BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT: SCIENCE AND MATHEMATICS EDUCATION

PROGRAMME
DIPLOMA IN SCIENCE EDUCATION

APR 2025

DP003/PH002 (2): THERMAL PHYSICS

DURATION: 3hrs TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES

Answer ALL questions in Section A and any THREE questions from Section B. Section A carries 40 marks and each question of Section B carries 20 marks. Show ALL formulae and substitutions in ALL calculations.

SECTION A (40 MARKS)

(Answer **ALL** questions from this section)

QUESTION 1 (40 MARKS)

a) Distinguish between '***heat capacity***' and '***specific heat capacity***'. (2 Marks)

b) Define the term '***greenhouse gas***' and give an example of such gases. (3 Marks)

c) A heat engine operates between a high-temperature reservoir at 500°C and a low-temperature reservoir at 20°C. The engine absorbs 200 kJ of heat energy from the high-temperature reservoir and rejects 120 kJ of heat energy to the low-temperature reservoir. Calculate:

i. The work done by the engine (2 Marks)

ii. The efficiency of the engine (2 Marks)

iii. Compare the calculated efficiency with the maximum possible efficiency (Carnot efficiency) for an engine operating between these temperatures. Explain why the actual efficiency is lower. (2 Marks)

iv. Calculate the efficiency of a power plant if the efficiencies of the boiler, turbine and generator are 88, 40 and 98%, respectively. (4 Marks)