

BINDURA UNIVERSITY OF SCIENCE EDUCATION

CHEMISTRY DEPARTMENT

COURSE: CH406: FUEL TECHNOLOGY

JUN 2025

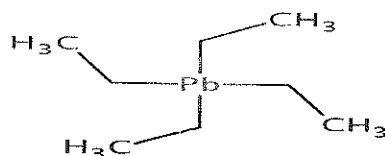
2 HOURS

ANSWER QUESTION ONE AND FOUR OTHERS, TWO FROM EACH OF THE SECTIONS A AND B. EACH QUESTION CARRIES 20 MARKS

1. (a) Define the following terms as used in fuel technologies.
 - (i) Biomimetic catalysts [2 marks]
 - (ii) Ultimate analysis [2 marks]
 - (ii) Blue gas [2 marks]
- (b) Discuss natural gas under the following headings;
 - (i) Composition [4 marks]
 - (ii) Advantages [5 marks]
- (c) What are the advantages and disadvantages of methyl alcohol as an alternative fuel? [5 marks]

SECTION A: ANSWER ANY TWO QUESTIONS

2. (a) Discuss the desirable properties of a good fuel. [7 marks]
- (b) Discuss liquid fuels under the following headings;
 - (i) Advantages and disadvantages [10 marks]
 - (ii) Examples [3 marks]
3. (a) Discuss petroleum under the following headings;
 - (i) Classification [6 marks]
 - (ii) Environmental concerns [4 marks]
- (b) Discuss the chemistry behind the Fischer-Tropsch process. [10 marks]
- 4 (a) (i) Describe the chemistry behind the addition of the compound below in petrol?



[4 marks]

- (ii) Why is the replacement of the compound above with aromatic phosphates desirable? [6 marks]
- (b) (i) What are the advantages of biodiesel as fuel? [4 marks]
- (ii) Describe the chemical composition and uses of water gas. [6 marks]

SECTION B: ANSWER ANY TWO QUESTIONS

- 5. (a) State the advantages and disadvantages of power alcohol. [10 marks]
- (b) Discuss the following types of cars under the headings, fuel type and emission levels.
 - (i) Hybrid electric vehicles [3 marks]
 - (ii) Plug-in hybrid electric vehicles [3 marks]
 - (iii) Battery electric vehicles [4 marks]
- 6. Discuss hydrogen as a fuel under the following headings;
 - (a) Pollution [5 marks]
 - (b) Manufacturing process [5 marks]
 - (c) Economic implications [5 marks]
 - (d) Current trends [5 marks]
- 7. (a) Describe the process of mining uranium. [10 marks]
- (b) What are the advantages and disadvantages of uranium as a source of energy in developing countries like Zimbabwe? [10 marks]

END OF PAPER