St Mary's

Performance Task — Learner Copy

Biology · Grade 11 · STEM · Nakuru County

TPAD Evidence — CBE Assessment · Biology · Grade 11 · 20 March 2026 · Ref: ASSESSKE-BIO-G11-TAS-20260320

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IN-CLASS PERFORMANCE TASK · 40 MINUTES

Analysing Gaseous Exchange Adaptations in Nakuru County Dairy Cattle

Analyse structural adaptations of mammalian gaseous exchange surfaces and evaluate their efficiency in supporting metabolic demands

BACKGROUND

You are a veterinary consultant working with dairy farmers in Nakuru County's Rift Valley. High-altitude conditions (1850m above sea level) and intensive milk production create unique respiratory challenges for livestock. Using provided data on cattle respiratory measurements and milk production records, you must analyse how structural adaptations of gaseous exchange surfaces support the high metabolic demands of dairy cattle in this environment.

Nakuru County is a major dairy farming region in Kenya's Rift Valley, with thousands of smallholder and commercial dairy farms. The county's elevation (1850m above sea level) means lower atmospheric oxygen pressure, while high-yielding dairy cattle have increased metabolic demands due to milk production. Understanding how mammalian gaseous exchange systems are adapted to meet these challenges is crucial for maintaining livestock health and productivity.

YOUR TASK

1 Examine the provided data pack containing respiratory measurements from dairy cattle, milk production records, and comparative mammalian lung structure data from Nakuru County veterinary clinics.

2 Identify and analyse three key structural adaptations of mammalian gaseous exchange surfaces, using specific measurements from the data to support your analysis.

3 Calculate the relationship between lung surface area, breathing rate, and milk production using the provided cattle data, showing all working steps.

4 Evaluate how these structural adaptations maximise gas exchange efficiency to support high metabolic demands of dairy cattle at Nakuru's altitude, providing evidence-based recommendations for farmers.

WHAT TO SUBMIT

- Detailed analysis of three structural adaptations with supporting calculations from provided data

SUCCESS CRITERIA

✓ I can identify and explain three structural adaptations of mammalian gaseous exchange

- Mathematical relationship established between respiratory measurements and metabolic output using cattle data
- Evidence-based evaluation of adaptation efficiency with practical recommendations for Nakuru dairy farmers

surfaces using specific data evidence

✓ I can calculate and interpret relationships between lung measurements, breathing rates and metabolic demands using provided cattle data

✓ I can evaluate how structural adaptations maximise gas exchange efficiency in high-altitude dairy farming conditions

✓ I can provide evidence-based recommendations for optimising cattle respiratory health in Nakuru County farming conditions

This is a teacher-designed classroom or school-based assessment task. It supports but does not replace KNEC-provided SBA tools available at cba.knec.ac.ke.