University of South Wales Prifysgol De Cymru

Faculty of Computing and Engineering Assessment Brief

Module Title: Intelligent Systems
Module Code: CS3S668
Module Leader/Tutor: Christopher Tubb
Date assessment set: 15th September 2025
Assessment Type: Asynchronous Assessment: Practical Written Work
Assessment Title: Rule Based System <individual titles provided>
Weighting: 50%
Word count/duration/equivalent: 2000
Submission Date: 10:00 10th November 2025
Return Date: 12:00 8th December 2025

Assessment Description

Context

Rule based systems encode domain knowledge expertise which can be used to make decisions/suggestions based on specific case information determined during a consultation.

The creation of the rule base, and practical implementation of such a system present a number of challenges. An engineer must be aware of the nuances of these during the construction of a knowledge-based system.

A well designed and implemented rule-based system benefits from being:

- understandable: how an output is reached can be traced through the rules that are applied
- usable: it is clear to the user what is being asked and what they are expected to do
- useful: it should be clear how the output is to be interpreted, and of course the output should be “correct” and applicable to the subject domain.

Task

Scenario

Self-appointed ‘experts’ have produced simple expressions of their understanding of seven problems, each given in the form of a decision tree.

1. House purchase
2. Wait for table
3. Discount Fares
4. Freshwater Invertebrate Identification
5. Freshwater Arthropod Identification

6. Meteorite identification
7. British Bat Identification

The trees are provided below (appendix one)

A brief note is provided with each tree. This is intended to help you place the work in context and develop your ideas.

You will be allocated one of these problems via lot. Student numbers with associated trees will be posted to Blackboard following the draw.

It is recommended that you study all trees and their associated notes to help with completion of this assessment.

You **must** produce an expert system which successfully implements the tree allocated to you. The system you produce will obtain information through presenting questions to the user. A suitable output will then be provided via a user message.

You are also required to write and submit a report which describes your solution and places the work into the wider AI context. You **must** also record a video demonstration of your system via screencast. Further information on the requirements is provided below.

To provide further context you may wish to consider additional examples, such as the use of similar systems in medical diagnosis, or perhaps applications such as the placement of mobile 'phone masts and relate these to the comments you make.

The Expert System

In each consultation, your system should build and analyse knowledge about the problem by asking questions and using its inference engine to derive intermediate facts.

A typical consultation will:

- Invite the user to input known facts in response to questions
- Result in an output taking the form of a decision or suggestion. The output should include details of the process by which the decision was made
- Approximate a natural dialogue. For instance, it should ideally only ask questions that still seem relevant following previous answers.

The systems should be written following good coding practice and appropriate conventions.

The Report

The report ***will:***

- Be written in a formal style.
- Place the system in the wider context, including considerations of ethical, commercial and social issues of such systems. These considerations should include those directly related to your specific system and its domain and to appropriate general cases.
- Consider the cases where the results could be misleading and suggest ways to improve how the system deals with any ambiguity. You might also suggest ways to incorporate other information which effects any interpretation of the knowledge at hand, but you are not obliged to produce a new expert system to illustrate these changes.

- Include a discussion on the view that a rule-based approach makes it difficult to deal with complexity and uncertainty.
- Discuss difficulties with the process of knowledge acquisition and how inductive learning might help overcome these.

Along with the required elements above, the report **MUST** cover the following areas:

- A short description of the problem (i.e. what is the system for).
- A short explanation of the logic and workings of your knowledgebase.
- A discussion of how well you think your program works (with specific examples and printouts of consultations) and suggested improvements.
- Human factors involved within the use of your system.
- **Your code as text within an appendix**

Guidance on Format of Assessment

Note: Students are reminded **not** to include this assessment brief with the assessment submission.

You should record a video demonstration of the system working. You may choose to add a voice over for further explanation, but it must be clear that:

- The system works
- The system is the one for which the code is provided

You should comment and use other appropriate techniques to help illuminate the structure and operation of your code.

Your **code** should be submitted as text within an appendix to the report. The code should be presented in such a way that it may be easily tested by pasting into the expert system software. You are encouraged to add a link to your code stored on a suitable repository. This is neither mandatory nor an alternative to including the text as stated above.

You are being asked to create a working rule-based system and then report upon this work. This is not simply a book exercise. Remember the practical elements must be complete and working.

Learning Outcomes Assessed

1 Demonstrate knowledge, comprehension, and discernment of AI paradigms in the context of common problems and of ethical, legal and commercial issues.

2 Synthesize effective AI based solutions to specified problems

Learning outcomes are specified in the course definition document on VERO (https://curriculum.southwales.ac.uk/). VERO holds the definitive published course and module documents should be considered the “ultimate truth”; though will be interpreted to instantiate the module.

Marking Criteria/Rubric

Note: All grades are provisional until they are ratified by the exam board

For clarity the rubric has been moved to the final appendix of this document.

Links to Graduate Attributes

As well as developing subject-specific knowledge and skills, this assessment also supports the development of key graduate attributes that prepare you for life beyond university. These attributes are designed to support you to be a resilient, ethical, culturally aware, and globally minded professional. The attributes supported by this assessment are indicated below:
[Please tick which graduate attribute/s apply to this assessment.]

☒	☒	☒	☒	☐	☒

Supporting your Success

Learner Development Services

The Learner Development Service offers a range of support to help you succeed, including self-help resources and 1:1 support tailored to your needs.

You can also access the Academic Skills Hub for practical guidance on academic writing, referencing, critical analysis, and more.

Use of Artificial Intelligence

This section will let you know if and how you can use AI in this assessment. You can also find our handy guides here.

You may use AI to Level 3. Remember you must demonstrate your own achievement of the learning outcomes, not that of an AI.

Please note that using AI incorrectly can be considered academic misconduct.

To support your understanding of what constitutes good academic practice, we strongly recommend completing USW's **Epigeum** course. This online resource helps you build your knowledge and confidence around all aspects of academic integrity.

Referencing, Plagiarism and Good Academic Practice

It's important you learn to reference correctly, and that you adhere to the guidelines of good academic practice.

Submission Details

You must submit the following items:

a) A formal report. This report will be submitted for automated plagiarism checks in line with University practice (TurnItIn)[1] or assessed for AI generated content.

b) Your system code (***must*** be included as an appendix to the report). This should be submitted in a way such that it may easily be tested. You may also choose to provide a link to a suitable repository.

c) A video demonstration/screencast of the system being used, uploaded to Panopto. This should cover all significant cases and illustrate the functionality of the system – this screencast will be used in grading. You may wish to add a voice-over to help explain what you are showing, this however is not a requirement. It should be clear that the code submitted in the report is the code being demonstrated. Ensure that you submit to the correct folder to enable all examiners to review your work. Failure to do so may be considered a failure to submit. Provide a link in your report so that your video submission may be identified. It is ***required*** that you include your ***student number*** in the filename of the video.

Also:

d) You may be asked to demonstrate your system in person on campus if there is any ambiguity in the report or screencast recording. If you are asked to produce a live demonstration you should see this as an opportunity to ameliorate any shortcoming in your submission.

Ensure you submit to the correct Panopto Folder

Your video filename must include your student number.

You should provide a link to your Panopto submission in your report

What happens next?

Your marked assessment should be available 20 working days after submission. However, please be advised that this may be subject to change in the event of Bank Holidays, University Closure or staff sickness. If there is something about the feedback you have been given that you are unclear about, please see your module tutor.

[1] A Turnitin similarity report is not the only means by which submissions will be checked for academic misconduct.

Feedback

Feedback will be provided in written form on the link to which the REPORT is submitted on BB.

In addition, general feedback may be provided. This will be given as an entry in the assessment section of BB. General feedback will be anonymous and may address common issues, ideas and approaches of particular value which have been identified and any other comments which may be useful across the class to help with future submissions or to support learning. No student will be identified in the general feedback.

Feedback will be released in line with course practice and University requirements: 12:00 on the first Monday following 20 working days from submission.

Late Submission

You are allowed a further five working days from the submission deadline in which to submit, however, your mark will be capped at the pass mark (usually 40%). If you are a student who has an Individual Support Plan (ISP), your mark will not be capped and your feedback will include acknowledgement of your ISP.

Extenuating Circumstances

If you are experiencing circumstances that are affecting your performance in assessments, you may be able to claim Extenuating Circumstances. You may need evidence of your circumstances to make a claim. Further information can be found on the UniLife Extenuating Circumstances pages. If you need support to make a claim, Advice Zone Online has a helpful FAQ about Extenuating Circumstances. You can 'ask a question' which will be sent to Advice Zone staff. You can also Contact the Advice Zone directly.

What happens if you don't submit?

If you do not submit your assessment or do not effectively claim Extenuating Circumstances, you will receive 0%. This may affect your chances of successfully passing the module. It may also be used as an indicator that you are not engaging on your course.

What happens if you don't pass the assessment?

Please remember that all grades are provisional until they are ratified by the exam board. If you have not passed the assessment here are some possible options for you:

In-Year Retrieval

The assessment is eligible for IYR

Possible Retrieval

University standard retrieval processes will be followed

Support is available - you can discuss your options with your course team, or contact the Advice Zone

Feeling overwhelmed?

USW's Wellbeing Service offer free advice and support to all USW students.
You will also find links to self-help and can access one of their specialist services:

- Mental Health Service
- Counselling
- Health Service
- Disability

For other help and support check the USW support services page.

Your Assessment Queries

Please make queries in practical sessions or via the module discussion fora. This allows others to benefit from any clarifications.

Formative Assessment Opportunities

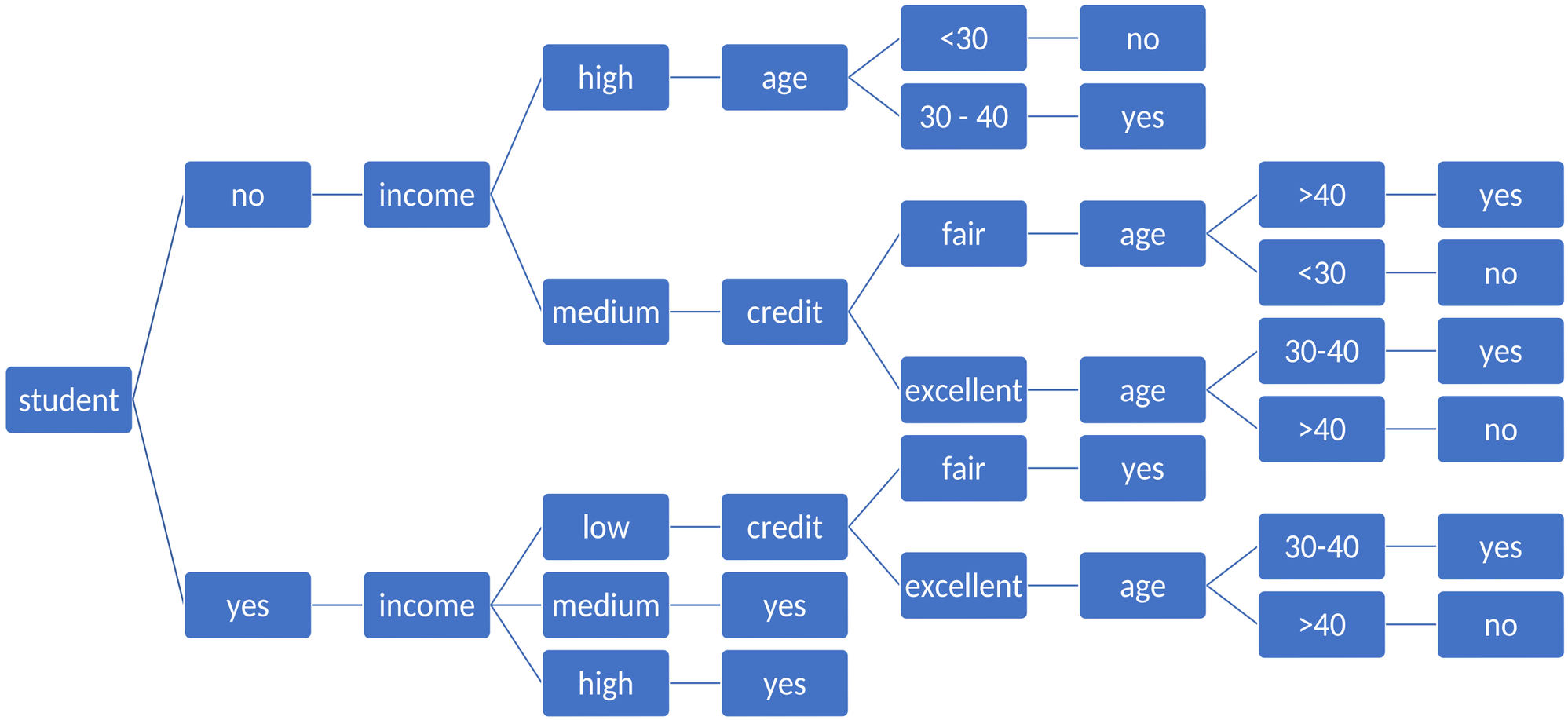
Completing the practical tasks for this module and discussing these with the tutor in the timetabled sessions will provide important formative assessment opportunities. Your attention is drawn specifically to the UTI Diagnosis exercise.
There are notes below the trees. It would be wise to read and discuss all the questions posed in your study group, regardless of which system you are completing.

Student Checklist

- Double check the content of the brief above before submission. Does your work meet ALL the requirements?
- Have you read and understood the grading requirements? Have you used these to inform your work?
- Have you submitted to the correct Panopto assessment folder?
- Have you included a link in your report to your video submission?
- Is your student number included in the video filename?

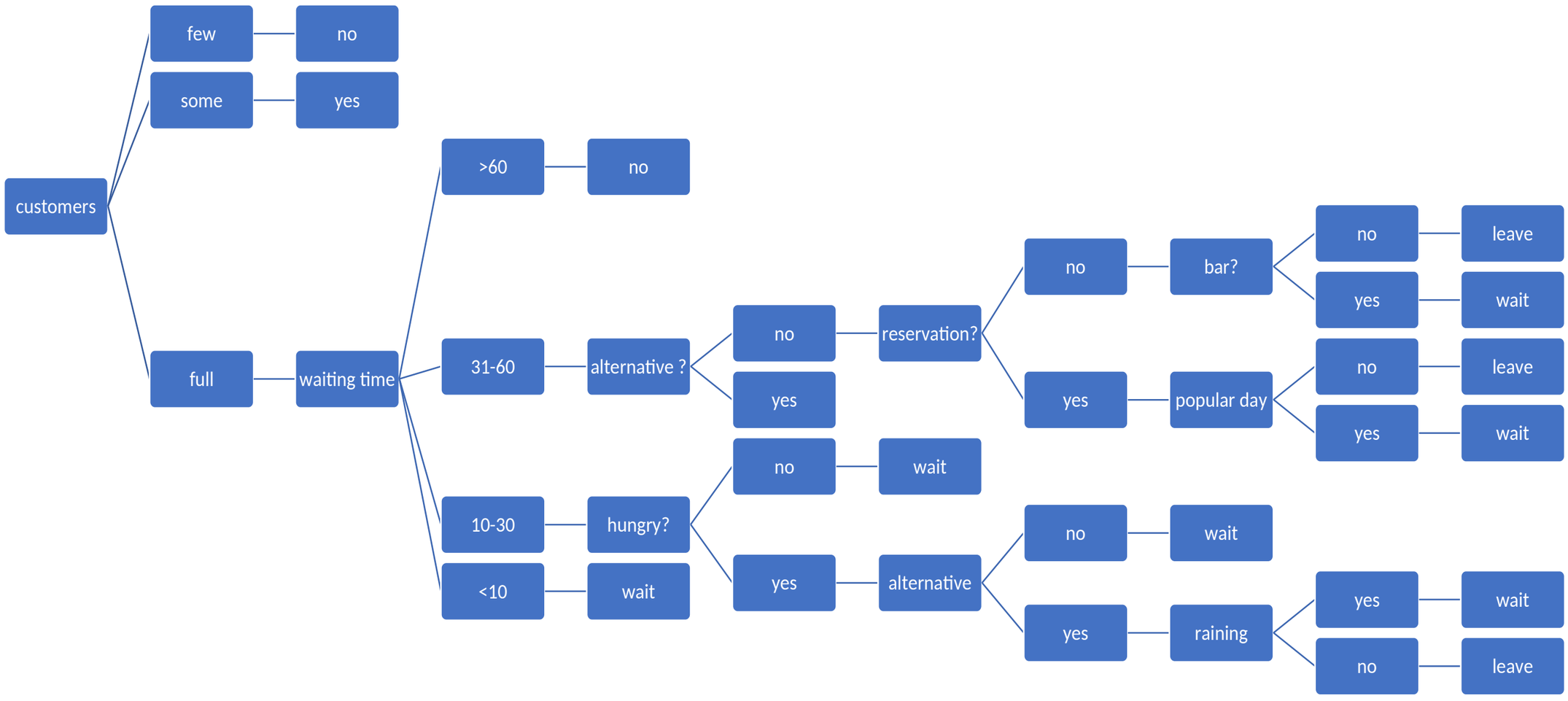
Appendix One

House Purchase



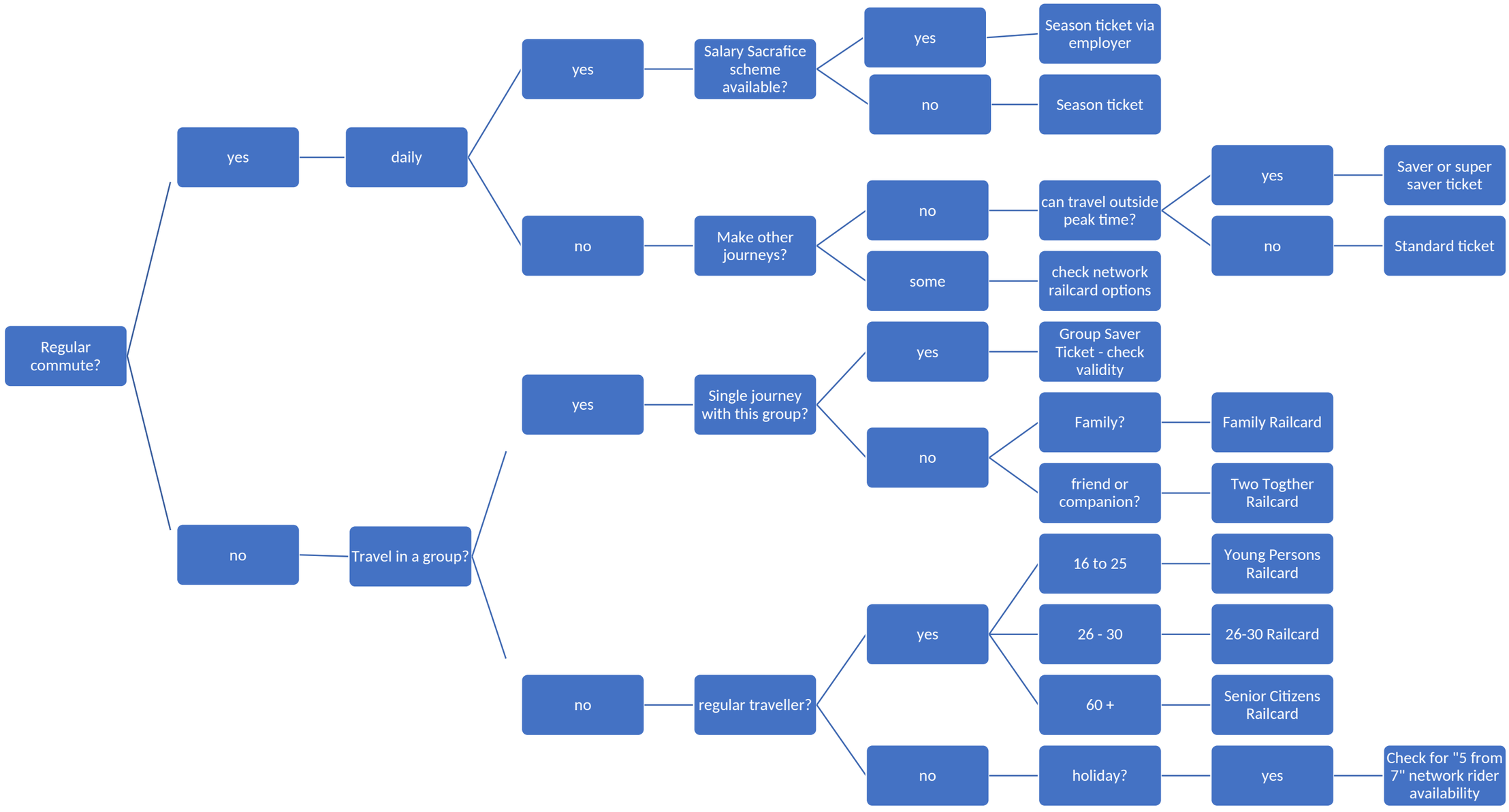
Note:
In generating this tree, the expert considers income to determine if a purchaser is a good risk. The expert has not considered the property, which a mortgage lender might also like to base their decision upon. How might this be integrated into the tree? How might multiple decision-making processes be structured?

Wait for Table



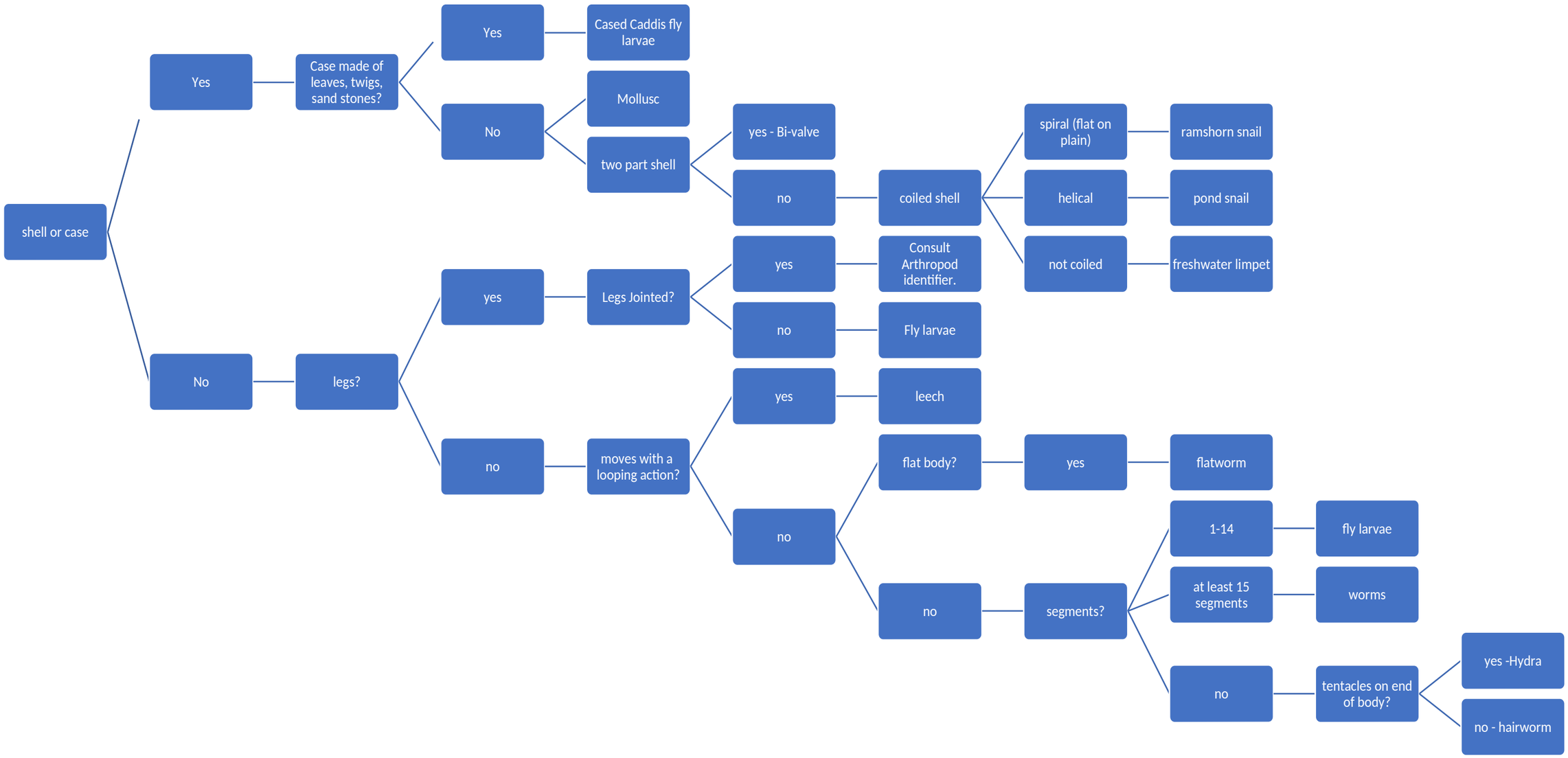
Note:
Whether to wait for a table can be a subjective exercise. If this tree were to be adapted to help businesses determine whether punters are liable to wait, and to adjust elements of their business practice to optimise the number of customers, how would this be done?

Discount Fares



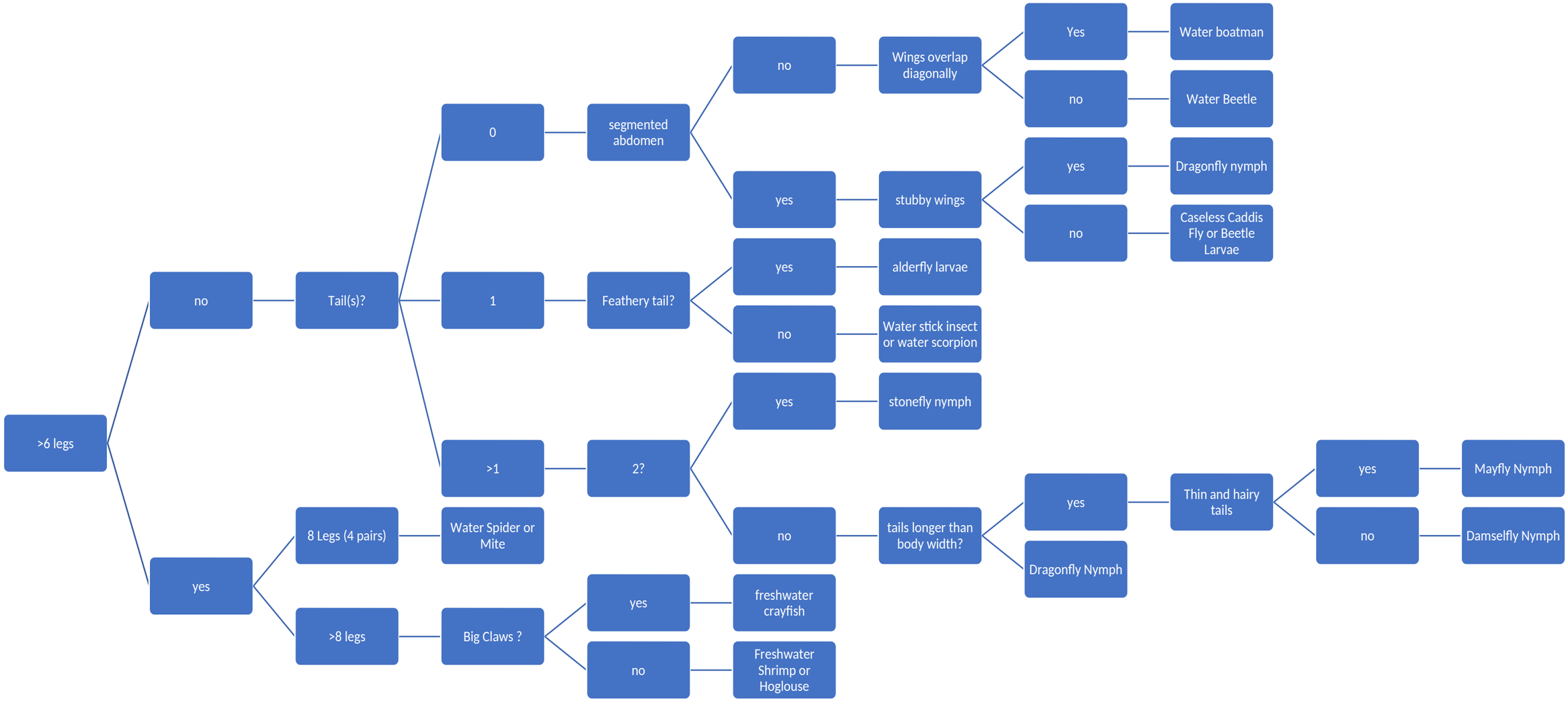
Notes:
The system should ***always*** recommend an appropriate ticket.
Special offers and temporary solutions may be included. Could you consider this in the rule base?

Freshwater Invertebrate Identification (2mm+. excludes skating and other water surface animals)



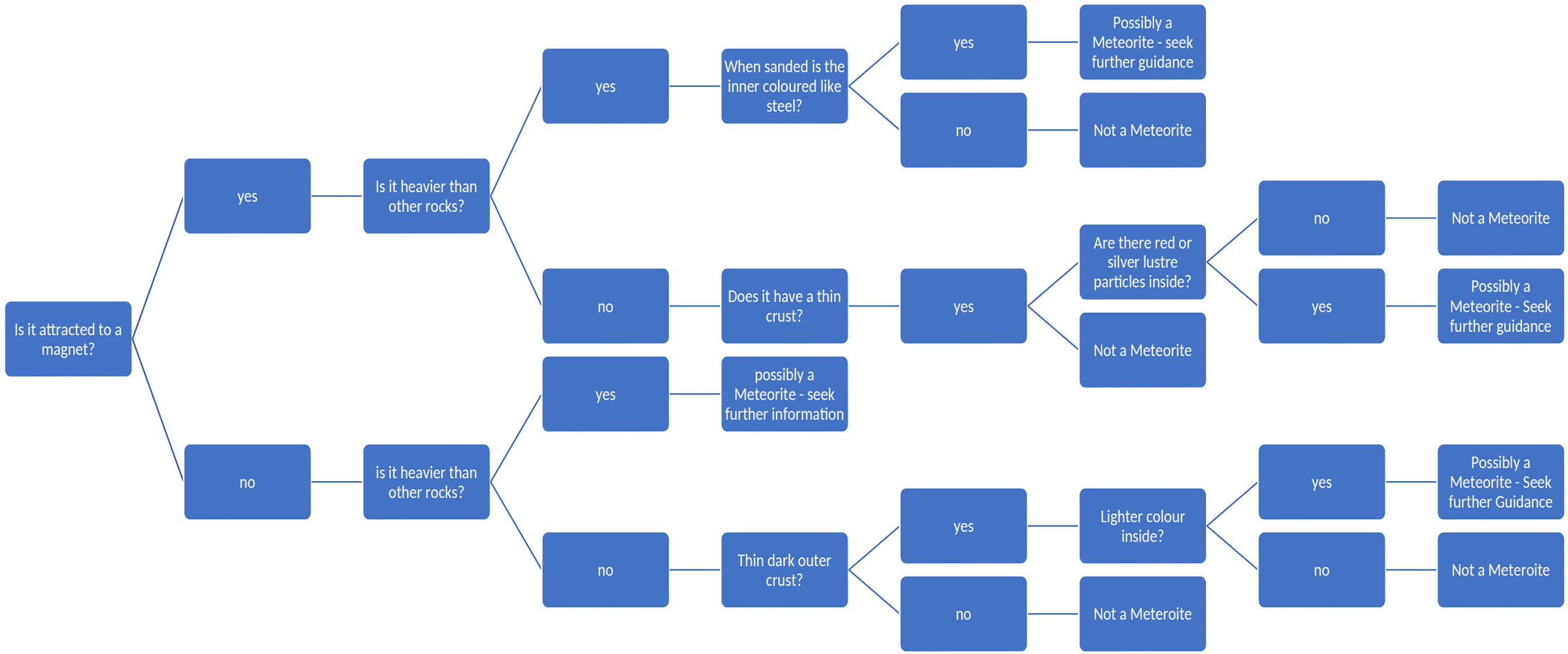
Note
This decision tree applies for creatures above 2mm length. You may consider filtering before the tree. How might this be achived?
Note that one possible outcome is the starting point of the next tree. How would you integrate these two trees?

Freshwater Arthropod Identification (2mm+ excludes skaters and other surface animals)



Note:
The previous tree could have been followed to get to this point. How would you direct a user back to the other tree if needed?

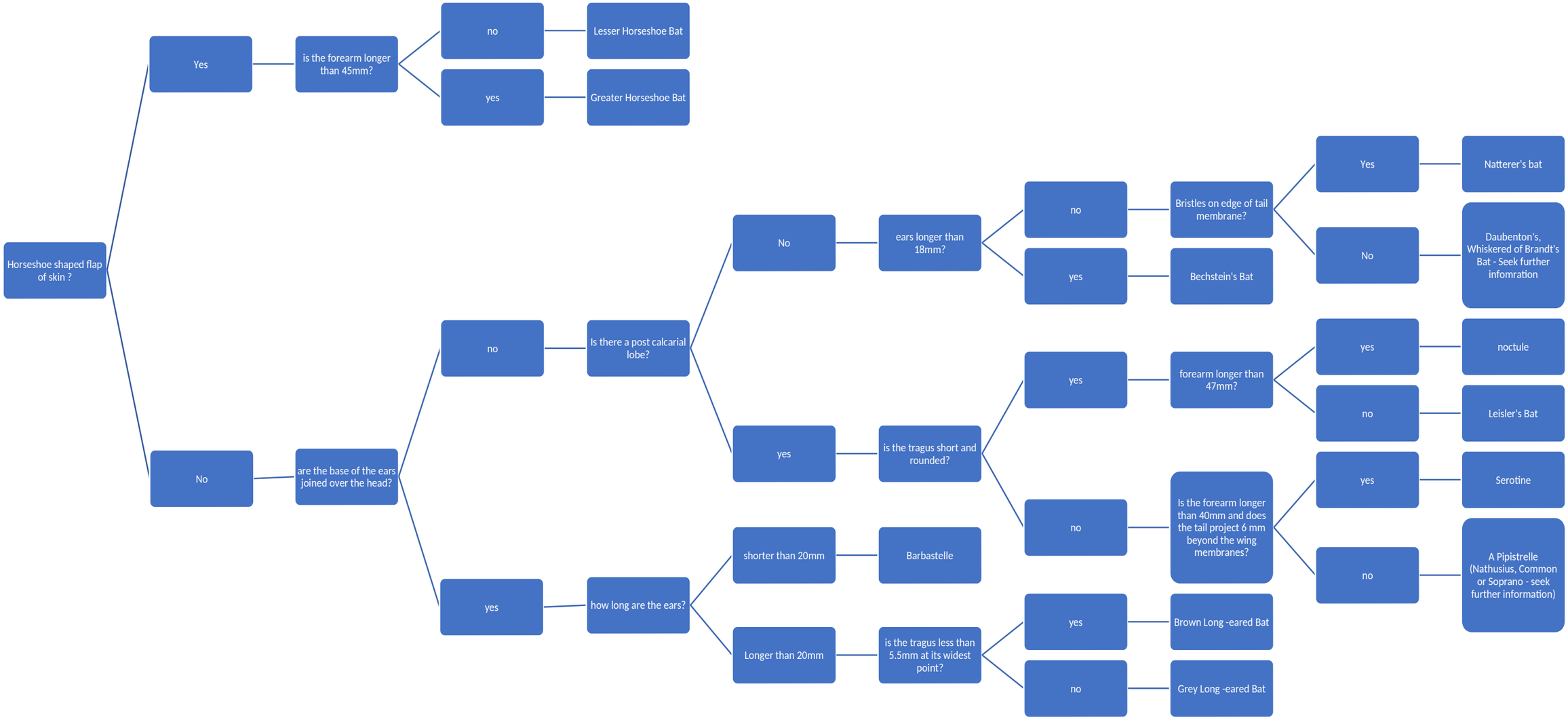
Meteorite Identification



Note:
This tree is based on one set of experts advice? You may be able to identify other experts with differing views. How would you synthesise these views into a single system? How can the system then be tested for reliability?

British Bat Identification

PUBLIC / CYHOEDDUS



Note:
This tree asks about specific information which might not be readily available to the user. What systems can be used to give an indication with some perhaps some level of confidence attached? The tree also uses specialised terms. How might the interface be constructed/adapted to help a lay user identify bats.

Appendix Two

	Fail with Significant Weakness (0-29)	Fail	Satisfactory (3rd)	Good (2:2)	Very Good (2:1)	Excellent Work (1st)
Rule Base Depth 25%	The rule-base produces little or none of the intended inference and output with or without interim decisions, which may also include unnecessary, repetitive or unreadable constructs	The rule-base produces most of the intended inference and output with or without interim decisions, which may also include unnecessary, repetitive or unreadable constructs	The rule-base produces the intended inference and output with some interim decisions where required, and may have some unnecessary, repetitive or unreadable constructs	The rule-base produces the intended inference and output and establishes some interim decisions, and may have some unnecessary, repetitive or unreadable constructs, but these will be the lesser part	The rule-base produces the intended inference and output and establishes interim decisions may have a few unnecessary, repetitive or unreadable constructs.	The rule-base produces the intended inference and output, establishes interim decisions and avoids unnecessary, repetitive or unreadable constructs where possible. Consideration of the wider context and future scaling of the rule base have been applied and clearly communicated
Quality of output and natural dialog 15%	User input may lead to some sensible output that are not well tailored to the input. The rules and output actions constructed does not respond well to the user and includes many unnecessary questions	User input leads to some sensible output that may not be well tailored to the input. The rules and output actions constructed does not respond well to the user and/or includes many unnecessary questions	User input leads to a mostly sensible output that may not be well tailored to the input. The rules and output actions constructed respond fairly well to the user, but may include some unnecessary questions	User input leads to a mostly sensible output but this may not be well tailored to the input. The rules and output actions constructed respond fairly well to the user, but may include some unnecessary questions, generally the minority. Consideration has been made of the user experience	User input leads to a sensible output that seems tailored to the input. The rules and output actions constructed respond well to the user, but may include very few unnecessary questions. Clearly demonstrates some consideration of the user experience	User input leads to a sensible output that seems tailored to the input. The rules and output actions constructed should persuade the user that an actual consultation is occurring i.e. that the system seems to be responding to input (and not asking unnecessary questions). Clearly demonstrates consideration of the user experience and expectations and responds in a clean

						effective manner
Discussion of knowledge acquisition 25%	Very little or no evidence of understanding knowledge acquisition or inductive learning in context is presented. The breadth, depth and suitability of materials used in support of the discussion falls far short of expectation and contains significant inaccuracies	Little evidence of understanding of knowledge acquisition or inductive learning in context is presented. The breadth, depth and suitability of materials used in support of the discussion falls short of expectation and contains some inaccuracies	Evidence of some understanding of how inductive learning might lead to a more effective Decision Tree than the one given is presented. The breadth, depth and suitability of materials used in support of the discussion meets minimum expectations and may contain some significant inaccuracies	Evidence of understanding of how inductive learning might lead to a more effective Decision Tree than the one given is presented. Discusses KA in general terms. The breadth, depth and suitability of materials used in support of the discussion is reasonable, but may contain some inaccuracies	Thorough understanding of how inductive learning might lead to a more effective Decision Tree than the one given. This is related to a discussion of KA in general. The breadth, depth and suitability of materials used in support of the discussion is commendable, but may contain some minor inaccuracies	Deep and critical understanding of how inductive learning might lead to a more effective Decision Tree than the one given, and with which the expert might be happy. This will be integrated into a critical discussion of knowledge acquisition. The breadth, depth and suitability of materials used in support of the discussion is excellent
Analysis of system and demonstration 25%	Very little or no understanding. Discussion of how well the program works is minimal or non-existent and not justified. Little or no attempt has been made to suggest how the program might be improved. Minimal if any relevant problems or limitations of the knowledge-base are highlighted and these include inaccuracies. Some or all of the above is missing	Little understanding. Discussion of how well the program works is very limited and not justified. An attempt may have been made to suggest how the program might be improved. Very few relevant problems or limitations of the knowledge-base are highlighted and these may include some inaccuracies. Some of the above is missing	Some understanding of the programme demonstrated. Discussion of how well the program works is limited and may not be particularly well justified. An attempt is made to suggest how the program might be improved are included. these suggestions will be reasonable. Few relevant problems or limitations of the knowledge-base are highlighted and these may include some inaccuracies. Some of the above may be missing	Generally understood. Some discussions of how well the program works are included and somewhat justified. Some suggestions of how the program might be improved are included. Some relevant problems or limitations of the knowledge-base are highlighted, but may include some inaccuracies	Thorough understanding. Discussions of how well the program works are included and reasonably well justified. Reasonable suggestions of how the program might be improved are included. Some relevant problems or limitations of the knowledge-base are highlighted	Deep and critical understanding. Discussions of how well the program works are well constructed and thoroughly justified. Justified suggestions of how the program might be improved are included. Any relevant problems or limitations of the knowledge-base are highlighted
Use of sources and quality of presentation	Very poor Use of sources and quality of presentation Few or no sources cited. Poorly	Poor Use of sources and quality of presentation Few or no cited sources.	Satisfactory Use of sources and quality of presentation. The work is presented in a	Good Use of sources and quality of presentation. The work is presented in a	Very good use of sources and quality of presentation. The work is presented in a clear and	Excellent use of sources and quality of presentation. The work is

10%	presented work which lacks detail or has significant errors	The work lacks some necessary detail and may contain errors	way which aids clarity. Evidence of the use of sources. Perhaps incorrectly. Errors will be minor	clear and unambiguous way. Sources are used	unambiguous manner. Sources clearly support the arguments	presented in a clear unambiguous manner. Sources are used to support arguments and to place the work in its wider context.