Should Vegetable Oil be used as a Fuel?

Suggested Assessment Criteria

This module provides much opportunity for student assessment without the need for setting aside a separate time for this. Thus formative assessment methods are advocated. These are illustrated in three different approaches

- Assessment by skill
- |Assessment by lesson
- Assessment by teacher strategy

Part A Assessment based on Skill Acquired

Award of social value grade

x not able to put forward justified reason as to whether vegetable oil should be used as a fuel. Not able to cooperate well within the group;

√ able to put forward merits and demerits of using vegetable oils as fuels and formulate a decision; able to cooperate as a member of a team;

√√ able to put forward socio-scientific merits and demerits for using vegetable oils as fuels and formulate a justified decision; cooperate as a team member and showing leadership skills in the carrying out the experimental procedures, devising tests for determining the suitability of the bio-diesel created and in discussing the merits and demerits of using vegetable oils as fuels.

Award of a science method grade

x not able to prepare bio-diesel without much guidance;

√ able to prepare bio-diesel successfully and put forward plans and carry them out for testing the suitability of the bio-diesel with help from the teacher;

√√ able to prepare bio-diesel successfully and put forward plans and carry them out for testing the suitability of the bio-diesel.

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Award of a science concept grade

- x not able to understand the functioning of diesel in an internal combustion engine and poor understanding of esters and their function;
- √ able to explain the functioning of ordinary diesel as a fuel, suggest how to determine the suitability of fuels, understands the formation and hydolysis of esters;
- √√ able to explain the functioning of biodiesel and ordinary diesel as fuels, suggest how to determine the suitability of fuels and the best biodiesel, understand the formation and hydrolysis of esters and the transesterification process.

Award of a personal skill grade

- x poor report on biodiesel and little interest shown in the experimentation;
- √ willing to participate as a member of the group and produce a sound report;
- √√ willing to participate and help others and produces a complete and accurate report.

Part B Assessment by Lesson

Lesson 1

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	Discussion on whether biodiesel compared to vegetable oil as a fuel	Contributes to the discussion	
		Illustrates leadership skills in guiding others in the discussion	
		Shows tolerance of the views of others	
2	During preparations for making biodiesel	Contributes to the preparation procedures	
		Understands the process	
		Understands the need for a non-aqueous catalyst	

Lesson 2

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	Performing the experiment to make biodiesel	Is able to follow instructions	
		Performs the experiment	
		Uses the equipment/chemicals safely	
		Behaves in a safe manner	
		Maintains an orderly and clean work table.	
2	Devising tests for separation and suitability	Puts forward positive ideas for separating out the biodiesel	
		Cooperates as a member of a group in devising tests to determine the suitability of the fuel	
		Illustrates leadership skills in guiding the group.	
		Shows tolerance of the views of others	

Lesson 3

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	Performing the experiment to separate out biodiesel	Able to separate the liquids	
		Able to limit the formation of an emulsion	
		Maintains an orderly and clean work table.	
2	Compare with trans-esterification	Provides appropriate written response on the meaning of trans-esterification	

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Lessons 4

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	Conducts tests on suitability of biodiesel as a fuel	Contributes to the group work in carrying out the tests	
2	Record observations	Makes and records observations	
3	Interpret from data collected and makes inferences	Intreprets form the observations	
4	Questions to the group on the experimental work	Able to explain the work of the group	
		Understands the science involved in the work of the group	
		Willing to support the responses given by others in the group	
5	Questions to individuals in the group	Able to explain the action taken by each member of the group	
		Understands the objective of the work	
		Exhibits appropriate non-verbal behaviour	

Lessons 5

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	Participation in the debate on whether biodiesel should be used as fuel	Contributes to the group discussion to make justified decisions.	
		Illustrates leadership skills in guiding the discussions to involve all members of the group	
		Shows tolerance towards opinions of others	
2	Put forward socio-scientific reasoning	Illustrates reasoning skills in discussions and arriving at a decision	
		Gives a justified socio-scientific decision	

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Part C Assessment by Teacher Strategy

Assessment Tool based on the Teacher's Observations

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	Functioning in the group during experimentation or discussion	Contributes to the group discussion during the planning phase, experimental phase and decision making.	
		Cooperates with others in a group and fully participates in the work of the group.	
		Illustrates leadership skills – guiding the group by thinking creatively and helping those needing assistance (cognitive or psychomotor); summarising outcomes.	
		Shows tolerance with, and gives encouragement to, the group members.	
2	Performing the investigation or experiment	Understands the objectives of the investigation/experimental work and knows which tests and measurements to perform.	
		Performs the investigation/experiment according to the instructions/plan created.	
		Uses lab tools and the measurement equipment in a safe and appropriate manner.	
		Behaves in a safe manner with respect to him/herself and to others.	
		Maintains an orderly and clean work table.	
3	Presenting the investigation or experiment orally	Presents the activity in a clear and practical manner with justified decisions.	
		Presents by illustrating knowledge and understanding of the subject.	
		Uses precise and appropriate scientific terms and language.	

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		Presents with clarity and confidence using an audible voice.	

Assessment Tool based on Marking of Written Material

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	Writes a plan or report of an investigation	Puts forward an appropriate research/ scientific question and/or knows the purpose of the investigation/experiment	
		Creates an appropriate experimental plan for testing the suitability of biodiesel as a fuel.	
		Develops an appropriate procedure (including apparatus and safety procedures required) and indicates variables to control	
2	Record experimental data collected	Makes and Records observations/data collected appropriately (in terms of numbers of observations deemed acceptable/accuracy recorded/errors given)	
3	Interpret or calculate from data collected and making conclusions	Interprets data collected in a justifiable manner including the use of appropriate graphs, tables and symbols	
		Draws appropriate conclusions related to the suitability of biodiesel as a fuel.	
4	Answers questions	Provides correct written answers to questions given orally or in written format	
		Provides answers in sufficient detail especially when called upon to give an opinion or decision	
5	Scientific or socio-scientific reasoning	Gives a justified socio-scientific decision to an issue or concern, correctly highlighting the scientific component	

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Assessment Tool based on the Teacher's Oral Questioning

	Dimension	Criteria for evaluation The student:	Mark/grade given (x,√,√√)
1	**Questions to individuals in a Whole Class setting**	Answers questions at an appropriate cognitive level using appropriate scientific language	
		Shows interest and a willingness to answer	
		Willing and able to challenge/support answers by others, as appropriate	
2	**Questions to the group**	Able to explain the work of the group and the actions undertaken by each member	
		Understands and can explain the science involved using appropriate language	
		Willing to support other members in the group in giving answers when required	
		Thinks in a creative manner, exhibits vision and can make justified decisions	
3	**Questions to individuals in the group**	Able to explain the work of the group and actions taken by each member	
		Understands the purpose of the work and shows knowledge and understanding of the subject using appropriate scientific language	
		Can exhibit non-verbal activity (demonstrate) in response to the teacher's questions, as appropriate	

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