Building JATS-Compatible Vocabularies
Draft 0.10

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Executive Summary

Many people who create vocabularies based on ANSI/NISO Z39.96-2015 JATS will assume that documents tagged according to their new JATS-based models will be compatible with existing JATS documents and the systems that manipulate them. This is not necessarily the case!

The goal of this document is to enable creators and maintainers of JATS-based document models to know when the extensions they make to JATS models are JATS-compatible, and to suggest ways in which they can achieve their modeling goals in a JATS-compatible way.

Tagging consistency and best practices in document creation are outside the scope of this document.

JATS compatibility is evaluated on the element/attribute and tag set levels. A structure in a JATS-based model that uses an existing JATS name must have the same semantic meaning as in JATS. Additionally, there are a number of "Properties" that a structure might or might not have. For example: an element might or might not be allowed to contain character data; an attribute might or might not be an XML `ID` or an XML `IDREF`; a structure might or might not have a recursive section-like model.

An element or attribute defined by a JATS extension is "JATS-compatible" if it has the same semantic meaning as the object of the same name in JATS and the object matches the corresponding JATS object on all of the Compatibility Properties identified in this document. A tag set that is an extension of JATS is "JATS-compatible" if all of the shared elements are JATS-compatible.

This document is intended to help developers of new JATS-related XML vocabularies create those vocabularies in ways that usefully *extend the reach* of the JATS vocabularies without *conflicting with* current JATS vocabularies. It describes those things that must not change about a model for it to be consistent with the JATS models and some best practices to follow when extending JATS.

1 Introduction

The JATS models (JATS Archiving, JATS Publishing, and JATS Authoring), now ANSI/NISO Z39.96-2015, were the first of a growing set of related XML document models. STS (the Standards Tag Suite), which was first published as ISO STS and is now NISO STS ANSI/NISO Z39.102-2017, was based on JATS, as was BITS (the Book Information Tag Set). JATS was designed to enable customization and extension. The JATS Standard describes new tag sets that are subsets of one of the JATS tag sets as "conforming", and new tag sets that extend the JATS vocabulary as "based on JATS".

Documents that are encoded with conforming JATS vocabularies can generally be intermixed with documents that are encoded with JATS. For example, JATS-conforming documents can be processed with tools that format, search, and manage JATS documents – perhaps with extensions to accommodate new structures.

It is reasonable that people creating vocabularies based on JATS will assume that they simply need to extend tools and databases that work with JATS and JATS-conforming documents to be able to use them with JATS-based documents. **This is not necessarily the case!** There are some

ways in which the JATS models can be extended that will work gracefully in a JATS environment and other ways in which JATS could be extended that will create documents that are not likely to work well with JATS documents.

The goal of this document is to enable creators and maintainers of this growing set of document models to know when the extensions they make to JATS models are JATS-compatible, and to suggest ways in which they can achieve their modeling goals in JATS-compatible ways when they consider an option that is not JATS-compatible. These guidelines are intended to help vocabulary designers find a good balance between consistency and customization when interacting with these models or making new models based on existing models.

When creating a new JATS-based vocabulary, customization may be needed because both the documents and the expected uses of documents may differ from existing JATS-based vocabularies. Structures to encode the unique and/or important features of each document type are key to valuable XML encoding of those documents. Typically, the superstructure of the documents and some subject-matter specific structures will be unique to a vocabulary. However, most of the structures of textual documents (internal structures such as figures, footnotes, lists, and citations) will be the same among all prose documents and should be the same in all documents in the JATS environment.

Consistency among the models is desirable because consistent models allow users to:

1. Use tools developed for one document type to be used with other document types in the family, or with new families also based on JATS, in such a way that adding processing to handle new features of the vocabularies does not require re-engineering the entire tool;
2. Interchange XML documents, document fragments, and metadata, not only between users of the same vocabulary, but among users of other vocabularies in the same family;
3. Manage and search the documents in the vocabularies as a group, for example, putting them all into a single XML-cognizant database and searching the entire collection;
4. Format the documents for print and electronic display using existing stylesheets and formatting applications, adding only formats for new structures; and
5. Minimize the learning needed to add another document type in an environment where people already know one of the document types in the family.

2 Purpose and Scope

This document establishes what it means for a tag set to be JATS-compatible and provides guidance on how a tag set can be developed or modified to be JATS-compatible. It provides both the principles on which JATS compatibility can be decided and some specific criteria that must be met to ensure JATS compatibility.

This document is intended to help developers of new JATS-related XML vocabularies create those vocabularies in ways that usefully *extend the reach* of the JATS vocabularies without *conflicting with* current JATS vocabularies. It documents those things that must not change about a model for it to be consistent with the JATS models.

JATS compatibility is evaluated both on a tag set level and on an element-by-element, attribute-by-attribute basis. Some of the evaluation criteria are expressed as general Design Principles (see section “Design Principles”), and some are expressed as Compatibility Properties (see “Appendix C: JATS Compatibility Properties Catalog”.

In order for a tag set to be JATS-compatible the tag set as a whole must meet all of the rules expressed in this document and all of the structures (individual element and attribute models) in the tag set must meet all of the Design Principles. Agreement on these design principles will ensure that the document models are fundamentally compatible. For example, while there are XML document models that prohibit any mixed content elements, such models are not JATS-compatible.

In addition to the general design principles, there are a number of "Properties" which a structure might or might not have. For example: an element might or might not be allowed to contain character data; an attribute might or might not be an XML `ID` or an XML `IDREF`; a structure might or might not have a recursive section-like model.

The JATS Compatibility Properties Catalog (Appendix C) shows the value of each Property for each individual element and attribute. In order to be JATS-compatible, each element and attribute must match the values of each of the Compatibility Properties shown in the Catalog.

If an element or attribute does not match previously cataloged JATS-based vocabularies on all of these Properties, the new vocabulary should re-name the element or attribute so that it is not in conflict with a similarly named pre-existing structure. These new structures can then be added to the JATS Compatibility Properties Catalog so that as subsequent vocabularies check for compatibility they will check against an ever-growing JATS Compatibility Properties Catalog. There is no intention to prohibit new vocabularies from adding as many new structures as needed. The intention is simply to prevent the same element or attribute name from being used in a way that is incompatible with existing JATS vocabularies. We want to encourage new vocabularies to use existing structure names when their use is JATS-compatible.

Example:

The JATS model for `<name>` allows it to contain only other elements, not characters. JATS `<name>` can contain `<surname>`, `<given-names>`, `<prefix>`, and `<suffix>` in a specified sequence. If another vocabulary wanted to change the sequence of the elements in `<name>`, or to add another element (perhaps `<avatar>`), this would be compatible with the JATS `<name>` model, and the new model would match on all of the Properties in the JATS Compatibility Properties Catalog.

Note: the sequence of child elements in an element is not constrained by these Design Principles and there is no "Matches Sequence" or "Matches Model" Property in the Catalog.

If vocabulary wanted to put data characters directly inside `<name>`, they should be advised that this does not match the "whitespace handling" Property, and therefore is incompatible with the JATS model for `<name>`. A new element name would need to be created for the name variant. (Note: We hope someone would point them to JATS' `<string-name>` element, which was created for just this purpose.)

For example, a JATS name might be:

```
<name><surname>McCrohan</surname>
<given-names>John</given-names><prefix>Capt.</prefix></name>
```

And we can imagine a JATS-compatible name such as:

```
<name><avatar>McThor</avatar><surname>McCrohan</surname><given-names>John
```

```
</given-names><prefix>Capt.</prefix></name>
```

But this would not be a compatible JATS <name>:

```
<name>Capt.<given-names>John</given-
names><surname>McCohan</surname></name>
```

It is important that JATS element and attribute names be used in new JATS-compatible vocabularies when the meaning of the content is semantically similar to the meanings of previous JATS vocabularies and the model matches on all of the Compatibility Properties. Reusing existing structures will make it possible to extend existing JATS tools for new document sets instead of developing new tools and will make it practical to search across a body of JATS-compatible documents.

Example:

There might be a document set in which it is important to identify the types of organizations and the specific organizations that host each of the events being described. If such a vocabulary were not intending to be JATS-compatible, it might model these as <org-type>, <educational>, <not-for-profit>, <commercial>. We can imagine an event tagged as:

```
<event><name>…</name><date>…</date><location>…</location>…
<sponsor><educational><university>University of Frostbite Falls
</university>
<department>Dept of Moose and Squirrel Security
</department></educational></sponsor></event>
```

However, JATS has structures for encoding such organization names, and we encourage new vocabularies to use them. In a JATS-compatible vocabulary we suggest this information should be encoded as:

```
<event><name>…</name><date>…</date><location>…</location>...
<sponsor>
<institution content-type="edu">University of Frostbite
Falls</institution>   <institution content-type="dept">Dept of Moose and
Squirrel Security</institution>
</sponsor></event>
```

NOTE: While documents tagged to a tag set that conforms to these guidelines are more likely to work in existing JATS environments than documents tagged to a JATS-based tag set that does not conform to these guidelines, there is neither the expectation nor the intent that existing applications will simply “work” with documents tagged to a new JATS-based tag set. The intent is to minimize the modification needed to existing JATS documents to accommodate newly designed JATS-based document sets. By following these guidelines, vocabulary designers make it likely that the portions of the newly designed documents that match previous JATS documents will work in JATS environments; tool customization will be needed for the new structures and their contexts.

2.1 Out of Scope: Use of the Tag Sets and Tagging Consistency

There are many situations in which JATS provides more than one way to tag a structure and it is likely that JATS-based tag sets will also have such flexibility. Some users and some

communities of users want to tag their documents consistently for many reasons, including to enhance interchange and enable shared applications. There are groups that provide guidance on tag usage and best practices for use of tag sets. Some provide documentation and tools that support their efforts. Document tagging and other best practices in document creation and use are outside the scope of this document.

2.2 In Scope: Subsets and Supersets

In creating a JATS-based tag set it is possible to make a subset, in which some structures have been removed but none have been added. And it is also possible to make a superset, in which new structures have been added but none have been removed. However, in our experience, most JATS-based tag sets remove some structures, and add some structures, and change a few models.

When creating a JATS subset (or removing structures from a complex JATS-based tag set) it is important to consider the intended use of documents tagged to the new tag set. If a creator of documents uses a subset of JATS and sends the documents to a consumer of documents who is prepared to receive JATS documents, there are unlikely to be problems; in fact the recipient may not even notice that some structures are never used (because they were removed from the content creator's model). However, if a consumer of JATS documents creates a subset of JATS and prepares to accept only documents that conform to that subset, the recipient must be sure to communicate with all of the content creators who will be sending them documents, to ensure that the content creator does not use JATS structures the recipient is not prepared to receive.

Similarly, if a document recipient creates a JATS superset, adding structures to the JATS, it is likely that they will be able to receive documents that do not include the added structures. But if a document creator adds structures the content creator must work with all users/recipients of the documents to ensure that they will be able to ingest documents that contain the extended structures.

3 Design Principles

These design principles are intended to make tag sets fit together gracefully in ways that are easier to describe in prose than in a checklist.

3.1 Element and Attribute Names

Semantic Match

The most important rule for determining if a proposed element or attribute already exists in JATS is a requirement for semantic equivalence. If the definition/meaning of an element or attribute is different from that of the JATS structure, the tag set will not be JATS-compatible unless that structure is given a different element or attribute name. It is not JATS-compatible to repurpose a JATS structure for information with a different meaning even if that might create an appropriate display and even if the new structure has the same model as the one already in JATS.

Appendix C, JATS Compatibility Properties Catalog, indicates which of the JATS family of specifications uses each of the structures (elements and attributes) in the catalog. We recommend reading these descriptions of the elements and attributes before using them in a new vocabulary. As of this writing, the descriptions, with additional remarks, usage notes, and examples, for these vocabularies can be found at these locations:

JATS Archiving 1.2: https://jats.nlm.nih.gov/archiving/tag-library/1.2/

JATS Publishing 1.2: https://jats.nlm.nih.gov/publishing/tag-library/1.2/

JATS Authoring 1.2: https://jats.nlm.nih.gov/articleauthoring/tag-library/1.2/

BITS 2.0: https://jats.nlm.nih.gov/extensions/bits/tag-library/2.0/

NISO STS 1.0: https://www.niso-sts.org/TagLibrary/niso-sts-TL-1-0-html/index.html

Note that while in natural language it is common for words to have multiple meanings which might be significantly different, replicating this in tag sets can cause significant difficulty with interchange and search. If a meaning seems distantly related to that of an existing JATS structure, or if it seems that the meaning of an existing structure is being stretched to include the meaning needed in a new context, we urge the developers to use a new structure instead. Repeated stretching of the meanings of markup structures seriously degrades the value of the markup.

Example:

A vocabulary that has no need for the JATS `<term>` element, which is defined as "Word, phrase, graphic, chemical structure, equation, or other noun that is being defined or described." but would find it useful to have an element for "Length of time for which an office holder is elected" must not use `<term>` for this information if it wants to be JATS-compatible; a newly named element (such as `<term-length>`) is required in order for this new vocabulary to join the JATS models.

Creating New Objects

The same name may only be used for a structure if it matches all of the Compatibility Properties in the JATS Compatibility Properties Catalog. Our expectation is that if a modified model matches the JATS model on all of these Properties, this model can, and should, use the same name as JATS uses for that structure. Most text documents contain paragraphs, and while the details of what is allowed inside those paragraphs may differ, they should all be tagged as paragraphs.

If, however, a modified model does not match on even one of the Compatibility Properties, it should be given a different name—one that is not already in JATS. This rule is not intended to restrict the structures or models that can be created in the JATS environment; this is simply a mechanism to differentiate between those variations that are comfortably compatible and those that should be differentiated as something new.

Example:

Paragraph (`<p>`) in JATS has a mixed content model. If a vocabulary wanted paragraphs that contained labels, titles, text-blocks, and perhaps nested paragraphs, that model in a JATS-Compatible environment would have to be named something other than Paragraph (`<p>`).

JATS Naming Conventions

Although it is not a requirement for compatibility, we recommend that new elements and attributes follow the JATS naming conventions. These conventions are documented in the JATS Tag Library (`https://jats.nlm.nih.gov/archiving/tag-library/1.1/chapter/imple-naming-rules.html`)

3.2 Superstructure

Superstructure elements in JATS are used to shape the document. It is these elements that may be used as "templates" into which the specific content of the document may be inserted. It is likely that the superstructures of document types will differ far more than the prose content of the documents.

In JATS, the superstructure starts with `<article>` and includes elements that identify the major organizing structure of the article, including `<front>`, `<body>`, and `<back>` as well as structures that are used for convenience groupings such as `<floats-group>`.

In any new JATS vocabulary, the top-level element is expected to be a new element, such as `<book>`, `<report>`, `<standard>`, or `<encyclopedia-article>`. A new JATS-family vocabulary should not redefine `<article>` to mean something other than a journal article or to have a significantly different infrastructure; if a new meaning or new high-level structure is needed, a new element with a new tag should be created. The large pieces of the new top-level structure may or may not use JATS superstructure models such as `<front>` (which contains metadata, not narrative front matter), `<body>`, and `<back>`, but if the new vocabulary uses them, they must be used in a superstructure role the same way JATS uses them. Similarly, it would be incompatible to make `<front>` into a container for Dedications, Lists of Figures, Introductions, etc. A new element such as `<front-matter>` should be created for this.

3.3 Proper Subsetting

Subsetting Elements

Changing a model to be a subset of a JATS model is always JATS-compatible provided the white-space handling of the model is unchanged. Element models may be subsets, even very small subsets, of the JATS structure.

Example:

In the JATS Compatibility Properties Catalog, <abstract> is a section-like model. For example, the model for `<abstract>` in JATS Publishing 1.1 is:

- Label `<label>`, optional, followed by
- Title `<title>`, optional, followed by
- Paragraph `<p>`, optional repeatable, followed by
- Section `<sec>`, optional repeatable.

If a vocabulary wants an `<abstract>` model that does not allow internal sections, such as:

- Label `<label>`, optional, followed by
- Title `<title>`, optional, followed by
- Paragraph `<p>`, optional repeatable

that would be JATS-compatible because the model is a subset of the section-like model. In fact, it would be JATS-compatible if the new model for abstract were as small a subset as

- Title `<title>`, optional, followed by

- Paragraph <p> (one or more, required)

or even

- Paragraph <p> (one and only one)

The white-space handling of the model must not change, so:

- a model that is empty may be changed to character data or to character data mixed with element content but may not be changed to element content only, and
- a model that contains element content may have elements added or elements removed or reorganized but may not be modeled as empty nor may character data be added to the model.

Restricting Attribute Values

Attribute values may be more specific than those in existing JATS vocabularies provided the attribute values are of the same type as those already in the JATS Compatibility Properties Catalog. A new model that defines a restricted list of values on a JATS attribute that takes any character data is not restricted by the suggested values for that attribute in the JATS Tag Libraries.

Example:

`@abstract-type` is a character data value attribute in JATS, with a suggested value list in the non-normative documentation. If a vocabulary wanted to restrict `@abstract-type` to "`short`", "`graphical`", and "`audio`", that would be JATS-compatible.

3.4 Linking

Linking and pointing within documents is used for many purposes including cross-references between locations in the text, associating parts of the text with references, and for linking contributors with their affiliations. A wide variety of systems for associating one part of a document with another are possible in XML. Interoperability of XML documents is greatly enhanced if the same system of location identifiers and pointers is used in all of the documents in the environment.

In JATS, the thing that occurs only once is assigned an identifier `ID` (an attribute of XML type `ID`) and it is pointed to from the type of structure that might occur more than once, such as a cross-reference. That is, links in JATS are either one-to-one or one-to-many. JATS does not provide explicit many-to-one links, although from the one-to-many tagging in the JATS XML document a display application may provide that functionality. (Similarly, while it is possible to tag reciprocal links using the JATS tag sets as they are currently published, this is not an expected use of JATS.)

Example:

Each bibliographic reference has an `ID` (attribute `@id`), and each cross-reference to that bibliographic reference uses the value of that `ID` in its `IDREF` (attribute `@rid`).

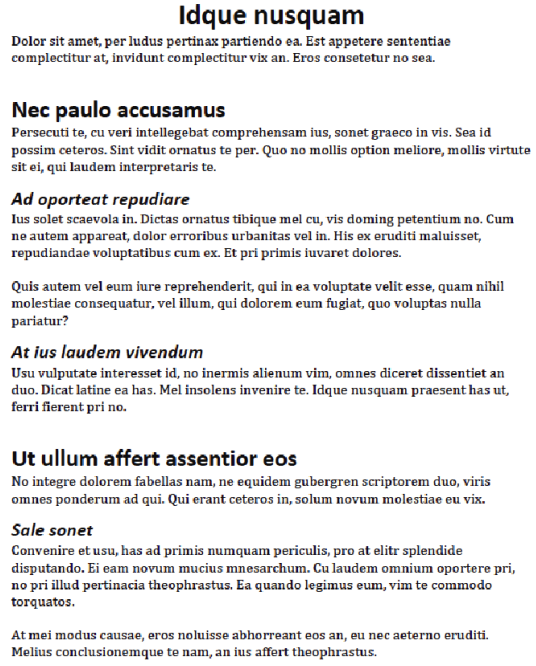
Each organizational affiliation in the article metadata of the article metadata may take an `ID`, and each of the contributors associated with that organization has a link (using an attribute of type `IDREF`) on a cross-reference `<xref>` to that affiliation.

3.5 Section-based Logic

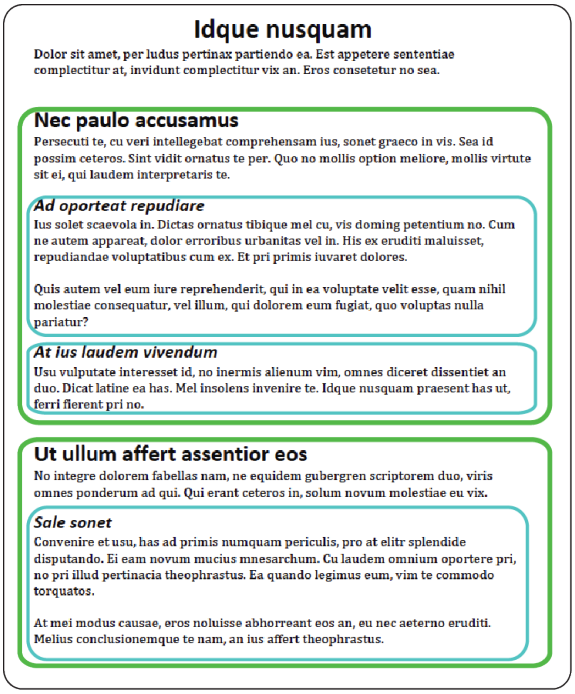
A fundamental characteristic of complex prose documents is that they have multiple styles of headings, that the various styles of headings imply a hierarchical structure, and that there can be text subsidiary to those headings. There are many ways to model this. Word processors typically have multiple levels of headings intermixed with paragraphs and other text structures. Some systems have mechanisms to identify sections and subsections, associating the paragraphs "below" a heading with that heading. Some nest the headed sections, with lower-level sections appearing inside higher-level sections. Some number each level and control the levels of nesting allowed while others allow sections to occur inside sections creating a recursive model.

The recursive section model:

A document that looks like this:



Would be modeled in JATS as nested sections:

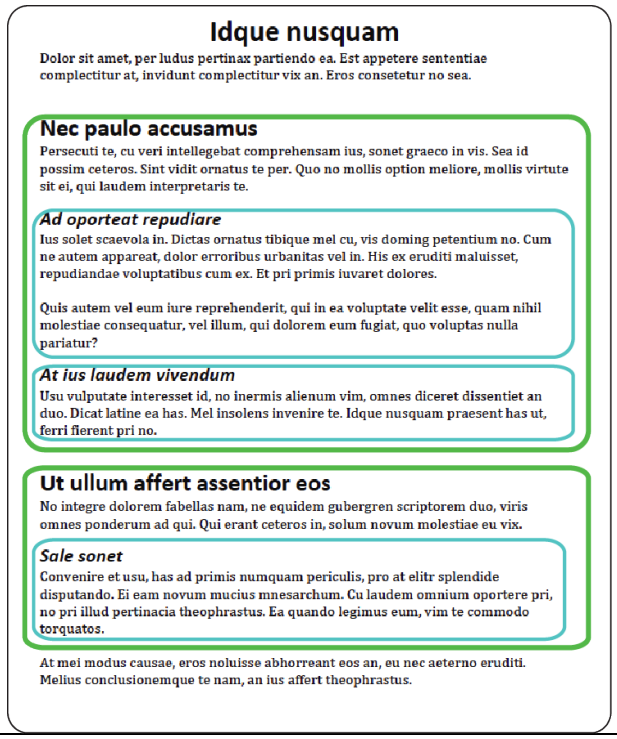


JATS sections are infinitely recursive. That is, a section may contain sections, which may contain sections without limit. (If a JATS-compatible application needs to limit the nesting of sections for some reason, this might be done using a mechanism other than the XML model, for example, a Schematron that implements these business rules.)

Extent of a Section

JATS elements that are sections or modeled like sections do not allow block-like objects (such as paragraphs) to occur after the sections start unless they are clearly identified as section-tail objects because if they were allowed, readers of the documents would be confused.

If the last paragraph of the document illustrated above were not in the sections it follows the reader would have no way to know this:



Parts of a Section

The JATS section-like model has 4 parts, all of which are optional but which must occur in this sequence if they occur:

- Section-Head
- Section-Blocks
- Sections
- Section-Tail

Note: These are not element names; they are roles that elements may play in the structure of a section. In any particular section or section-like model each of these roles may be played by any number of elements, or none.

Some section-like structures, e.g., `<sec>`, `<abstract>`, `<boxed-text>`, and `<app>`, allow all parts of the section model. Others, e.g., `<statement>`, contain only part of the section-model.

The parts of the section-model are illustrated in Appendix A: Parts of a Section.

Because the rules of XML modeling prohibit non-deterministic models[1], in most cases a structure may not be allowed in more than one of these roles in a specific section-like element. If a structure that is allowed to play a role in the section model is needed in another part of the section it must be put in a containing element so that the model remains deterministic (which some tools call unambiguous).

Example:

In JATS sections <sec>, reference lists <ref-list> is a section-tail structure. That is, it may occur at the end of a section after any nested structures. However, it may not occur in the section-blocks area of the section.

Section-Head

The section-head contains identification of the section and descriptions of it. This may include labels, titles, abstracts, keywords, licensing and permissions information, and/or a grouping of such information such as <sec-meta>.

Example:

In JATS, <bio> has a section-like model, but does not include <object-id>. It would be JATS-compatible to add <object-id> to the section-head area of the <bio> model because it is an identifier.

In JATS, the section-head of <bio> includes <sec-meta>, <label>, and <title>. Since the section-head is optional in the section model, all of these could be removed in a JATS-compatible vocabulary, leaving <bio> to contain only section-blocks, sections, and section-tail.

Section-Blocks

The blocks in a section or section-like structure appear before the first of the subsections. The most common blocks are paragraphs, tables, and figures, but many other block-level structures may be allowed. The blocks must appear only *before* the first of the nested sections because it is the habit of readers to assume that any paragraphs (or other blocks) that appear after a heading are part of the section identified by that heading. If a section were to end and be followed by a block, the reader would assume the block was inside that section.

Example:

Reference lists <ref-list>s are not allowed in the section-blocks area of Sections <sec> in JATS; they are allowed only in the section-tail area of JATS sections. It would be possible, and reasonable, to make a JATS-compatible model of <sec> that allows <ref-list>s in the section-blocks area of <sec>s, but this would mean that in this model <ref-list>s would not be allowed in the section-tail area of <sec>s.

[1] See the XML Specification, and specifically section 3.2.1 Element Content at https://www.w3.org/TR/REC-xml/#sec-element-content.

Sections

JATS uses a recursive nested model for sections. Section levels are computed from the location on the section in the document, heading styles are computed by the nesting level of the section in which they are contained, and sections may nest as deeply as needed.

Example:

Sections may nest as deeply as needed in a document:

```
<sec><label>2</label><title>Pets</title>
  <sec><label>2.1</label><title>House Pets</title>
    <sec><label>2.1.1</label><title>Furry House Pets</title>
      <sec><label>2.1.1.1</label><title>Dogs</title>
        <sec><label>2.1.1.1.1</label><title>Lap Dogs</title>
          <sec><label>2.1.1.1.1.1</label><title>Shih Tzu</title>
          </sec>
        </sec>
      </sec>
    </sec>
  </sec>
</sec>
```

Section-Tail

The section-tail is information that may come at the end of a section after the end of the last nested section. Section-tail structures are typically structures that may be referenced from inside the section: `<notes>`, `<fn-group>`, `<glossary>`, and `<ref-list>`.

Example:

It is common in JATS documents for sections to end with reference lists. It would be a reasonable extension for a JATS-compatible vocabulary to add test questions to the tail of sections containing instructional material.

4 Compatibility Properties

The JATS Compatibility Properties Catalog (Appendix C) summarizes several Properties on which a new use must be compared to the existing JATS uses. These Property lists can be thought of as checklists. In order for a structure to match an existing JATS structure it must have the same values on each of these checklists. Some of these Properties apply to all structures (Element versus Attribute), some are relevant only to some structures (Attribute Type applies only to attributes). Some are yes/no, where an "X" means yes and no value means no (is the element a superstructure element, for example), and at least one Property (Whitespace Handling Type) has three options which are represented by single-letter codes.

Note: The Compatibility Properties described here and summarized in Appendix C are far from all of the possible properties of a tag set. It would be possible, for example, to identify with structures in a tag set are pointers to content outside the current document, which are expected to have numerical content, and which are metadata about the document. These are properties of the

tag set, but are not included in the Compatibility Properties list because matching on them is not necessary to achieve the types of document interoperability anticipated by this document.

4.1 Element Versus Attribute

If JATS has put certain content with an element, as narrative text or a child element, a new JATS vocabulary should not make that content into attributes. If the content must be made into an attribute, a new element to hold this attribute must be created. Similarly, if JATS defines the content as an attribute value, a new vocabulary should not make it into child elements; a new and different structure with child elements would need to be created.

Further, although JATS has several examples of the same name being used for an element and an attribute, (e.g., `'corresp'` and `'version'`) we strongly discourage this practice.

Example:

In JATS, keywords are tagged as elements and describe the content at the level in which they appear (inside a keyword-group inside a larger structure such as an article or a section). Keywords in the article metadata describe the whole article; keywords inside an appendix describe the appendix; keywords inside a figure describe that figure. It would be possible for a vocabulary to put an attribute on various structures and put the keywords into that attribute. Since this is the same information contained in the JATS `<kwd-group>` and `<kwd>` elements, we encourage other JATS vocabularies to put their keywords into elements as JATS does. Should there be a good reason that the other vocabulary uses an attribute to contain this information, the attribute should not be given a name already in use as either an element or an attribute name.

4.2 Whitespace Handling

This apparently obscure detail of the way XML is processed can have significant impact on the ability to re-use tools among documents in a heterogeneous collection. If all of the documents in a collection do not have the same whitespace handling rules for each element, there may be unfortunate (and in some cases misleading) effects on the display of the document content.

Significant and Insignificant Whitespace in XML

By definition in XML documents there are two types of whitespace: significant whitespace and insignificant whitespace. In any context where the whitespace is insignificant, any process touching the XML document (such as an XSLT transformation or an XML editor) may remove all whitespace, add whitespace, or collapse multiple whitespaces into one at any time. In a context where whitespace is significant, any process touching the XML document may collapse multiple whitespaces into one or add additional whitespace where whitespace already occurs, but it may not remove all whitespace or insert whitespace where there was none in the document.

In XML all whitespace characters are considered identical: spaces, tabs, line-feeds, and carriage returns are treated as equivalent.

Whitespace Handling Property

The Whitespace Handling Property identifies each element as having one of three types of whitespace handling:

E = Element-like whitespace handling (whitespace is insignificant)

D = Data-like whitespace handling (whitespace is significant and may be folded)

P = Preserve whitespace (whitespace is to be preserved exactly)

Element-like whitespace

Content models that contain only elements (no characters) have insignificant whitespace. By definition, the following XML fragments (if modeled using JATS, which defines all of these elements except `<kwd>` as having element content) are identical, and a process could convert one to another at any time and no XML processor is allowed to treat these three examples differently:

```
<kwd-group specific-use="mobile-nav">
  <nested-kwd>
    <kwd>dosing</kwd>
    <nested-kwd>
      <kwd>geriatric</kwd>
      <nested-kwd>
        <kwd>Heart failure</kwd>
      </nested-kwd>
    </nested-kwd>
  </nested-kwd>
</kwd-group>

<kwd-group specific-use="mobile-nav">
  <nested-kwd><kwd>dosing</kwd>
    <nested-kwd><kwd>geriatric</kwd>
      <nested-kwd><kwd>Heart failure</kwd>
      </nested-kwd>
    </nested-kwd>
  </nested-kwd>
</kwd-group>

<kwd-group specific-use="mobile-nav"><nested-kwd><kwd>dosing</kwd>
<nested-kwd><kwd>geriatric</kwd><nested-kwd><kwd>Heart failure</kwd>
</nested-kwd></nested-kwd></nested-kwd></kwd-group>
```

This is the way whitespace is handled in element-only content models. Processors may remove all whitespace and/or add one or more whitespace characters in this context (that is, between the elements contained in this context) without making any difference in how the content is processed. In Appendix C, “Element-like whitespace handling” is represented by “E”.

Data-like whitespace

This is for content models that allow character content, that have mixed content, or that are declared to be empty. In these contexts, a processor may collapse multiple whitespaces into one whitespace, convert all kinds of whitespace into spaces, and may add whitespace any place where there is already a whitespace character. In Appendix C, “Data-like whitespace handling” is represented by “D”. (Empty elements are specified to have whitespace handling of type D because it does not affect JATS-compatibility if empty elements are converted to allow character data content.)

Content models that allow character data or mixed content have significant whitespace. By definition, the following XML fragments are identical, and a process could convert one to another at any time and no XML processor is allowed to treat these three examples differently:

```
<aff id="StLukes">Department of Health Care for the
```

```
Elderly, St Luke&#x2019;s Hospital, Bradford BD5 0NA</aff>

<aff id="StLukes">Department of Health Care
                  for the Elderly,
                  St Luke&#x2019;s Hospital,
                  Bradford BD5 0NA</aff>

      <aff id="StLukes">Department
                     of
                       Health Care
                          for the Elderly,
                  St Luke&#x2019;s
                       Hospital,
                          Bradford
                               BD5
                                  0NA</aff>
```

An XML processor may not convert such content, if it has significant whitespace into either of the following (whitespace is added in the first and removed in the second):

```
<aff id="StLukes">
     Department of Health Care for the Elderly, St Luke&#x2019;s Hospital, Brad
     ford BD5 0NA</aff>

<aff id="StLukes">DepartmentofHealthCareforthe
Elderly,StLuke&#x2019;sHospital,BradfordBD50NA</aff>
```

Preserve whitespace

No whitespace may be added, none removed, and none converted from one type of whitespace to another. In Appendix C, “Preserve whitespace” is represented by “P”.

Whitespace folding (collapsing each whitespace-only text node into a single space character (U+0020)) is the default expectation in XML that has data-like whitespace handling. In JATS we have one other way to handle whitespace. It may be specified (using “`xml:space="preserve"`”) that all whitespace is to be preserved. For elements where whitespace is to be preserved, the processor may not insert whitespace, may not collapse whitespace, and may not normalize (e.g., convert tabs to spaces) whitespace. This is typically used in examples like this:

```
<code code-type="dtd"  xml:space="preserve">
&lt;!ELEMENT  implications  (tree+) &gt;
&lt;!ELEMENT  tree          (root, branches) &gt;
&lt;!ELEMENT  root          (term, synonym?) &gt;
&lt;!ELEMENT  branches      (term | (term, synonym) | tree)* &gt;
</code>

or

<preformat preformat-type="dialog">
C:\users\lap make
  'make' is not recognized as:
    - an internal or external command
    - an operable program
    - a batch file
</preformat>
```

4.3 Section-like Property

While JATS has only one "section" model (<sec>), it has many section-like models, including <abstract>, <ack>, <app>, and <bio>. All of these structures consist of a Section-Head (identification and labeling information), optional repeating block structures, and optional repeating sections; most have optional section-tails.

In order to be JATS-compatible, a model of one of the elements identified as section-like must have a section model or a model that is a subset of the section model. This is because a subset of a model is always JATS-compatible with the model. So, if a structure has a section-like model in the JATS Compatibility Properties Catalog and a tag set models that element as having a subset of the section-like model that is JATS-compatible.

Example:

In JATS, Boxed Text <boxed-text> has a section-like model. The boxed text model in a vocabulary that modeled boxed text as a title followed by one or more paragraphs would be JATS-compatible.

4.4 Alternatives-Type Property

In JATS, alternatives elements contain several variations or versions *of the same content* that are intended to be used in different renderings or situations. Alternatives may be used to provide a name in more than one character set or to provide a mathematical expression as a graphic, as MathML, and perhaps as plain text. To the extent possible, each alternative represents the same information. Typically, only one of the alternatives is displayed, although in the cases of names more than one may be displayed if it is clear that they are alternate versions of the name of the same person and not multiple people.

JATS alternatives elements include <alternatives> (which is used for graphical or controlled-presentation content) and some alternatives elements with more specific uses, such as <citation-alternatives>, <name-alternatives>, <aff-alternatives>, and <collab-alternatives>.

These alternatives elements are merely containers, which have no meaning of their own, but contain a set of processing alternatives in such a way as to make it clear that all their children represent the same object. Alternatives is a Compatibility Property because an element that performs this function should perform no other (such as containing a label, title, or content).

4.5 Superstructure

The superstructure elements in JATS are used to shape the document. In JATS, the superstructure starts with <article>, but also includes elements that identify the major organizing structure of the article, such as <front>, <body>, and <back> as well as structures that are used for convenience groupings such as <floats-group>.

An element that is named as a superstructure should remain a superstructure or not be used at all; it should not, for example, become, a section-block level element. That usage would not be JATS-compatible.

Example:

In JATS, <response> is a superstructure element. It would be conceivable that in another tag set <response> could be interleaved with <speech> to tag a dialog. For that tag set to become JATS-compatible, that element would need to be renamed, perhaps to <speech-response>.

4.6 Attribute of Type ID or IDREF

This Property indicates whether an attribute is and XML ID or IDREF.

In JATS, any element may be assigned an internal identifier (using the @id attribute), so any element may be pointed to by cross-references. In JATS, many elements have IDREF/IDREFS attributes, which means that many elements may point to other elements in the documents. However, a JATS-Compatible vocabulary might well provide fewer ID and IDREF attributes. Should the developers of a JATS-Compatible vocabulary decide to reduce the number of ID and IDREF attributes available, it is important that they provide IDs on things that will occur once in the documents and IDREFs on the things that might point to them to support JATS's best practice in tagging internal links. This is because software that displays JATS (and JATS-Compatible) documents is likely to assume pointers in this direction.

It is JATS recommended practice to point in only one direction, from the item that occurs many times to the item that occurs once. Equally important, it is JATS best practice not to put reciprocal pointers into the XML documents because this raises the possibility that pointers that are intended to be reciprocal do not match and such errors could be very challenging to locate or correct and create more challenging processing problems than an error in a one-directional pointer.

Example:

It is common for a table to have many footnotes, some of which may be referenced more than once. Each of the table footnotes is identified with an ID (using the @id attribute), and each of the places that references that footnote is identified with an <xref> with an IDREF that points to the footnote. There are NO IDREFS on the footnote that point to the places it was referenced.

In the JATS use of ID and IDREF, the thing that occurs only once is assigned an ID (using an @id attribute), and it is pointed to from a structure that might occur more than once (using an attribute of type IDREF). In order to maintain this consistency it is important that elements that have ID-type attributes in JATS have ID-type attributes in all vocabularies in the environment, and that elements that have IDREF- or IDREFS-type attributes use them consistently. Changing from an IDREF to IDREFS or vice versa does not affect JATS-compatibility because our goal is to be consistent with what is doing the pointing and what is being pointed at. Changing an attribute type from type ID to type CDATA would create interoperability problems because the tools that rely on IDs being unique within the document and structured according to the rules for IDs (which are much more limiting than the rules for CDATA) might be unable to correctly process that attribute with values that are allowed in CDATA.

Example:

It is common for journal articles to have multiple authors, for authors to have multiple affiliations, and for several authors of an article to be affiliated with the same organization. In recording the relationship between contributors and affiliations, each affiliation is given an `ID` and there are cross-references from the author/contributors to their affiliations. The affiliation elements do not point to the contributors.

```
<contrib-group>
<contrib contrib-type="author">
<name><surname>Forster</surname><given-names>Anne Williams</given-
names></name>
<role>research physiotherapist</role>
<xref ref-type="aff" rid="StLukes"/>
<xref ref-type="aff" rid="RoyalInf"/>
</contrib>
<contrib contrib-type="author">
<name><surname>Young</surname><given-names>John G.</given-names></name>
<role>consultant physician</role>
<xref ref-type="aff" rid="RoyalInf"/>
</contrib>
<aff id="StLukes">Department of Health Care for the
Elderly, St Luke&#x2019;s Hospital, Bradford BD5 0NA</aff>
<aff id="RoyalInf">Academic Section of Geriatric
Medicine, Royal Infirmary, Glasgow G4 0SF</aff>
</contrib-group>
```

5 Determining JATS Compatibility

The goal of this document is to help users build JATS-based vocabularies that are as compatible as possible with JATS documents. We hope to enable users to extend JATS to meet new needs while enabling the users to mix their new documents with existing JATS-based documents in databases and discovery systems and to use existing tools developed for JATS documents.

JATS Compatibility should be checked at two levels: the element or attribute level and the tag set/suite level.

5.1 Compatibility of Individual Elements and Attributes

An element or attribute defined by a JATS extension is “JATS-compatible” if it has the same semantic meaning as the object of the same name in JATS (see 3.1 “Semantic Match”) and the object matches the corresponding JATS object on all of the Compatibility Properties.

The Compatibility Properties are described, above, in Section 4 and are cataloged, below, in Appendix C.

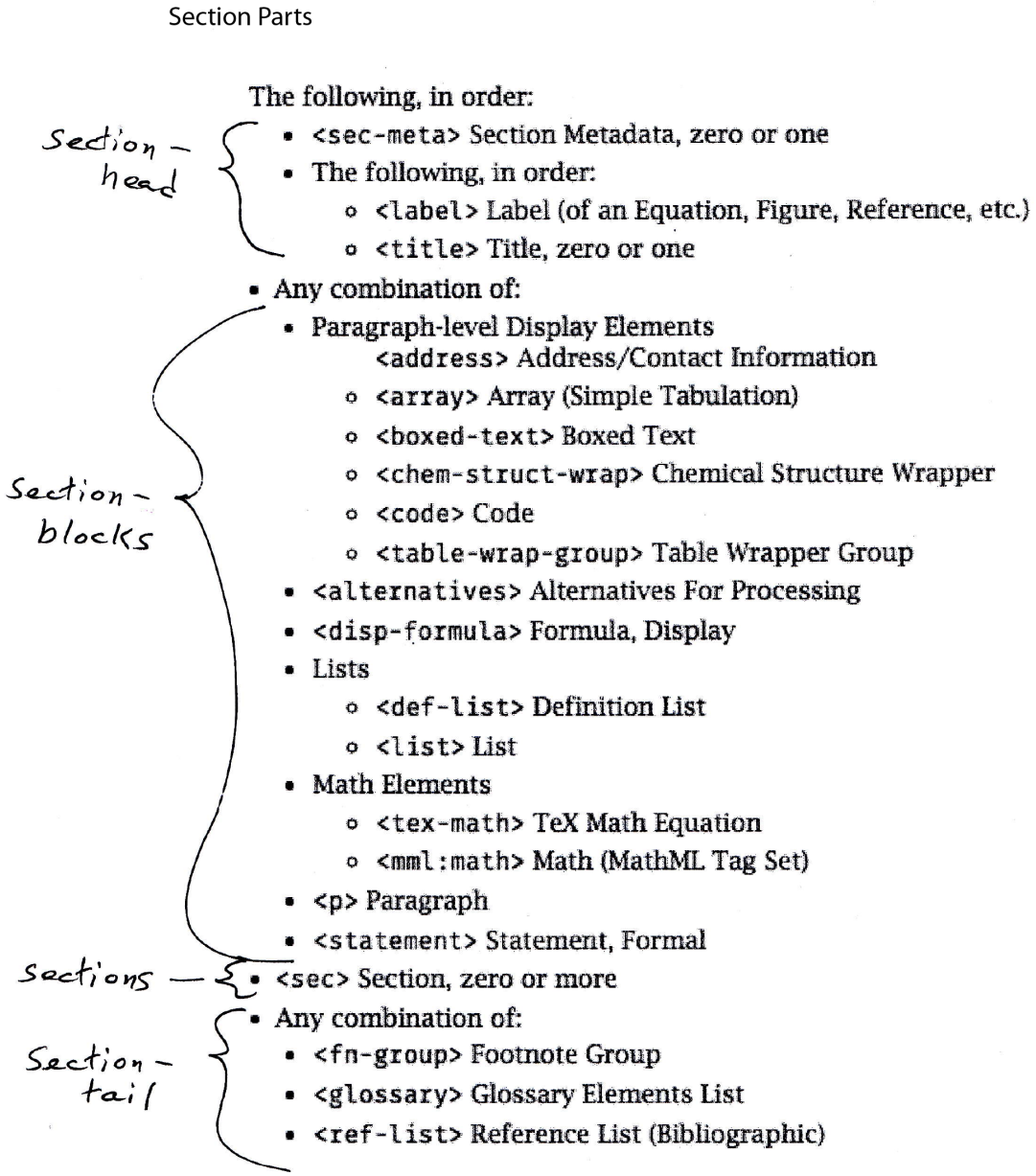
5.2 Compatibility of New Tag Suites

A tag set that is an extension of JATS is “JATS-compatible” if all of the shared elements are JATS-compatible. That is, if a tag set uses some elements and attributes that are used in one or more of the JATS family of specifications and some structures that are not in JATS, that tag set is JATS-Compatible if all of the structures that are in JATS are used according to these

guidelines. The structures (elements and attributes) that are not already in the JATS family may be adopted from other tagging environments or created for this new JATS-Compatible tag set.

If any of the structures in the new tag set use a tag or attribute that is in JATS in a way that conflicts with these Compatibility Guidelines, that new tag set may be described as JATS-based but it is not JATS-Compatible.

Appendix A: Parts of a Section



Appendix B: Known Incompatibilities in Current Models

While it was always the intent of the JATS Standing Committee and its predecessor groups that the Authoring, Publishing, and Archiving versions of the JATS be compatible, little thought and no documentation had gone into supporting that goal. When BITS was developed it was assumed that it would "slide in gracefully" to JATS environments. ISO STS, the predecessor to NISO STS, was developed with the explicit goal that it work well with JATS-based tools. However, these models were developed before work on the JATS Compatibility model began.

It should not, then, be surprising that *after* these principles for compatible modeling had been articulated, it was discovered that there were a few instances in which the JATS models are in violation of them.

As of January 2019, this document describes JATS 1.1, BITS 2.0, and NISO STS 1.0 (the successor to ISO STS). At this time, the known inconsistencies (as defined in this document) within the JATS-based standards are described below.

Whitespace Handling

History

The model for `<history>` in JATS Archiving is a mixed content model, with character data and 46 elements. The model for `<history>` in JATS Publishing is an element only model, containing one required repeatable element. JATS Authoring does not have a `<history>` element.

The `<history>` element differs on the Whitespace-Handling Type access between Publishing and Archiving. This means that systems set up with the Archiving model may preserve unimportant whitespace from Publishing documents and systems set up on the Publishing model may discard significant whitespace when handling Archiving documents.

Publication Date

The element `<pub-date>` has an element model in JATS Archiving and Publishing (Authoring does not include `<pub-date>`). In NISO STS, however, `<pub-date>` has mixed content, including character data. This means that systems that handle both JATS documents and STS documents may insert mangle white space in `<pub-date>`.

Element & Attributes with Same Names

As described above: "although JATS has several examples of the same name being used for an element and an attribute, (e.g., '`corresp`' and '`version`') we strongly discourage this practice". This is a list of names that have been used for both elements and attributes:

- `corresp`
- `count`
- `country`
- `elocation-id`
- `glyph-data`
- `issue`
- `journal-id`
- `language`
- `name`
- `object-id`
- `originator`
- `std-id`
- `version`

Appendix C: JATS Compatibility Properties Catalog

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
abbr	attribute					X	X	X	X	X
abbrev	element			D		X	X	X	X	X
abbrev-journal-title	element			D		X	X			
abbrev-type	attribute					X	X			
abstract	element		X	E		X	X	X	X	X
abstract-type	attribute					X	X	X	X	X
accept	attribute								X	X
accept-language	attribute								X	X
access-date (deprecated)	element			D		X	X	X		X
accredit-acronym	attribute									X
accrediting-organization	element			D						X
ack	element		X	E		X	X	X	X	X
addr-line	element			D		X	X	X	X	X
address	element			E		X	X	X	X	X
adoption	element			E						X
adoption-front	element			E						X
aff	element			D		X	X	X	X	X
aff-alternatives	element	X		E		X	X	X	X	X
ali:free_to_read	element			D		X	X	X	X	X
ali:license_ref	element			D		X	X	X	X	X
align	attribute					X	X	X	X	X
alt	attribute					X	X	X	X	X
alt-text	element			D		X	X	X	X	X
alt-title	element			D		X	X		X	X
alt-title-type	attribute					X	X		X	X
alternatives	element	X		E		X	X	X	X	X
annex-type	element			D						X
annotation	element			E		X	X	X	X	X
anonymous	element			D		X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
answer	element		X	E					X	
answer-set	element			E					X	
app	element		X	E		X	X	X	X	X
app-group	element		X	E		X	X	X	X	X
arrange	attribute					X	X	X	X	X
array	element			E		X	X	X	X	X
article	element			E		X	X	X		
article-categories	element			E		X	X			
article-id	element			D		X	X			
article-meta	element			E		X	X	X		
article-title	element			D		X	X	X	X	X
article-type	attribute					X	X	X		
article-version	element			D		X	X	X		
article-version-alternatives	element	X		E		X	X			
article-version-type	attribute					X	X	X		
assigning-authority	attribute					X	X	X	X	X
attrib	element			D		X	X	X	X	X
audience	attribute								X	
authenticated	attribute					X	X	X	X	X
author-comment	element			E		X	X	X	X	X
author-notes	element			E		X	X		X	
authorization	element			D						X
authorize-acronym	attribute									X
award-group	element			E		X	X	X	X	
award-id	element			D		X	X	X	X	X
award-type	attribute					X	X	X	X	
axis	attribute					X	X	X	X	X
back	element			E		X	X	X	X	X
baseline-shift	attribute					X	X	X	X	X
bio	element		X	E		X	X	X	X	X
body	element		X	E		X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
bold	element			D		X	X	X	X	X
book	element			E					X	
book-app	element			E					X	
book-app-group	element			E					X	
book-back	element			E					X	
book-body	element			E					X	
book-count	element			D					X	
book-equation-count	element			D					X	
book-fig-count	element			D					X	
book-id	element			D					X	
book-id-type	attribute								X	
book-meta	element			D					X	
book-page-count	element			D					X	
book-part	element			E					X	
book-part-id	element			D					X	
book-part-id-type	attribute								X	
book-part-meta	element			E					X	
book-part-type	attribute								X	
book-part-wrapper	element			E					X	
book-ref-count	element			D					X	
book-table-count	element			D					X	
book-title	element			D					X	
book-title-group	element			E					X	
book-type	attribute								X	
book-volume-id	element			D					X	
book-volume-number	element			D					X	
book-word-count	element			D					X	
border	attribute					X	X	X	X	X
boxed-text	element		X	E		X	X	X	X	X
break	element			D		X	X	X	X	X
calendar	attribute					X	X	X	X	X
caption	element			E		X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
cellpadding	attribute					X	X	X	X	X
cellspacing	attribute					X	X	X	X	X
chapter-title	element			D		X	X	X	X	X
char	attribute					X	X	X	X	X
charoff	attribute					X	X	X	X	X
chem-struct	element			D		X	X	X	X	X
chem-struct-wrap	element		X	E		X	X	X	X	X
citation-alternatives	element	X		E		X	X	X	X	X
city	element			D		X	X	X	X	X
code	element			P		X	X	X	X	X
code-type	attribute					X	X	X	X	X
code-version	attribute					X	X	X	X	X
col	element			D		X	X	X	X	X
colgroup	element			E		X	X	X	X	X
collab	element			D		X	X	X	X	X
collab-alternatives	element	X		E		X	X	X	X	X
collab-type	attribute					X	X	X	X	X
collection-id	element			D					X	
collection-id-type	attribute								X	
collection-meta	element			E					X	
collection-type	attribute								X	
colspan	attribute					X	X	X	X	X
comm-ref	element			D						X
comm-ref-group	element			E						X
comm-ref-group-type	attribute									X
comment	element			D		X	X	X	X	X
compl	element			D						X
compl-title-wrap	element			E						X
compound-kwd	element			E		X	X	X	X	X
compound-kwd-part	element			D		X	X	X	X	X
compound-subject	element			E		X	X		X	X
compound-subject-part	element			D		X	X		X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
conf-acronym	element			D		X	X	X	X	X
conf-date	element			D		X	X	X	X	X
conf-loc	element			D		X	X	X	X	X
conf-name	element			D		X	X	X	X	X
conf-num	element			D		X	X	X	X	
conf-sponsor	element			D		X	X	X	X	X
conf-theme	element			D		X	X	X	X	
conference	element			E		X	X	X	X	
content-language	element			D						X
content-type	attribute					X	X	X	X	X
continued-from	attribute				IDREF	X	X	X	X	X
contrib	element			E		X	X	X	X	X
contrib-group	element			E		X	X	X	X	X
contrib-id	element			D		X	X	X	X	X
contrib-id-type	attribute					X	X	X	X	X
contrib-type	attribute					X	X	X	X	X
contributed-resource-group	element			E		X	X	X		
copyright-holder	element			D		X	X	X	X	X
copyright-statement	element			D		X	X	X	X	X
copyright-year	element			D		X	X	X	X	X
correct	attribute								X	
corresp	attribute					X	X	X	X	X
corresp	element			D		X	X		X	
count	attribute					X	X	X	X	X
count	element			D		X	X			X
count-type	attribute					X	X		X	X
country	attribute					X	X	X	X	X
country	element			D		X	X	X	X	X
counts	element			E		X	X		X	X
currency	attribute					X	X	X	X	X
custom-meta	element			E		X	X		X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
custom-meta-group	element			E		X	X		X	X
data-title	element			D		X	X	X	X	X
date	element			E		X	X	X	X	X
date-in-citation	element			D		X	X	X	X	X
date-type	attribute					X	X	X	X	X
day	element			D		X	X	X	X	X
deceased	attribute					X	X	X	X	X
dedication	element			E					X	
def	element			E		X	X	X	X	X
def-head	element			D		X	X	X	X	X
def-item	element			E		X	X	X	X	X
def-list	element			E		X	X	X	X	X
degree-contribution	attribute					X	X	X		
degrees	element			D		X	X	X	X	X
description	attribute					X	X	X	X	X
designator	attribute					X	X	X	X	X
disp-formula	element			D		X	X	X	X	X
disp-formula-group	element			E		X	X	X	X	X
disp-level	attribute					X			X	
disp-quote	element			E		X	X	X	X	X
display-as	attribute								X	
doc-ident	element			E						X
doc-number	element			D						X
doc-ref	element			D						X
doc-type	element			D						X
document-id	attribute					X	X	X	X	X
document-id-type	attribute					X	X	X	X	X
document-type	attribute					X	X	X	X	X
dsep	attribute									X
dtd-version	attribute					X	X	X	X	X
editing-instruction	element		X	E						X
edition	element			D		X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
element-citation	element			E		X	X	X	X	X
elocation-id	attribute					X	X	X	X	X
elocation-id	element			D		X	X	X	X	X
email	element			D		X	X	X	X	X
encoding	attribute								X	X
end_date	attribute					X	X	X	X	X
equal-contrib	attribute					X	X	X	X	X
equation-count	element			D		X	X			X
era	element			D		X	X	X	X	X
etal	element			D		X	X	X	X	X
event	element			E		X	X		X	
event-desc	element			D		X	X		X	
event-type	attribute					X	X		X	
executable	attribute					X	X	X	X	X
explanation	element	X		E					X	
ext-link	element			D		X	X	X	X	X
ext-link-type	attribute					X	X	X	X	X
fax	element			D		X	X	X	X	X
fig	element			E		X	X	X	X	X
fig-count	element			D		X	X			X
fig-group	element			E		X	X		X	X
fig-type	attribute					X	X	X	X	X
fixed-case	element			D		X	X	X	X	X
floats-group	element			E		X	X		X	
fn	element			E		X	X	X	X	X
fn-group	element			E		X	X	X	X	X
fn-type	attribute					X	X	X	X	X
fontchar	attribute					X	X	X	X	X
fontname	attribute					X	X	X	X	X
foreword	element			E					X	
form-type	attribute									X
format	attribute					X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
fpage	element			D		X	X	X	X	X
frame	attribute					X	X	X	X	X
from-where	attribute								X	
front	element			E		X	X	X		X
front-matter	element			E					X	
front-matter-part	element			E					X	
front-stub	element			E		X	X			
full	element			D						X
funding-group	element			E		X	X	X	X	
funding-source	element			D		X	X	X	X	X
funding-statement	element			D		X	X	X	X	
given-names	element			D		X	X	X	X	X
glossary	element			E		X	X	X	X	X
glyph-data	attribute				IDREF	X	X	X	X	X
glyph-data	element			P		X	X	X	X	X
glyph-ref	element			D		X	X	X	X	X
gov	element			D		X	X	X	X	X
graphic	element			E		X	X	X	X	X
gsep	attribute									X
headers	attribute				IDREF	X	X	X	X	X
history	element			D/E		X	X			
hr	element			D		X	X	X	X	X
href	attribute								X	X
ics	element			D						X
ics-desc	element			D						X
ics-wrap	element			E						X
id	attribute				ID	X	X	X	X	X
indent-level	attribute					X	X	X		
index	element		X	E					X	X
index-div	element		X	E					X	X
index-entry	element			E					X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
index-group	element		X	E					X	X
index-term	element			E		X	X	X	X	X
index-term-range-end	element			D		X	X	X	X	X
index-title-group	element			E					X	X
index-type	attribute					X	X	X	X	X
indexed	attribute								X	
initials	attribute					X	X	X	X	X
inline-formula	element			D		X	X	X	X	X
inline-graphic	element			E		X	X	X	X	X
inline-media	element			D		X	X	X		
inline-supplementary-material	element			D		X	X	X	X	X
institution	element			D		X	X	X	X	X
institution-id	element			D		X	X	X	X	X
institution-id-type	attribute					X	X	X	X	X
institution-wrap	element			E		X	X	X	X	X
intro	element			D						X
intro-title-wrap	element			E						X
is-form	attribute									X
is-proof	element			D						X
isbn	element			D		X	X	X	X	X
iso-8601-date	attribute					X	X	X	X	X
iso-meta	element			E						X
issn	element			D		X	X	X	X	X
issn-l	element			D		X	X	X	X	X
issue	attribute					X	X	X	X	X
issue	element			D		X	X	X	X	X
issue-id	element			D		X	X	X	X	X
issue-part	element			D		X	X	X	X	X
issue-sponsor	element			D		X	X			
issue-title	element			D		X	X	X	X	X
italic	element			D		X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
journal-id	attribute					X	X	X	X	X
journal-id	element			D		X	X	X	X	X
journal-id-type	attribute					X	X	X	X	X
journal-meta	element			E		X	X			
journal-subtitle	element			D		X	X			
journal-title	element			D		X	X			
journal-title-group	element			E		X	X			
kwd	element			D		X	X	X	X	X
kwd-group	element			E		X	X	X	X	X
kwd-group-type	attribute					X	X	X	X	X
label	element			D		X	X	X	X	X
language	attribute					X	X	X	X	X
language	element			D						X
language-version	attribute					X	X	X	X	X
level	attribute									X
license	element			E		X	X	X	X	X
license-p	element			D		X	X	X	X	X
license-type	attribute					X	X	X	X	X
link-type	attribute					X	X	X	X	X
list	element			E		X	X	X	X	X
list-content	attribute					X	X	X	X	X
list-item	element			E		X	X	X	X	X
list-type	attribute					X	X	X	X	X
long-desc	element			D		X	X	X	X	X
lpage	element			D		X	X	X	X	X
main	element			D						X
main-title-wrap	element			E						X
media	element			E		X	X	X	X	X
meta-date	element			D						X
meta-name	element			D		X	X		X	X
meta-note	element		X	E						X
meta-value	element			D		X	X		X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
milestone-end	element			D		X	X		X	X
milestone-start	element			D		X	X		X	X
mime-subtype	attribute					X	X	X	X	X
mimetype	attribute					X	X	X	X	X
mixed-citation	element			D		X	X	X	X	X
mml:math	element			E		X	X	X	X	X
monospace	element			D		X	X	X	X	X
month	element			D		X	X	X	X	X
name	attribute					X	X	X	X	X
name	element			E		X	X	X	X	X
name-address-wrap	element			D					X	
name-alternatives	element	X		E		X	X	X	X	X
name-style	attribute					X	X	X	X	X
named-book-part-body	element			E					X	
named-content	element			D		X	X	X	X	X
nat-meta	element			E						X
nav-pointer	element			D					X	X
nav-pointer-group	element			D					X	X
nav-pointer-type	attribute								X	X
nested-kwd	element			E		X	X	X	X	X
nlm-citation	element			E		X	X	X		X
non-normative-example	element		X	E						X
non-normative-note	element		X	E						X
norm-part-of-speech	attribute									X
normative-example	element		X	E						X
normative-note	element		X	E						X
notation	attribute					X	X		X	X
note	element			E		X	X		X	
notes	element		X	E		X	X		X	X
notes-group	element			E						X
notes-type	attribute					X	X		X	X
num	element			D						X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
oasis:table	element			E		X	X		X	X
oasis:tbody	element			E		X	X		X	X
object-id	attribute					X	X	X	X	X
object-id	element			D		X	X	X	X	X
object-id-type	attribute					X	X	X	X	X
object-type	attribute					X	X	X	X	X
on-behalf-of	element			D		X	X	X	X	X
open-access	element			E		X	X	X	X	X
option	element	X		E					X	
orientation	attribute					X	X	X	X	X
originator	attribute									X
originator	element			D						X
overline	element			D		X	X	X	X	X
overline-end	element			D		X			X	
overline-start	element			D		X			X	
p	element			D		X	X	X	X	X
page	attribute					X	X	X	X	X
page-count	element			D		X	X	X		X
page-range	element			D		X	X	X	X	X
parse	attribute								X	X
part-number	element			D						X
part-of-speech	element			D						X
part-title	element			D		X	X	X	X	X
part-type	attribute									X
patent	element			D		X	X	X	X	X
permissions	element			E		X	X	X	X	X
person-group	element			D		X	X	X	X	X
person-group-type	attribute					X	X	X	X	X
phone	element			D		X	X	X	X	X
platforms	attribute					X	X	X	X	X
pointer-to-explained	attribute				IDREF				X	

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
pointer-to-question	attribute				IDREF				X	
position	attribute					X	X	X	X	X
postal-code	element			D		X	X	X	X	X
preface	element			E					X	
prefix	element			D		X	X	X	X	X
prefix-word	attribute					X	X	X	X	X
preformat	element			P		X	X	X	X	X
preformat-type	attribute					X	X	X	X	X
price	element			D		X	X	X	X	X
principal-award-recipient	element			D		X	X	X	X	
principal-investigator	element			D		X	X	X	X	
private-char	element			E		X	X	X	X	X
product	element			D		X	X	X	X	
product-type	attribute					X	X	X	X	
proj-id	element			D						X
pronunciation	element			D						X
pub-date	element			D/E		X	X		X	X
pub-date-not-available	element			D		X	X			
pub-history	element			E		X	X		X	
pub-id	element			D		X	X	X	X	X
pub-id-type	attribute					X	X	X	X	X
pub-type	attribute					X	X	X		X
publication-format	attribute					X	X	X	X	X
publication-type	attribute					X	X	X	X	X
publisher	element			E		X	X		X	
publisher-loc	element			D		X	X	X	X	X
publisher-name	element			D		X	X	X	X	X
publisher-type	attribute					X	X	X	X	X
question	element		X	E					X	
question-preamble	element		X	E					X	
question-response-type	attribute								X	

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
question-wrap	element			E					X	
question-wrap-group	element			E					X	
rationale	attribute					X	X		X	X
rb	element			D		X	X	X	X	X
ref	element			E		X	X	X	X	X
ref-count	element			D		X	X			X
ref-list	element			E		X	X	X	X	X
ref-type	attribute					X	X	X	X	X
reg-meta	element			E						X
related-article	element			D		X	X	X	X	X
related-article-type	attribute					X	X	X	X	X
related-object	element			D		X	X	X	X	X
related-term	element			D						X
related-term-type	attribute									X
release-date	element			D						X
release-version	element			D						X
release-version-id	element			D						X
resolution	attribute					X	X	X	X	X
resource-group	element			E		X	X	X		
resource-id	element			D		X	X	X		
resource-id-type	attribute					X	X	X		
resource-name	element			D		X	X	X		
resource-type	attribute					X	X	X		
resource-wrap	element			E		X	X	X		
response	element			E		X	X			
response-type	attribute					X	X			
rid	attribute				IDREF	X	X	X	X	X
role	element			D		X	X	X	X	X
roman	element			D		X	X	X	X	X
rowspan	attribute					X	X	X	X	X
rp	element			D		X			X	

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
rt	element			D		X	X	X	X	X
ruby	element			E		X	X	X	X	X
rules	attribute					X	X	X	X	X
sans-serif	element			D		X	X	X	X	X
sc	element			D		X	X	X	X	X
scope	attribute					X	X	X	X	X
sdo	element			D						X
season	element			D		X	X	X	X	X
sec	element		X	E		X	X	X	X	X
sec-meta	element			E		X	X		X	
sec-type	attribute					X	X	X	X	X
secretariat	element			D						X
see	element			D		X	X	X	X	X
see-also	element			D		X	X	X	X	X
see-also-entry	element			D					X	X
see-entry	element			D					X	X
self-uri	element			D		X	X	X	X	X
seq	attribute					X	X	X	X	X
series	element			D		X	X	X	X	X
series-text	element			D		X	X			
series-title	element			D		X	X			
serif	element			D					X	
show-in-toc	attribute								X	
sig	element			D		X	X		X	X
sig-block	element			D		X	X		X	X
size	element			D		X	X	X	X	X
sort-key	attribute								X	X
source	element			D		X	X	X	X	X
source-id	attribute					X	X	X	X	X
source-id-type	attribute					X	X	X	X	X
source-type	attribute					X	X	X	X	X
span	attribute					X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
speaker	element			D		X	X	X	X	X
specific-use	attribute					X	X	X	X	X
speech	element			E		X	X	X	X	X
standard	element			E						X
start_date	attribute					X	X	X	X	X
state	element			D		X	X	X	X	X
statement	element		X	E		X	X	X	X	X
std	element			D		X	X	X	X	X
std-doc-meta	element			E						X
std-id	attribute									X
std-id	element			D						X
std-id-group	element			E						X
std-id-link-type	attribute									X
std-id-type	attribute									X
std-ident	element			E						X
std-meta	element			E						X
std-meta-type	attribute									X
std-org	element			E						X
std-org-abbrev	element			D						X
std-org-group	element			E						X
std-org-level	attribute									X
std-org-loc	element			D						X
std-org-name	element			D						X
std-org-role	attribute									X
std-org-type	attribute									X
std-organization	element			D		X	X	X	X	
std-ref	element			D						X
std-relationship-type	attribute									X
std-type	attribute									X
std-xref	element			E						X
strike	element			D		X	X	X	X	X
string-conf	element			D		X			X	

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
string-date	element			D		X	X		X	
string-name	element			D		X	X	X	X	X
style	attribute					X	X	X	X	X
style-detail	attribute					X	X	X		
style-type	attribute					X	X	X	X	X
styled-content	element			D		X	X	X	X	X
sub	element			D		X	X	X	X	X
sub-article	element			E		X	X			
sub-part	element			E						X
subj-group	element			E		X	X		X	X
subj-group-type	attribute					X	X		X	X
subject	element			D		X	X		X	X
subtitle	element			D		X	X	X	X	X
suffix	element			D		X	X	X	X	X
summary	attribute					X	X	X	X	X
sup	element			D		X	X	X	X	X
suppl-number	element			D						X
suppl-type	element			D						X
suppl-version	element			D						X
supplement	element			D		X	X	X	X	X
supplement-type	attribute					X	X	X	X	X
supplementary-material	element			E		X	X	X	X	X
support-description	element			E		X	X	X		
support-group	element			E		X	X	X		
support-source	element			D		X	X	X		
support-type	attribute					X	X	X		
suppress	attribute								X	
surname	element			D		X	X	X	X	X
symbol	attribute					X	X		X	X
table	element			E		X	X	X	X	X
table-count	element			D		X	X			X
table-wrap	element			E		X	X	X	X	X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
table-wrap-foot	element			E		X	X	X	X	X
table-wrap-group	element			E		X	X		X	X
target	element			D		X	X	X	X	X
target-type	attribute					X	X	X	X	X
tbody	element			E		X	X	X	X	X
tbx:entailedTerm	element			D						X
tbx:termEntry	element			E						X
td	element			D		X	X	X	X	X
term	element			D		X	X	X	X	X
term-display	element			E						X
term-head	element			D		X	X	X	X	X
term-sec	element		X	E						X
term-source	element			D						X
term-status	attribute					X	X	X		X
term-type	attribute					X	X	X		X
tex-math	element			D		X	X		X	X
textual-form	element			D		X	X	X	X	X
tfoot	element			E		X	X	X	X	X
th	element			D		X	X	X	X	X
thead	element			E		X	X	X	X	X
time-stamp (deprecated)	element			D		X	X	X		X
title	element			D		X	X	X	X	X
title-group	element			E		X	X	X	X	
title-wrap	element			E						X
toc	element		X	E					X	X
toc-div	element		X	E					X	X
toc-entry	element		X	E					X	X
toc-group	element		X	E					X	X
toc-title-group	element			E					X	X
toggle	attribute					X	X	X	X	X
tr	element			E		X	X	X	X	X
trans-abstract	element		X	E		X	X		X	

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace [illegible]	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
trans-source	element			D		X	X	X	X	X
trans-subtitle	element			D		X	X		X	X
trans-title	element			D		X	X	X	X	X
trans-title-group	element			E		X	X		X	X
type	attribute									X
underline	element			D		X	X	X	X	X
underline-end	element			D		X			X	
underline-start	element			D		X			X	
underline-style	attribute					X	X		X	X
units	attribute					X	X	X	X	X
unstructured-kwd-group	element			D		X			X	
uri	element			D		X	X	X	X	X
urn	element			D						X
use-type	attribute					X	X	X		
valign	attribute					X	X	X	X	X
verse-group	element			E		X	X	X	X	X
verse-line	element			D		X	X	X	X	X
version	attribute					X	X		X	X
version	element			D		X	X	X	X	X
vocab	attribute					X	X	X		X
vocab-identifier	attribute					X	X	X		X
vocab-term	attribute					X	X	X		X
vocab-term-identifier	attribute					X	X	X		X
vol	attribute					X	X	X	X	X
volume	element			D		X	X	X	X	X
volume-id	element			D		X	X	X	X	X
volume-in-collection	element			E					X	
volume-issue-group	element			E		X	X			
volume-number	element			D					X	
volume-series	element			D		X	X	X	X	X
volume-title	element			D					X	
wi-number	element			D						X

JATS Structure Name	Element or Attribute	Alternatives*	Section-like*	Whitespace	ID or IDREF	JATS Archiving 1.2	JATS Publishing 1.2	JATS Authoring 1.2	BITS 2.0	NISO STS 1.0
width	attribute					X	X	X	X	X
word-count	element			D		X	X			X
x	element			P		X			X	
x-size	attribute					X	X	X	X	X
xi:fallback	element			D					X	X
xi:include	element			E					X	X
xlink:actuate	attribute					X	X	X	X	X
xlink:href	attribute					X	X	X	X	X
xlink:role	attribute					X	X	X	X	X
xlink:show	attribute					X	X	X	X	X
xlink:title	attribute					X	X	X	X	X
xlink:type	attribute					X	X	X	X	X
xml:base	attribute					X	X	X	X	X
xml:lang	attribute					X	X	X	X	X
xml:space	attribute					X	X	X	X	X
xmlns:ali	attribute					X	X	X	X	X
xmlns:mml	attribute					X	X	X	X	X
xmlns:oasis	attribute					X	X		X	X
xmlns:tbx	attribute									X
xmlns:xi	attribute								X	X
xmlns:xlink	attribute					X	X	X	X	X
xmlns:xsi	attribute					X	X	X	X	X
xpointer	attribute								X	X
xref	element			D		X	X	X	X	X
xsi:noNamespaceSchemaLocation	attribute					X	X	X		
y-size	attribute					X	X	X	X	X
year	element			D		X	X	X	X	X