Varèse wrote several short notes in succession across different instrument groups. For example, in the first two measures of Section 14, the trombones and bass drums play four short notes, each on the same downbeat, while the winds and the cymbal play four short notes, each on the same upbeat following the notes from the trombones and bass drum. This sequence of call and response between the instrument groups helps to set up the expectation for the short-long passage (see Figure 24). In my music, I merged my short- and long-note instrument groups so that they play together, while Varèse merged his individual short-note instrument groups into a singular short-note instrument group.

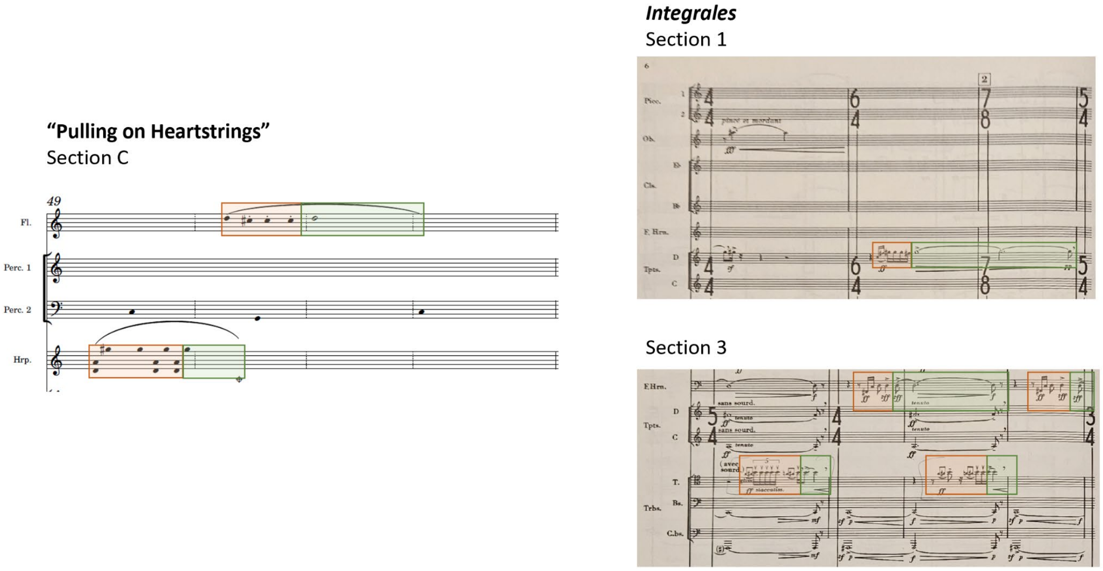
Another variation of short-long passages that I employed in “Pulling on Heartstrings” is using a flurry of short notes followed by a single long note, all from a single instrument. In contrast to the individual rhythmic weight provided by each note of the heartbeat pulsations, the flurry notes are ornamental to the longer-lasting principal note. Similar motifs are found in *Integrales*, for example in sections 1 and 3 (see Figure 23).


INTRO

SECTION A

Brightly
Marimba 1
Perc. 1
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
Animatedly
slow down
Bb Cl.
Perc. 2
Hrp.

Figure 22, "Pulling on Heartstrings": short- and long-note groupings


"Pulling on Heartstrings"
Section C

Integrales
Section 1

Section 3

Fl.
Perc. 1
Perc. 2
Hrp.
Picc.
Ob.
Cls.
F. Hrn.
Tpts.
E.Hrn.
Trbs.
C.bs.

Figure 23, Comparisons of multiple short notes ornamenting a long note

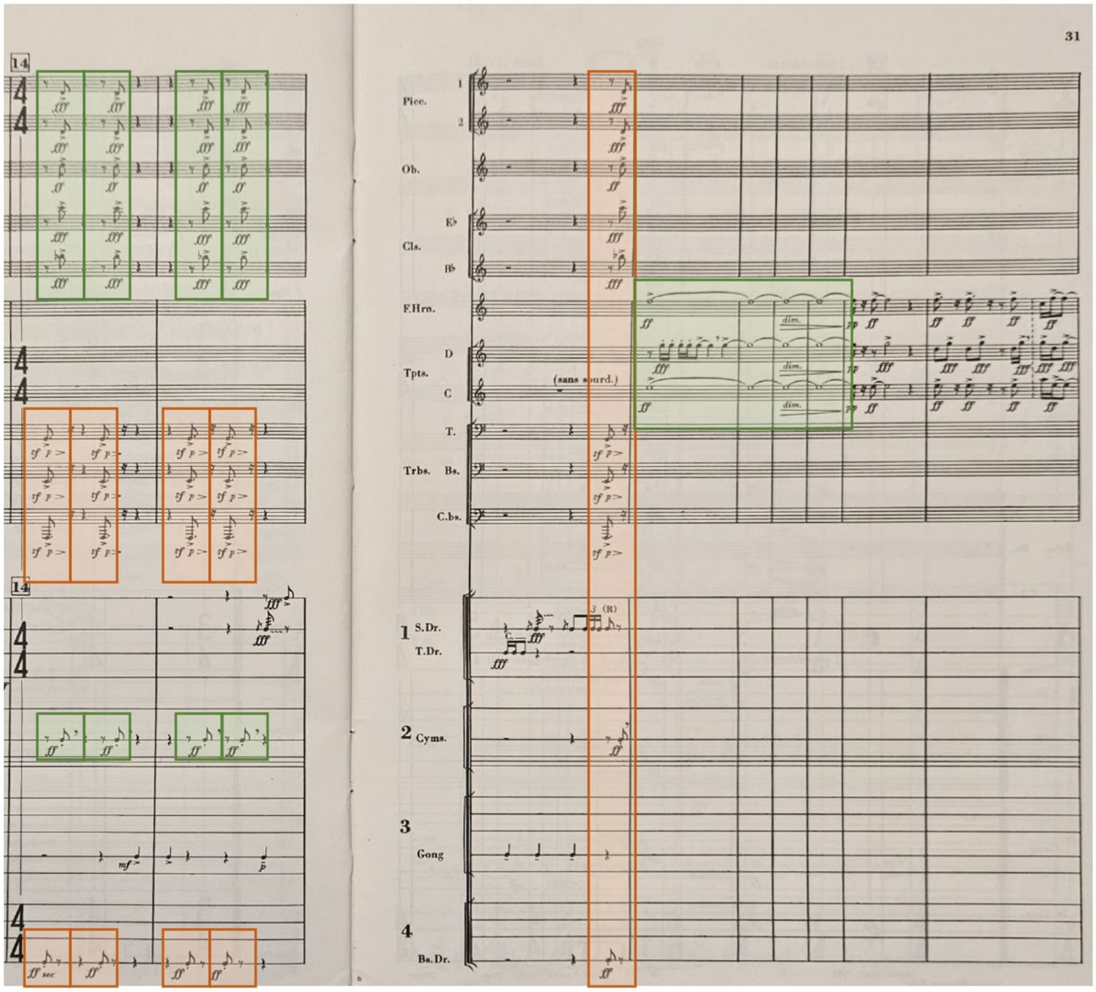

31
14
Picc.
Ob.
Cls.
E♭
B♭
F.Hrn.
D
Tpts.
C
(sans sourd.)
T.
Trbs. Bs.
C.bs.
1 S.Dr.
T.Dr.
2 Cyms.
3
Gong
4
Bs.Dr.
dim.
ff sec

Figure 24, *Integrales*, Section 14: short- and long-note groupings

CHAPTER 3: BOUNDS ON THE CREST

The third movement of *Ebb's Embrace, Fulfilling Flow* is designed to imitate the pattern of ocean waves in its structure. The introductory figures symbolize small wave crashes through abrupt block chords that then fade away gradually via slow arpeggiations. As the movement progresses, sections are crafted to mirror the rise, fall, and retreat of a large wave.

Arpeggiation, glissandi, and long note decay are some of the techniques that are featured prominently in this movement. These techniques are used to create intricate melodic lines and harmonies that ebb and flow throughout the movement. The use of multiple percussion instruments and percussive performance techniques helps to gradually shift the sonority of the music from light-hearted wooden sounds to heavy drumming to shimmering metallic drone sounds. This creates a sense of evolution and growth within the movement, as the music crests towards a climactic apex and then recedes to a calm, resting state.

This movement begins with a harp prelude accompanied by temple blocks and a suspended cymbal. The harp alternates between descending and ascending musical phrases. Descending phrases are played quickly with block chords and rapid glissandi, while ascending phrases are slower and arpeggiated. These two opposite musical directions are merged, resulting in the harp having two voices played simultaneously in opposite directions. The temple blocks provide short rhythmic accents while the suspended cymbal provides a sustained background color accompaniment. Towards the end of the prelude, the harp shifts to a more subdued, rhythmic supporting role as the focus shifts to the winds and strings. The winds perform flutter-tongue sustained notes between breath-like entrances and exits. Meanwhile, the violins perform quick, fleeting ascending phrases that become more intense over time.

At the midpoint of the piece, the harp stops playing and the focus shifts to a section that resembles a choreographed dance, conveyed through the drums and strings. The strings play interlocking melodies while the drums outline a phrase reminiscent of a dance. Eventually, the strings switch to playing sweeping glissandi with harmonics, and the drums take on a melodic-type role. The music then transitions into a spacious section featuring sustained bowed notes from the crotales and marimbas.

Inspirations from Xenakis' *Rebonds*

The percussion instrumentation for "Bounds on the Crest" was inspired by Iannis Xenakis' percussion solo piece *Rebonds*, performed in two movements (*A* and *B*). This percussion piece feels ritualistic, even dance-like, expressed through the wide-ranging timbres of the instrumentation and the formal development of the two movements. Performed with a wide range of drums (two bongos, three toms, and two bass drums), *Rebonds A* grows and collapses in density as the movement matures via polyrhythmic complexity. Its main motif is a 2-note phrase between the highest-pitched bongo and the lowest-pitched bass drum. *Rebonds B* is performed with a similar set of drums (two bongos, tumba, tom, and bass drum) and five wood blocks. It features a relentless sixteenth-note ostinato on the high bongo with varying patterns of lower pitched drums performed simultaneously. Each phrase is initiated by either an accented note or a drag (a grace-note figure consisting of two grace notes and a principal note).

Connections to Traditional Sundanese Presentational Dance

Broadly speaking, I designed the overall structure and energy of "Bounds on the Crest" to resemble that of a traditional Sundanese presentational dance. It was not developed to be performed alongside a particular dance, and its specific musical pitches and rhythms do not resemble the Sundanese gamelan music that is typically performed with such dances. Instead, the connection between the two is more conceptual in nature and represents a general aim for the overall flow and direction of "Bounds on the Crest."

To begin with, the introduction of my piece is very delicate, light, and sparse, featuring only harp, temple blocks, and suspended cymbal. The harp is like the melodic extension of a dancer's movements, where block chords and silence represent stillness, short arpeggiations and glissandi represent gentle poses of the head, neck, and arms, and long arpeggiations and interlocking voices represent slow, subtle, continuous motions from the head, neck, shoulders, elbows, hands, and fingers. The temple blocks act as accent points that emphasize certain positions or stages of development within a particular motion, similar to the role of the Sundanese *kendang* (a set of double-headed barrel drums) in dance accompaniment. They follow the contours of the harp phrases by partnering with specific harp notes or by embellishing a harp block chord. The role of the suspended cymbal is similar to the *kabluk* or *kecrek*, which are metallic time-keeping gamelan instruments that can serve in a colotomic role or in an accompaniment role to the kendang (which, in turn, accompanies the dance movements). Unmeasured rolls are performed on the suspended cymbal to partner with continuous motion from the harp. Rhythmically specific strikes on the cymbal are partnered with specific harp or temple block notes. Different cymbal surface areas are struck to reflect the harp's dynamic changes, such as the gradual standing up of a dancer with wider-ranging shoulder and arm movements.

Section A begins with a soft, gentle, repeated harp cycle accompanied by the winds. From a dance perspective, I compare this to Sundanese stepping motions where a dancer would continuously step around the stage in beat to the music accompanied by slow-moving, subtle motions with the arms, hands, and fingers. At measure 33, the strings enter followed by drums. The strings play a series of figures in rhythmic unison with a response from the drums. With the harp and temple blocks absent, the strings become the melodic extension of the dancer and the drums become the accent points.

The contrabass plays long tones that mimic a sustained gong tone from a gamelan. As measure 41 (marked in the score as being played “with renewed force”), the string phrases become denser and longer, and the drums become louder and more dynamic. This musical transition is similar to multi-character Sundanese dances, where a solo dancer portrays multiple characters in the same dance. For dances like *Topeng Koncaran*, the dancer will perform the first half of the dance as one character and then shift personalities (and don a mask) and perform as a different character the rest of the way. The synopsis of *Topeng Koncaran* is based on the Javanese epic Damarwulan. In the first half of the dance, the dancer portrays the princess Anjasmara as she prepares to meet the hero Damarwulan before he departs to battle. The dancer’s movements for Anjasmara are slow, gentle, and subtle. In the second half, the dancer portrays the villainous king Menak Jingga whom Damarwulan is going to battle. The Menak Jingga character is performed with a mask, and the dancer’s movements become wider ranging, faster, and more angular. In my music, the transition from Section A to Section B represents a shift in character and expression from subtle and gentle to more complex and raucous behavior from the strings, winds, and percussion.

As alluded to above, the music in Section B is reminiscent of a dance characterized by rapid, angular movements of the arms and torso, as well as by big steps and jumping motions. The sudden changes in dynamics from the strings and percussion contribute to this effect. The strings feature rhythms and bowing patterns that are somewhat intertwined, reminiscent of the interlocking melodic patterns heard in Sundanese gamelan dance accompaniment. The percussion instrumentation also resembles sounds common in Sundanese dance drumming. For example, the bongos are played by hand to produce bright, slapping sounds similar to those heard on the *keplak* drumhead of the Sundanese kendang. The toms are played with felt-covered mallets to produce warm, resonant tones, similar to the sounds produced by the *congo* and *kentrung* Sundanese drumheads. The high-pitched and low-pitched bass drums resemble the multiple pressure-induced tones that can be produced on the *gedug* drumhead of the Sundanese kendang (for a map of Sundanese kendang drumheads, see Figure 57). When pressure is applied to a drumhead, it increases its tension, causing it to vibrate faster and create a higher pitch. In the case of the gedug drumhead, the kendang player presses their foot against the drumhead to increase the tension and then simultaneously strikes the drumhead to produce a higher-pitched bass sound. The kendang player can then release their foot to play the drum’s naturally low bass sound.

In Section C, the character of the music gradually shifts away from the boisterous energy created in Section B. One by one the strings play continuous glissandi, leaving the role of evoking dance-like gestures to the drums. The drums are slowly replaced with crotales and marimbas. To use the dance metaphor again, this is like the dancer returning to the gentler, subtler movements from the Intro and sitting back down on the ground.

In Section D, the marimba plays a series of prolonged notes, either bowed or rolled, with intervals of silence in between. The subdued energy reminds me of the conclusion of many Sundanese presentational dances, where the dancer sits on the floor and performs a bowing, prayer-like motion with their arms and hands after which the dance typically ends.

Borrowing from Sundanese Gamelan Drumming Notation

The way I notated the suspended cymbal in this piece was influenced by my exploration of how Sundanese gamelan drumming is transcribed and notated. I aimed to give the performer clear directions on which part of the cymbal to strike (such as the bell, surface, or edge) and what kind of sound to create (such as a dry or wet sound, which depends on how the drumstick hits the cymbal). I believed that my knowledge of Sundanese drumming notation, which I had acquired through my research and the creation of a new notation font based on it, could provide me with useful options for notating non-gamelan music. Following the Sundanese notation style, I used letter-shaped noteheads to indicate the cymbal area to strike and superscript diacritics placed above the noteheads to describe specific articulations that are achieved through certain performance techniques.

Since my undergraduate studies in 2004 at UC Santa Cruz, I have been engaged in the study and performance of Sundanese gamelan and drumming. During this time, I began transcribing the drumming for presentational dance pieces such as *Topeng Koncaran*, *Merak*, *Lenyepan*, and others, taught to me by gamelan instructor Undang Sumarna. These transcriptions proved helpful for studying the music outside of rehearsals and comparing any drumming variations taught by Sumarna. By viewing the drumming variations in a written format, I was able to identify their shared characteristics and pinpoint the most impactful drum strikes that corresponded to the dance movements. Furthermore, I transcribed the drum parts for Sumarna's ongoing composition *Kendang Rampak*, which he continuously added new sections and drumming variations to. As a result, I realized that my transcriptions were becoming valuable documents for capturing these changes over time.

My transcription methods consisted of writing a chronological list of mnemonic syllables that represented specific drum strikes. Dots and spaces were used to denote musical rests, and circled mnemonics represented a gong strike from the accompanying gamelan. I interpreted these transcription lists like a percussion score, helping me to recall and practice the drumming patterns when I was outside of rehearsal. However, scores like these are devoid of rhythmic clarity, making it difficult to interpret unless the reader is already very familiar with the music and the notation style. See Figure 25 for a transcription example (Garcia 2022, pp. 40-41).

[:glong ▪pak glong glong ▪pak glong:]
▪bang bang bang pak dong

pak pak pak pak pak tung ting tung ting
pak ting pong ting pak bang tung ting
dong blang pak ting pong
tung tung dong
▪pak bang pak bang pak dong tung tung dong
tung tung tung tung tung tung

▪pak tung ting b-lang
ttt ting ting ting pak kling tung pak
▪tung pak tung pak dong tung tung blang
ttt ting ▪tung pak tung b-lang
ttt ting pak dong tung pak
pang tung pang tung▪
bang pak tung▪tung pak
bang pak tung▪tung pak ▪ ▪
pang tung pang tung▪

Figure 25, Drumming mnemonics for the *Anjasmara* dance

When I began my doctoral studies in 2016, I recognized the need to improve my transcription techniques to make them more rhythmically comprehensible. To achieve this goal, I sought to gain a better understanding of how Sundanese musicians and theorists transcribed and notated Sundanese drumming. I was particularly interested in exploring the historical approaches used by Sundanese artists in Indonesia, which was the basis of my Fulbright research in Bandung, West Java, Indonesia in 2020. During my time in Bandung, I collaborated with artists affiliated with ISBI Bandung (an

Indonesian national arts institute) to investigate the history of Sundanese dance drumming notation. Together, we developed a word processing font based on the most commonly used notation practice. I co-authored an article titled "Notating Sundanese Kendang: Historical Approaches and a New Font" with Een Herdiani (Sundanese traditional arts scholar, author, and performer), which documents our research and findings. The article introduced the notation font that I created with collaborator Yosep Nurdjaman (teacher, performer, and composer of Sundanese traditional arts).

Since the 1970s, Sundanese theorists and teachers developed rhythmically accurate notation approaches that were designed for cultural preservation and drumming pedagogy. The main notation approaches were from Pandi Upandi in the 1970s, Maman Suaman in the 1980s, and Dr. Lili Suparli in the 2000s. Upandi and Suaman both taught gamelan music at SMKN 10 (*Sekolah Menengah Karawitan Negeri*, Vocational Performing Arts High School #10), and Suparli taught and researched traditional Sundanese arts at ISBI Bandung. Each of these notation approaches can be seen as an evolution from the previous approach. Upandi based his notation approach on the use of four distinct glyphs (a, o, u, U), one for each kendang drumhead: “a” for kepl**a**k, “o” for cong**o**, “u” for kentr**u**ng, and “U” for ged**u**g. For a map of Sundanese kendang drumheads, see Figure 26. Diacritics were typically placed on top of the glyph to demarcate a specific sound from the drumhead, such as a dry, slapping sound, a resonant sound, or an overtone.

Suaman’s notation approach was based on similar glyphs (a, U), where “a” was for both the keplak and congo, and “U” was for both the kentrung and gedug. The decision to use fewer glyphs was likely because Sundanese kendang are arranged so that one hand is responsible for striking two drumheads each. This meant that the glyphs did not represent drumheads, they represented which hand to use while playing. As there were less glyphs in Suaman’s approach as compared to Upandi’s approach, it meant that there were more types of diacritics used to denote specific sounds and the specific drumhead.

Suparli’s approach used four glyphs (p, P, t, D), one for each drumhead. However, the glyphs were directly connected to common sounds heard on those drumheads rather than being named from the drumhead name itself. For example, “p” was used for the “**p**ak” and “**p**eung” sounds produced on the keplak drumhead, and “P” was used for the “**p**hak”, “**p**ang”, “**p**ong”, and “**p**ing” sounds coming from the congo drumhead. The glyph “t” stems from the “**t**ung” sound from the kentrung drumhead, and the glyph “D” is based on the “**d**ong” and “**d**et” sounds from the gedug drumhead. Suparli continued using diacritics influenced by Upandi and Suaman’s approaches, as their diacritics had already become commonplace for theorists, teachers, and students (Garcia 2022, pp. 43-45).

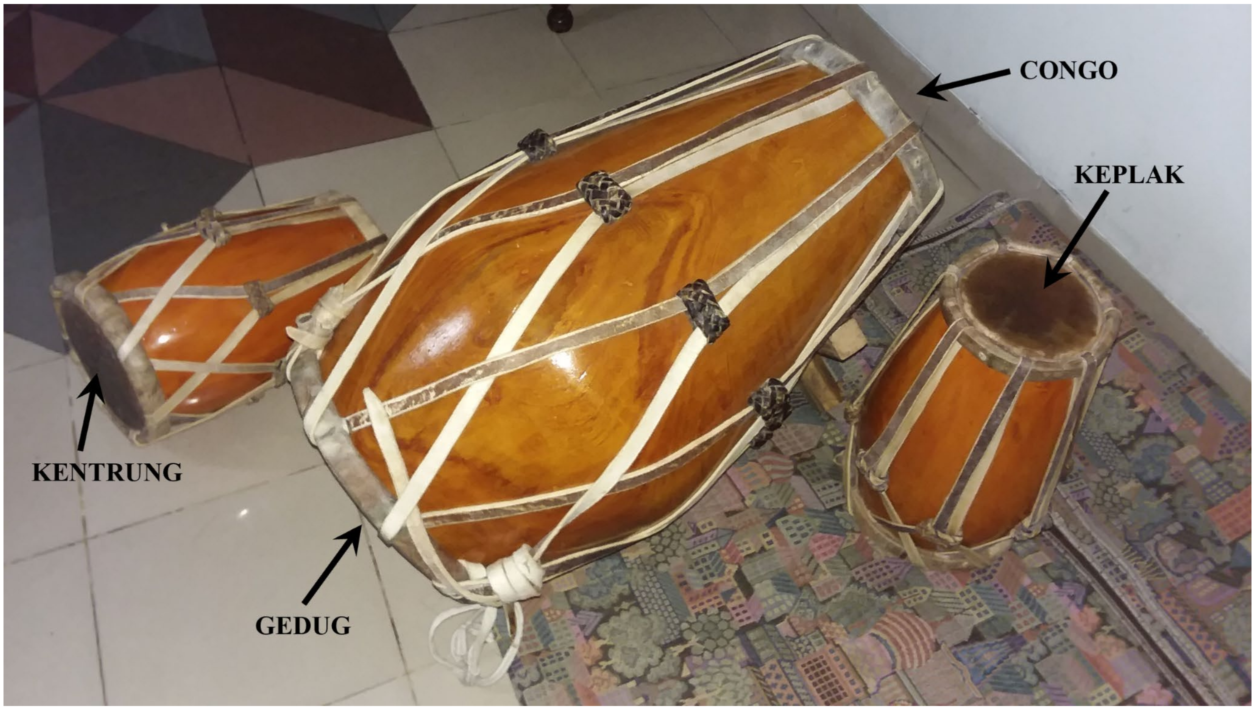


Figure 26, Sundanese kendang drumhead names

Each of these notation approaches has strong theoretical merit, and Suparli's approach was the most commonly used approach by theorists and teachers at ISBI Bandung during my Fulbright research. However, there was a need for a word processing font that could serve as a legible, reproducible representation of this notation approach. When Upandi and Suaman began their notation approaches in the 1970s and 1980s, they used typewriters to superimpose diacritical marks on top or above their glyphs. In the 2000s, the replacement of typewriters with word processing software eliminated the ability to overlay glyphs with custom diacritics with as much ease. Therefore, we constructed a user-friendly font based on Suparli's notation approach. The font contains glyphs with preset diacritics to represent a wide range of drumming sounds, and also contains symbols to represent musical rests, rhythmic beams, gamelan pitches, and gong strikes. The font, named KendangFont Sunda, was built using the free internet tool FontStruct (for an example, see Figure 27). Since its creation, Nurdjaman has used the font in his lectures and academic presentations at ISBI Bandung and has introduced it to his students (Garcia 2022, pp. 46-47).

While studying the historical approaches of Sundanese drumming notation, I came across an interesting notation project that provided specific inspiration for my dissertation composition. While teaching at Bandung's ASTI (*Akademi Seni Tari Indonesia*, Indonesian Dance Academy) in the 1990s, musician Tutun Hatta introduced a notation approach that integrated European staff notation with Upandi and Suaman's diacritical marks. Hatta used stem lines, rhythmic beams, and blackened circular noteheads from staff notation. Notes with a downward stem indicated a note played on the keplak and congo drumheads, and notes with an upward stem indicated a note played on the kentrung and gedug drumheads. Hatta placed diacritics above or below the notehead to denote specific sounds (Garcia 2022, p. 45). For a comparison between Hatta's notation and the KendangFont Sunda font, see Figure 28.

Drum Note	Drum Head	Diacritic Instruction
p̈	Kutiplak	Slapping sound struck with full hand
ṗ	Kutiplak	Resonant sound struck with one finger
P̄	Congo	Resonant sound struck with one finger
t	Katipung	Resonant sound struck with one finger
D	Gedug	Resonant sound struck with full hand
D̸	Gedug	Raised-pitch sound from foot pressure struck with full hand
D̸̤	Gedug	Ascending-pitch sound from foot pressure struck with full hand
T	Gedug	Muffled harmonic sound struck with fingertips

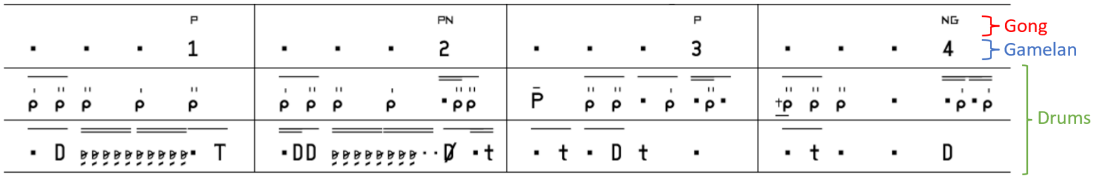


Figure 27, Example of the word processing font KendangFont Sunda

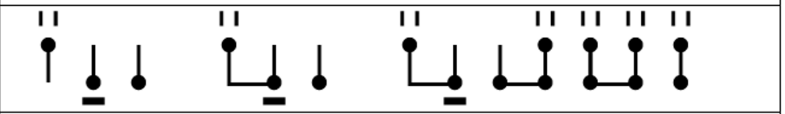
Beat	1 2 3 4 5 6 7 8
Tutun Hatta notation	
KendangFont Sunda notation	p̈ · p̈ · p̈ · p̈ p̈ p̈ p̈ · t D · t D · t D D D D D

Figure 28, Tutun Hatta's notation style vs. KendangFont Sunda

I was intrigued by Hatta's approach when considering percussion notation options for my piece. I liked his use of diacritics and that the noteheads were directly connected to the rhythmic beams. It coincided with European staff notation and the way that I had been notating the compositions for my dissertation. However, I also felt that the alphabet-letter glyphs from Upandi, Suaman, and Suparli's approaches provided an extra layer of information to performers that circled noteheads do not. I decided that I would combine these two ideas and incorporate alphabet-letter noteheads with European-style stemming and rhythmic beaming, accompanied by custom superscript diacritics. I constructed the suspended cymbal notation symbols in FontStruct, the same internet tool that was used when constructing the Sundanese drumming font KendangFont Sunda.

For the suspended cymbal, I used three glyphs (S, B, E) as noteheads that denote the cymbal area to be struck. The "S" notehead means to strike the cymbal's general surface area, the "B" notehead means to strike the cymbal's bell, and "E" means to strike the edge of the cymbal. Diacritics are used for bell and edge hits to describe the exact cymbal location to strike. For strikes on the cymbal's bell, the diacritic "^" is placed above the "B" to represent a cymbal strike on the top of the bell, and the diacritic "v" placed above the "B" represents a strike on the bottom area of the bell. Musically, the top of the bell has a drier, shorter sound with less overtones as compared to the bottom of the bell. Strikes on the bell's top have a pronounced attack and strikes on the bell's bottom have a longer decay.

For strikes on the cymbal's edge, the diacritic "/" is placed above the "E" to signify hitting the edge with the wide shoulder of the drumstick at a 45-degree angle, and the diacritic "|" is placed above the "E" to signify hitting the edge with the narrow shoulder of the drumstick at a 90-degree angle. The 45-degree angle strike implies that the drumstick will actually hit the outer boundary of the cymbal’s surface area that is closest to the cymbal’s edge. The 90-degree angle strike implies that the drumstick will hit the literal edge of the cymbal, not coming into contact with the cymbal surface at all (see Figure 29). The sound produced from the 45-degree angle strike will have a longer decay and more volume than the very dry, staccato-like sound produced from the 90-degree angle strike.

The notation system I developed for the suspended cymbal is similar to the Sundanese drumming font KendangFont Sunda, and I believe that it is clear and easy to understand for both score analysts and performers of the piece. By providing specific instructions on the technique and sound required, it adds compositional value and should result in more accurate and faithful performances of the music.

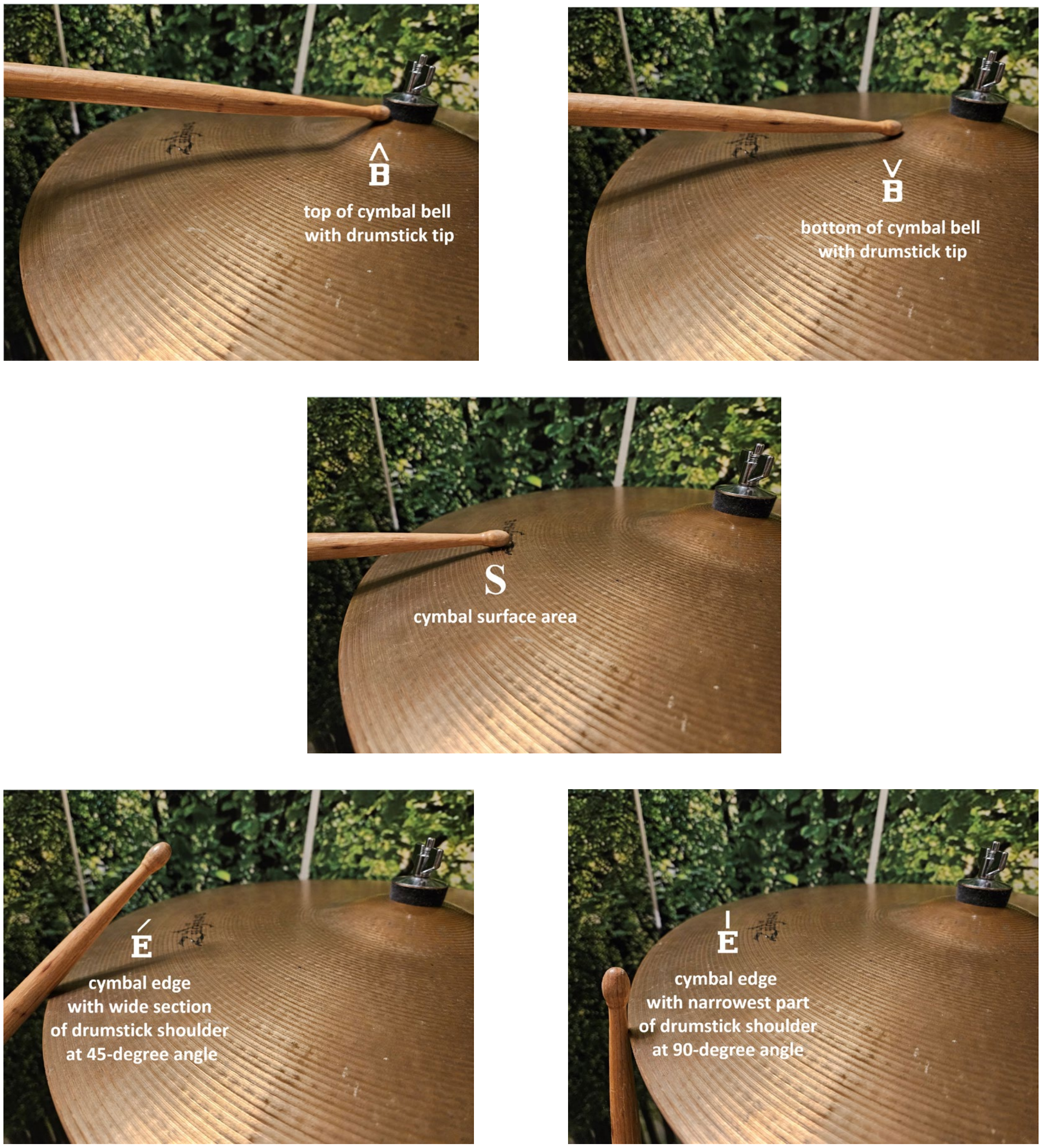

B̂
top of cymbal bell
with drumstick tip
B̌
bottom of cymbal bell
with drumstick tip
S
cymbal surface area
É
cymbal edge
with wide section
of drumstick shoulder
at 45-degree angle
E̍
cymbal edge
with narrowest part
of drumstick shoulder
at 90-degree angle

Figure 29, Examples of cymbal notation, striking areas, and techniques

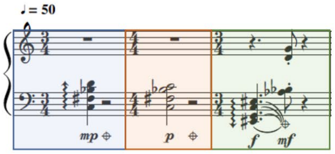
Intro: Slowly and Delicately

Inspirations from *Column's Nocturne* Sketch

The beginning of "Bounds on the Crest" was inspired by an earlier sketch I wrote in a UCSC composition seminar. The seminar assignment was to compose a harp solo for harpist June Han (Garcia 2020c). My sketch, titled *Column's Nocturne,* was meant to express the vertical quality of the instrument's column through sudden, dense block chords and descending glissandi, contrasted with slower-moving ascending lines and arpeggiations. These phrases were then separated by muffling either some or all notes.

Upon reflection of my initial harp sketch, I believed that it had the potential to be further developed by slowing down the tempo to emphasize each individual note. I decided to incorporate a second harp voice to embellish the block chords, glissandi, and arpeggiations of the original, with the second voice being higher in pitch than the first voice. The role of the second voice is similar to that of the original arpeggiations, serving as a response to the block chords and glissandi. Additionally, I intended for the harp sketch to serve as an introduction to the larger piece, so I added percussion to create a transition into the main body of the movement. Softly played temple blocks were used to provide rhythmic and accentual support to the added harp voice, while a softly-rolled suspended cymbal added a light and delicate accompaniment (see Figure 30).

Original Harp Sketch



Final Development with Harp, Temple Blocks, and Suspended Cymbal

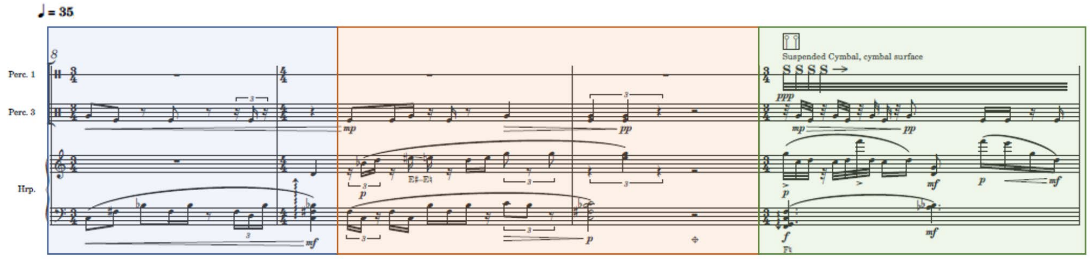
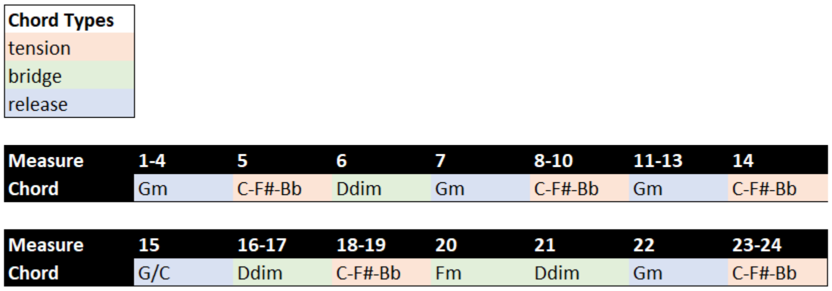


Figure 30, Example of original harp sketch vs. “Bounds on the Crest”

Chordal Movement

The piece begins with a descending glissandi chord followed by a slow-moving ascending line that outlines a G-minor scale variation (G-Ab-Bb-C-D-E#-F#). The first 4 measures highlight the section’s tonic, a G-minor chord. The next chord, which consists of C/F#/Bb, creates tension as it contains the tritone interval. This tension resolves through a D-diminished chord in measure 6, leading to a G-minor chord in measure 7. These three chords – C/F# tritone, D-diminished, and G-minor – form a tension-bridge-release relationship that can be found throughout the section. It's important to note that F# in the tritone chord resolves upward to G, C resolves upward to D, and Bb remains unchanged. Sometimes, the D-diminished chord is substituted with an F-minor chord because of their shared notes (D/F/Ab vs. F/Ab/C). The Intro ends with the unresolved tritone C/F# (see Figure 31).



Chord Types
tension
bridge
release

Measure	1-4	5	6	7	8-10	11-13	14
Chord	Gm	C-F#-Bb	Ddim	Gm	C-F#-Bb	Gm	C-F#-Bb

Measure	15	16-17	18-19	20	21	22	23-24
Chord	G/C	Ddim	C-F#-Bb	Fm	Ddim	Gm	C-F#-Bb

Figure 31, Intro: chord progression

Section A: Hocket and Development

Section A starts with the harp performing a repeated four-measure hocket. The harp generally alternates between an upper and lower voice, similar to the two-voiced phrasing found in the Intro. The lower harp voice mainly moves from Ab2 up to B2, and then descends chromatically back down to Ab2 before the cycle starts anew. The higher voice steps from G4 to A4 and then leaps down to B3 and C4.

During the repetition of the first two harp hocket phrases, the wind instruments join in and play sustained overlapping tones. These tones are mostly played as air sounds, with the entrances and exits of each tone played in the normal playing position and with the same fingering as the pitches to which they are connected. This creates a consistent pitch between the connected air and tone sounds.

The strings and drums accompany the third harp hocket phrase. The drums provide multiple roles: the bass drums, high bongo, and low tom accent the rhythm of the harp hocket, the high tom accents the rhythm of the strings, and the bass drums serve as a substitute for the tacet winds (see Figure 32). This last role is done by rubbing the bass drums with the hand (or wire brush), creating smooth, frictionless sounds on the drumhead. The rubbing sounds are soft and subtle by nature and resemble the air sounds played in the entrances and exits of the wind passages. Bass drum strikes with a mallet are performed in between rubbing sounds, typically in a pattern of one or two low bass drum strikes followed by a single high bass drum strike, which serve as the tone sounds from the wind passages.

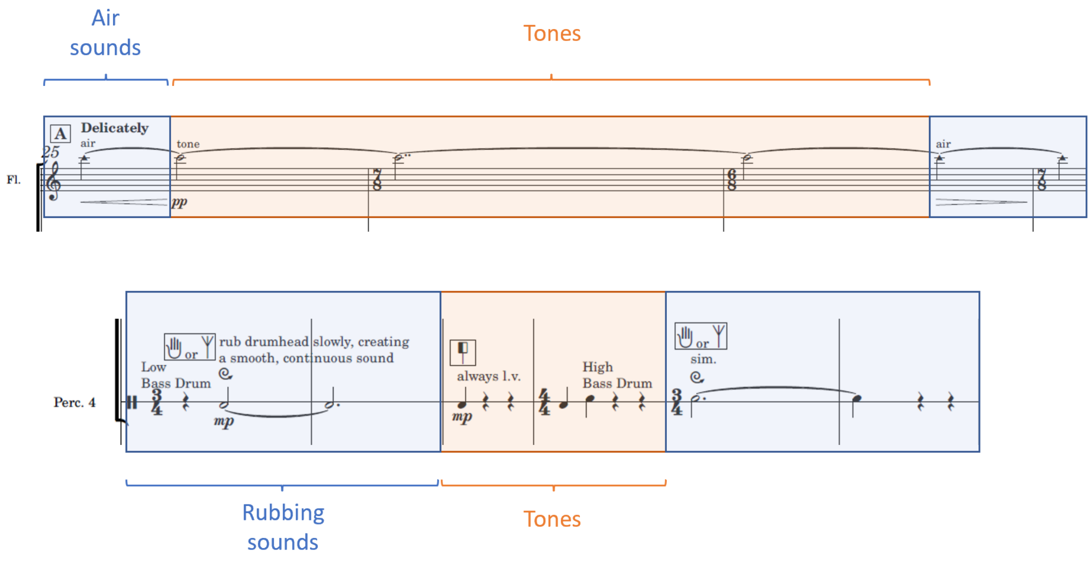

Air sounds
Tones
A
Delicately
air
25
tone
Fl.
pp
air
Perc. 4
Low Bass Drum
or
rub drumhead slowly, creating a smooth, continuous sound
mp
always l.v.
mp
High Bass Drum
or
sim.
Rubbing sounds
Tones

Figure 32, Winds vs. bass drums: auxiliary and primary sounds

Section B: Dance-like and Boisterous

Section B contains a multi-measure strings progression with rhythmically interlocking instrument parts and a persistent contrabass drone on the note E. The progression is split into two phrases of five measures each. The chordal movement within each phrase is based on the Intro chords of G-minor and the tritone chord (C-F#-Bb). The first three measures of each phrase are based on the tritone chord, followed by one measure of G-minor, and ending with a tritone measure. At the measure level, the non-bass string instruments perform interlocking patterns that move in the same melodic directions as each other (ascending, descending, or stagnant). In the first measure of the first phrase, the first half of the measure is performed stagnantly (two beats), and the second half of the measure is performed ascendingly (one beat) and descendingly (one beat). This static-motion sequence resembles the motifs from the Intro harp solo (stagnant block chords, descending glissandi, and ascending melodic lines).

The static-motion sequence is further expanded in subsequent measures in Section B. While the first three measures repeat the same melodic sequence (static for two beats, up for one beat, down for one beat), the following four measures expand these sequences to last twice as long (static for four beats, up for two beats, down for two beats). The last three measures of Section B start as if the expansion will last four times as long, but the sequence is truncated (static for eight beats, up for two beats, down for two beats).

The percussion also follows the form of two phrases split into five measures. Within each phrase, the bongos play notes in the first four measures and is tacet in the final measure. During the first four measures, a series of accented notes followed by a single unaccented note is played on the bongos, giving a tapered contour to their sequences. The toms sequences mainly consists of eighth notes and unmeasured rolls that taper via hairpin. On every fourth measure, the toms are played with a 16th-note sequence, lining up with the G-minor chord from the strings. The wood blocks play a similar sequence as the bongos, playing a series accented-unaccented notes in all measures except the fourth. Their silence in the fourth measure provides more space for the denser sequence by the toms. The low-high sequences from the bass drums stem from their motifs from the previous section. In the first phrase, there are generally a series of 1-2 low bass drum strikes in the first half of each measure and a single high bass drum strike in the second half of each measure. In the second phrase, these sequences are expanded so that low and high bass drum strikes alternate with each measure instead of each half-measure. Each phrase is ended with a fast sequence of bass drum notes: low-low-high-low-low-high (see Figure 33).

PHRASE	FIRST									
Measure	49		50		51		52		53	
Vln1	F#		F#		F#		G		F#	
Vln2	C		C		C		D		C	
Vla	D		D		D		E		D	
Vc	Bb		Bb		Bb		Bb		Bb	
Cb	E		E		E		E		E	
Melodic Direction	static	up-down	static	up-down	static	up-down	static	static	up-up	down-down
Bongos	accents		accents		accents		accents		tacet	
Toms	8th notes		8th notes		8th notes		16th notes		roll	
Wood Blocks	accents		accents		accents		tacet		accent	
Bass Drums	low-low	high	low	high	low-low	high	low-low	low-high	tacet	fast

PHRASE	SECOND									
Measure	54		55		56		57		58	
Vln1	F#		F#		F#		G		F#	
Vln2	C		C		C		D		C	
Vla	D		D		D		E		D	
Vc	Bb		Bb		Bb		Bb		Bb	
Cb	E		E		E		E		E	
Melodic Direction	static	static	up-up	down-down	static	static	static	static	up-up	down-down
Bongos	accents		accents		accents		accents		tacet	
Toms	roll		triplets		roll		16th notes		roll	
Wood Blocks	accents		nonaccents		accents		tacet		accents	
Bass Drums	low	low	high	high	low	low	low-low	low-high	tacet	fast

Figure 33, Section B: motivic analysis

Section C: Strings Transition from Interlocking to Glissandi

Chordal and Motivic Structure

The strings maintain their interlocking pattern of sixteenth-note triplets from Section B as they begin Section C. The strings play in a pattern of static-ascending-static-ascending for the first four measures, with each string instrument eventually transitioning to glissandi one by one. Motivically, the drums begin the first four measures of Section C by responding to the melodic direction in the interlocking strings part. In the first and third measures, each string instrument oscillates between two notes that are a major second apart. The role of the drums in these measures is to provide unmeasured rolls (from the low bongo and low tom). In the second and fourth measures, the medium tom and bass drums interlock with each other, matching the ascending sixteenth-note triplets of the strings. The low bass drums are played in the second measure and the high measures are played in the fourth, thus continuing their pattern of low-to-high bass drum strikes.

Starting at measure 63, the bass drums, toms, and bongos play three overlapping sequences across eleven measures. The bass drums play a modified version of their fast triplet sequence from Section B. This variant lasts for six beats and repeats three times, with pauses in between. At the same time, the bongos and toms play a call-and-response pattern that takes three measures the first time, two measures the second time, and three measures the third time (see Figure 34). The bongos continue to play for another three measures after that.

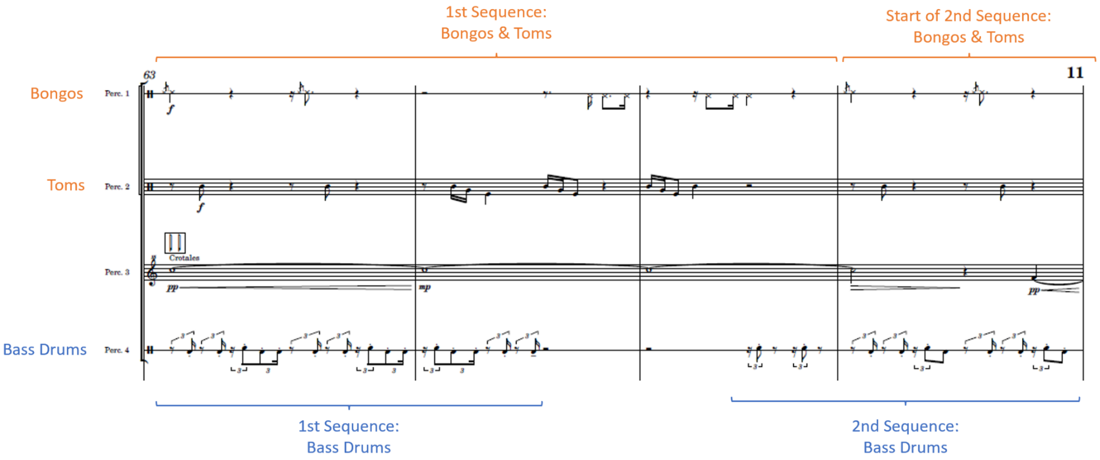

1st Sequence:
Bongos & Toms
Start of 2nd Sequence:
Bongos & Toms
63
11
Bongos
Perc. 1
Toms
Perc. 2
Crotales
Perc. 3
Bass Drums
Perc. 4
f
pp
mp
3
1st Sequence:
Bass Drums
2nd Sequence:
Bass Drums

Figure 34, Section C: overlapping percussion sequences

Inspirations from Ligeti's *String Quartet No. 1*, Senza misura

The strings in sections C are inspired by the harmonic glissandi phrases found in Ligeti's *String Quartet No. 1*, section UU-VV. Ligeti instructed each string instrument to perform glissandi using harmonics. Occasionally one instrument would stop playing their glissando to play a slow, graceful, melodic phrase (C-D-C#-D#), and then return to playing glissandi afterwards. This pattern continues through the end of section XX, lasting approximately two minutes until the glissandi gives way to an arpeggiated dynamic burst from the ensemble. In the final seconds of the piece, the low strings play double-stop chords while the violins play transposed versions of the previous melodic phrase (G-A-G#-A#). The entire section is effective at creating a mysterious yet calming musical landscape.

I appreciate the unsettling quality that Ligeti achieved with harmonic glissandi in his piece, and I was inspired to incorporate this technique into my own composition. In Section C, the violins and viola gradually shift from energetic interlocking patterns to slow, flowing harmonic glissandi, complemented by the glassy sonority of sul ponticello bowing. Meanwhile, the drums maintain a prominent presence, while the cello alternates between sustained nonharmonic notes and periods of silence. As the drumming subsides, the cello plays sustained harmonic notes and the crotales are bowed, enhancing the otherworldly atmosphere created by the high strings' glissandi. Eventually, the drums fade away completely, and the drummers gradually switch to bowing either the crotales or marimbas. The first violin and viola often stop their glissandi to play sustained, nonharmonic tones. The glissandi gradually transition into these sustained nonharmonic tones by narrowing the glissandi pitch range (i.e., the lowest pitch gradually becomes higher, and the highest pitch gradually becomes lower). The glissandi never fully take over from the drums or the sustained nonharmonic notes, but rather serve as a link between the boisterous drumming of the beginning of Section C and the subdued sustained notes of the marimbas at the end of the piece.

Section D: Subdued

In the concluding section of “Bounds on the Crest,” the marimbas are the only instruments still present, which play the same tension-bridge-release chords as heard in the Intro. There are three main chords separated by silence, similar to the beginning of the Intro where the harp was plucked and then muted. The first chord is the tension chord, which includes the notes C, F#, B, and an added E#. The second chord is the bridge chord, which is a D diminished chord. The final chord is actually two chords played without any silence between them. It begins with the tension chord and resolves on the release chord, which is G-minor. The last chord serves as the eventual resolution to the tension chord from the Intro that was left unresolved until now.

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