The relevant concepts in an application domain related to scientific publications are: journal, journal volume and article. The following facts are known about these concepts:

1. Each journal is published by exactly one publisher.
2. Each publisher uses exactly one open-access repository.
3. Each article can be a journal article or a conference article.
4. Each journal volume is an issue of exactly one journal and has exactly one number and one date.
5. Each journal volume consists exclusively of journal articles.
6. Each journal volume consists of at least five, possibly more journal articles.
7. A journal article is equivalent to an article that is part of a journal volume.
8. Each article consists of one abstract and at least four, possibly more sections. An article does not have any type of part other than an abstract and section.
9. Among others, exactly one of each of the following sections has to be present in each article: Introduction, Conclusions, References.
10. Each References section refers to at least one article.
11. A journal article can be an extended version of a conference article.
12. Journal, journal volume, article, publisher, section, abstract and repository are pairwise disjoint concepts.

The candidate should express all the above knowledge in an OWL 2 DL ontology, using the RDF Turtle notation. In particular, the ontology will:

Q1. Declare the required classes, providing for each class a concise textual description of the intension of the class, using the appropriate annotation property from the RDF Schema vocabulary.
Q2. Provide the axioms defining the class taxonomy.
Q3. Declare the required object properties, providing for each property:
    a. an axiom defining the domain of property
    b. an axiom defining the range of property
    c. an axiom defining the inverse of property
    d. any additional axiom expressing whether the property is functional, inverse functional, transitive
Q4. Define the object property taxonomy.
Q5. Declare the required data properties, providing:
    a. the domain of each property
    b. the range of each property, choosing the appropriate datatype from the OWL 2 DL datatype map.
Q6. Define the axioms expressing the above knowledge items 1 to 12, indicating, for each axiom, which item(s) it expresses.

Q7. Populate the ontology with individuals (at least one for each class) and define assertions on the individuals (at least one for each property).
Q8. Define the complex role inclusion axiom capturing the fact that an article that is part of a journal volume that is an issue of a journal published by a publisher that uses an open access repository is collected in that repository.
Q9. Verify whether or not the ontology satisfies the global restrictions on the axioms of an OWL 2 DL ontology.
Q10. Identify one class or property assertion that would make the ontology inconsistent.
Q11. Write the following queries in SPARQL:
    a. Find all abstracts of journal articles.
    b. Find all sections of the articles that are not Introduction, Conclusions and References.
    c. Find all conclusions of journal articles that are included in volumes published between 2015 and 2017.
    d. Find all the scientific publications and their parts.