A-LEVEL BIOLOGY
TRANSPORT SCENARIO ITEMS
BIOCLASS HUB

ITEM 1

In Kampala city, a group of boda-boda riders often park at busy junctions, exposing themselves to heavy **traffic fumes**. Over time, some riders developed symptoms of **headaches, dizziness, and difficulty concentrating**. A health survey tested blood samples from three groups: rural farmers (control), boda-boda riders, and traffic police officers.

Table: Average Blood Gas Levels and Heart Rates.

Group	Carboxyhaemoglobin (%)	Oxygen Saturation (%)	Average Heart Rate (beats/min)	Breathlessness Complaints (%)
Rural farmers	0.5	98	72	2
Boda-boda riders	8.0	89	95	40
Traffic police officers	12.5	83	110	70

Task:

(a) Explain how the changes in blood gas levels affect oxygen transport and energy supply in boda-boda riders and traffic officers.

(b) Using the data, analyse why traffic officers are more affected than boda-boda riders.

(c) Propose public health and personal strategies to reduce health risks from carbon monoxide in such environments.

TAP THE LINK BELOW FOR THE SOLUTION

https://www.youtube.com/watch?v=ivhro_ltugE

ITEM 2

In Mukono, a family keeps guinea pigs as pets. Their 14-year-old daughter, **Jane, develops sneezing**, watery eyes, and skin rashes whenever she plays with them. Interestingly, her twin **brother, John, has never** shown such symptoms despite playing with the pets daily.

Doctors carried out the following tests:

Table: Blood Test Results

Parameter	Jane	John	Reference (Normal)
IgE antibody levels (IU/ml)	340	60	<100
Histamine release after allergen exposure	High	Normal	Normal
White blood cell count	Normal	Normal	Normal

Task:

(a) Explain why Jane shows allergic reactions but John does not, even though they are twins.

(b) Analyse how histamine contributes to Jane's symptoms.

(c) Propose medical and lifestyle strategies that can help Jane manage her condition.

TAP THE LINK BELOW FOR THE SOLUTION

https://www.youtube.com/watch?v=UqVY9zH-ye4

ITEM 3

In Lira, an outbreak of measles affected children in a village. Health workers **vaccinated all children**, but a few still developed mild symptoms. Laboratory tests compared antibody levels in three groups:

Table: Average Antibody Levels after Vaccination

Group	Antibody Levels (arbitrary units)	Severity of Symptoms
Fully vaccinated, healthy children	High	None
Vaccinated but mildly symptomatic	Moderate	Mild
Unvaccinated children	Low	Severe

Task:

(a) Explain why some vaccinated children still developed mild symptoms.

(b) Analyse how antibodies protect the body from measles infection.

(c) Propose strategies to improve the effectiveness of vaccination campaigns in rural communities.

TAP THE LINK BELOW FOR THE SOLUTION

https://www.youtube.com/watch?v=Ma2a5GaZyLc

ITEM 4

Three Ugandan athletes trained under different environmental conditions and participated in a national cross-country competition. Doctors assessed their blood and **immune indicators** before and after the race. One athlete trained at high altitude, another at sea level, and a third in a humid, polluted city.

Parameter	**High Altitude (Kapchorwa, 2200 m)**	**Sea Level (Entebbe, 1135 m)**	**Polluted Lowland (Jinja)**
Haemoglobin (g/dL)	17.8	15.0	14.2
Blood oxygen saturation (%)	93	98	90
White blood cell count (cells/µL)	7,000	6,200	5,000
Pulse rate after race (beats/min)	120	145	160
Recovery time (min)	3	7	10

Task:

(a) Explain how differences in oxygen transport and immune cell activity influence performance and recovery.

(b) Suggest physiological and immunological strategies to strengthen endurance, immunity, and recovery in different training environments.

TAP THE LINK BELOW FOR THE SOLUTION

https://www.youtube.com/watch?v=l5slWi8J4wI